MODELING OF TAX INSTALLMENT BY RADIO FREQUENCY IDENTIFICATION (RFID)

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Research Project
Entitled

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ABSTRACT

This research project has developed a system called Modeling of Tax Installment by Radio frequency Identification (RFID). The technique applies RFID technology to verify and store taxpayer data. It is a tax payment in installments, with a tax amount of 3,000 baht or over, both for mid-year and year-end tax. A taxpayer is eligible to ask for a tax payment in 3 equal installments without having to pay any additional money. He may request to pay tax in installments at the Revenue Department's regional office using a set of 'ภ.ง.ด.35' tax forms, consisting of 3 sheets, and using the following process. For the first installment, it is paid, along with the submission of a tax form, before September 30 or March 31. The second installment must be paid within one month after, the first installment is paid while third installment has to be paid within a month after the second installment is paid. In case any one installment is not paid in due time, a taxpayer will be deprived of his privilege to pay in installments and will have to pay additional money of 1.5 % per month or fractional month, of the remaining tax amount. The system performance is web-based. A taxpayer's installment payment data are stored in an RFID tag, which enables, an accurate verification of data due to the system's automation and diminishes officials' errors. Furthermore, the efficiency of 'ภ.ง.ด.35' tax forms is enhanced for a sound service to taxpayers. Finally, the system helps reduce the amount of paper of 'ภ.ง.ด.35' tax forms currently used, since an RFID tag can be reused.

KEY WORDS : RFID TECHNOLOGY/ RFID TAG/ TAX PAYMENT/REVENUE DEPARTMENT

180 pp.

การจำลองระบบการผ่อนชำระภาษีผ่านบัตร RADIO FREQUENCY IDENTIFICATION (RFID)
(MODELING OF TAX INSTALLMENT BY RADIO FREQUENCY IDENTIFICATION)

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บทคัดย่อ

สารนิพนธ์นี้ ได้พัฒนาระบบที่เรียกว่า การจำลองระบบการผ่อนชำระภาษีผ่านบัตร RFID (Radio frequency Identification) ด้วยเทคนิคการนำ RFID Technology มาใช้ในการตรวจสอบและเก็บข้อมูลของผู้เสียภาษี เป็นการผ่อนชำระภาษีจำนวนตั้งแต่ 3,000 บาทขึ้นไป ทั้งภาษีครึ่งปีและภาษีสิ้นปี ผู้เสียภาษีมีสิทธิ ขอผ่อนชำระภาษีได้เป็น 3 งวดเท่า ๆ กัน โดยไม่ต้องเสียเงินเพิ่มใดๆ ผู้เสียภาษีอาจติดต่อขอผ่อนชำระได้ที่ สำนักงานสรรพากรพื้นที่สาขาโดยใช้แบบ บ.ช. 35 จำนวน 1 ชุด 3 แผ่น ข้อความเหมือนกันดังนี้ งวดที่ 1 ชำระพร้อมกับการยื่นแบบแสดงรายการภายในวันที่ 30 กันยายน หรือ วันที่ 31 มีนาคม งวดที่ 2 ชำระภายใน 1 เดือน นับตั้งแต่วันที่ต้องชำระงวดที่ 1 งวดที่ 3 ชำระภายใน 1 เดือนนับแต่วันที่ต้องชำระงวดที่ 2 ถ้าภาษีงวดใดงวดหนึ่งมิได้ชำระภายในกำหนดเวลาดังกล่าว ผู้เสียภาษีหมดสิทธิที่จะชำระภาษีเป็น รายงวด และต้องเสียเงินเพิ่มในอัตราร้อยละ 1.5 ต่อเดือน หรือเศษของเดือนของเงินภาษีงวดที่เหลือ ลักษณะการทำงานของระบบข้อมูลที่เป็นเว็บเบส รายการผ่อนชำระของผู้เสียภาษีจะเก็บอยู่บนบัตร RFID ซึ่งช่วยให้การตรวจสอบการผ่อนชำระได้ถูกต้องเพราะระบบเป็นแบบอัตโนมัติ ลดความผิดพลาดการทำงานของเจ้าหน้าที่ นอกจากนี้ยังจะช่วยเพิ่มประสิทธิภาพของแบบ บช.35 ในการให้บริการกับผู้เสียภาษีได้อย่างถูกต้อง และยังช่วยลดปริมาณการใช้กระดาษที่เป็นแบบ บช.35 เพราะบัตร RFID สามารถนำกลับมาใช้ใหม่ได้

180 หน้า

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CHAPTER I
INTRODUCTION

1.1 Introduction

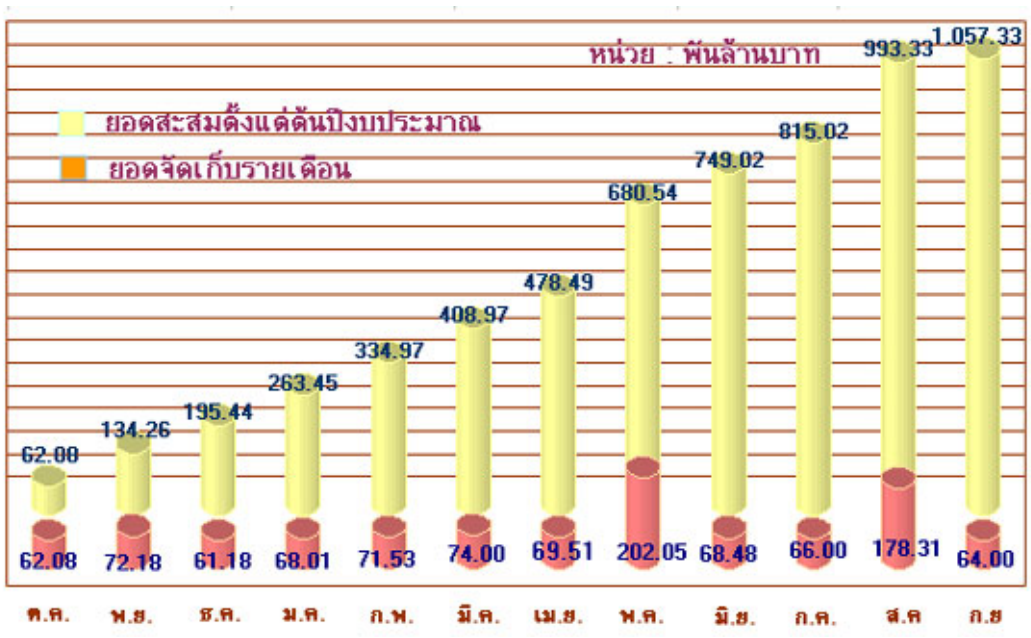
Currently, a particular code inspection system using radio frequency identification (RFID) is widely accepted as a technology favorable to usage that needs to distinguish or indicate specific data of each person. The system can perform accurately, precisely and rapidly while it is more automatic than other code inspection systems like barcode. Furthermore, it is capable of searching for or following up an object, which requires more detailed detection that an ordinary barcode system cannot do, particularly an inspection of code in the area smeared with dirty mud, lubrication oil or grease, etc. In addition, the RFID system can read data without having to press a reader (reading machine) against the name RFID tags like that of barcode. And because this is the sending of radio signal, data can be read completely or in large amount at a time. Similarly, the name RFID tags or chip can store much more data than a barcode dose and is far more difficult to forge, and RFID tags can be reused. Moreover, the RFID system is easy to utilize and has a potential in enhancing the capability to provide additional services for a commercial purpose, besides being in accordance with the technology on computer data storage, all contributing to a rapid expansion of RFID use.

1.2 Problem Statement

The Revenue Department (RD) is considered a significant government agency which is indispensable to the country's development. The majority of the country's revenue is delivered from RD. Apparently, tax collection deals with a great majority of the people. Based on statistics, there are about 20 million taxpayers in Thailand, a very little number compared to the country's 63 million populations. The amount of all

types of taxes paid in 2007 was around 1,057,326,800 million baht. RD has fully realized that to provide convenience to taxpayers in order to make them willing to pay taxes is a difficult issue but RD is not discouraged by this and has always attempted to improve and developed its computer program to support taxpayer's services. For instance, a system of tax payment via the Internet has been initiated, which subsequently becomes very popular since taxpayers don't have to travel to RD branch offices but are able to make a business transaction on tax payment round the clock, even on weekends .

At present, RD Intranet possesses a system of overseeing individual taxpayers, making it possible for RD officials to know the financial status of each taxpayer all the time and increasingly be able to follow up his/her tax payment. Simultaneously, taxpayers themselves can examine their own data all the time, enabling them to analyze or plan for their spending or business transactions.



Picture from www.rd.go.th

Figure 1.1 Consequence of RD's Tax Collections

Figure 1.1 illustrates statistics of increasing annual tax collection due to the country's economic growth and augmenting populations. Another service that RD offers taxpayers is taxpayer ID card. To enhance the efficiency of tax collection management, RD has used a computer to store taxpayer data in database and assigned

each person who is liable to pay tax to have and use only 1 taxpayer ID number consisting of 10 figures, in accordance with that defined in the revenue code. Nonetheless, currently, RD stipulates that each taxpayer must use his/her ID card number instead of taxpayer ID number, making it more convenient for all taxpayers.

This research project was carried out to facilitate services for taxpayers concerning their tax payment to RD on an installment basic because the country's current economy is not so good, causing the people to lack liquidity. Thus, it is believed that tax payment in installments will help relieve their financial burden. With this in mind, RD has made a regulation allowing taxpayers to pay taxes in 3 installments. In this regard, the RFID technology serves to collect the installment data of each taxpayer. Therefore, if RFID is used to compile installment data or as taxpayer ID cards, it will help increase convenience for taxpayers. As a rule, taxpayers are required to present this card to RD officials to assure their identify for each installment. The RFID technology can be used for tax installment with the Income Tax Form 90, which is a form displaying items of personal income tax of those earning from their salary only, including with the Income Tax Form 91, which is a form displaying items of personal income tax of those earning from both their salary and other business transactions. Additionally, RFID can also be used with many other income tax forms, through which tax payment is in installments, using the RFID technology with RD work system. Base on the system principle, tax installment data are stored on RFID tags, which taxpayers have to present to RD office every time they pay tax installments. All installment data are stored on RFID tags while the amount of each installment is cut off. For the last installment, taxpayers will have to return their card to RD since it is regarded as the government's asset. It the card is not returned, taxpayers will be fined 100 bath a card or base on the price of RFID tags at that moment.

1.3 Objectives

The objectives of this research are listed as follows:

1. To use the RFID technology for RD tax installment program.

2. To study and understand the RFID technology so that it can be applied to the exiting work and yields the highest benefit.
3. To study the writing of a program communicating between a reader and RFID tags, using a program via web application, such as HTML, PHP and VB Script
4. To find a guideline for replacing the current taxpayer paper cards, which cannot be modified, with RFID tags?
5. To study the storage of data on RFID tags, using a web technology technique.

1.4 Scope of Work

The following are to be covered by this project.

1. Develop and write a program connecting between an RF reader and computers.
2. Develop a program for a tax installment system through the web application technology, along with MySQL database.
3. Languages used to develop the system are, PHP, VB Script and Java Script.
4. The RFID technology is used for RD tax installment.
5. A web – based application system is used for RD tax installment.
6. Develop the RFID system so that it can be application to the RD work system.

1.5 Benefits to Be Derived from This Project

The benefits to be derived from this project are classified into 3 dimensions as the following:

1. Benefits for users: Users who pay taxes are anticipated to be provided with more convenience and swiftness in dealing with RD officials. A taxpayer can use only one card for paying various categories of taxes, all at the same time. Besides, the card may be reused in case of its cancellation by the previous cardholder; helping to decrease an agency’s expenses. Similarly, taxpayers can verify data in retrospect.

2. Benefits for operators: Errors stemming from work performance can be reduced since the system operators automatically and is able to verify existing items and compare between RFID tags and RD database. Apparently, this helps diminish time for taxpayers data searching, generating satisfaction among taxpayers.
3. Benefits for managers and executives: The proposed system will decrease the problems incurred by the customers' service use, resulting in a good image on managers or executives, apart from preventing officials' corrupt practice. In addition, the data from the system may be efficiently used for analysis and management, for example, tax payment data are analyzed and managed in order to create flexibility of tax payment. Moreover, personnel management is done for appropriateness of each issue concerned so as to reduce unnecessary labor costs. Finally, the RFID technology can be applied along with RD performance.

1.6 Organization of the Research Project

This research project is divided into six chapters as follows:

Chapter I **Introduction:** This chapter discusses an introduction, the problem statement, the objectives, the scope of the research project, the contributions of the research project and the organization of the project document.

Chapter II **Literature Review:** This chapter provides a brief survey of the researches most related to our work.

Chapter III **Methodology:** This chapter presents of modeling of tax installment by radio frequency identification (RFID) architecture and components.

Chapter IV **Design and Implementation:** This chapter presents the design, the implementation, the specification and the user interfaces of modeling of tax installment by radio frequency identification (RFID).

Chapter V **System Evaluation and Results:** This chapter shows and discusses the evaluation results of modeling of tax installment by radio frequency identification (RFID).

Chapter VI **Conclusion:** This chapter provides the conclusions of this research project and suggestions for future work.

CHAPTER II
LITERATURE REVIEW

2.1 What is RFID?

RFID is an acronym for radio frequency identification, which is a technology used to identify data that reveals the identity of objects or persons through radio frequency wave. It was developed in 1970s with an aim to be used to identify the identity of objects at a distance. Current RFID has a feature of a thin signboard containing a small microchip which can store data and read data through remote radio signal. The performance of the signboard is to verify, follow up and record data on it. To use the signboard, it is buried inside or attached to such objects as products, boxes or other stuffs. One piece of signboard can follow up the data of object. Details within the signboard will tell about the data of products to which the signboard is attached, for example, where the products were produced, who produced them, how they were produced, when they were produced, how many components they have and where each component comes from, including the location of this objects. This aims to identify in which part of the world they are, without having to contact less or see those objects first. A performance by using a reader that communicates with a signboard via radio signal, in order to read and write RFID data, has the following advantages [1].

- Be able to store data of instruments that are attached.
- Reading data on RFID tags can be done much faster than on other tags types.
- Be able to read data simultaneously on several RFID tags.
- Be able to send data to a receiver without having to hold a tag at the right angle, just hold it in the area where radio signal can be received, which enables the reading of data.

- Average rate of reading accuracy by means of RFID technology is about 99.5 % while that of other methods is around 80 %
- Sine data are rewriteable, RFID tags can thus be reused, helping to reduce the production cost.
- Be able to read data repeatedly without causing any error.
- The damage caused to RFID tags is less compared to other methods since it is not necessary to attach them outside a package.
- A security system is better since forgery and imitation are hard to do.
- Be resistant to dampness, vibration and clash.

2.2 How dose RFID Work?

RFID is a system that utilizes radio wave to transmit data between to types of instruments called RFID tags and a reader or interrogator. It is a form of wireless communication using the principle of electromagnetic induction, causing a circulation of energy from a reader or interrogator to the microchip inside RFID tags. In the process, the data to be transmitted will be modulated with radio wave and then sent out via an antenna which is in a data receiver, both from the reader and RFID tags [1].

2.3 Components of RFID System.

The RFID system has 3 major components as the following:

The first components is a reader which uses radio frequency wave to read or write, and can read the code from RFID tags without having to view them or RFID tags are hidden inside the objects and are not necessary in a straight line to the wave. They are just in and area where radio wave can be received, which enables the reading of data. Besides, to read RFID tags in the RFID system can be done on a number of tags at the same time. For the reading distance, in depends on the operational frequency.

The second component is RFID tags or transponder, which is used to attach to objects that we need. RFID tags consist of an antenna and a microchip on which an ID number or data on those objects are recorded.

The last component is an application system including hardware and software used, or the database system, all depending on related working systems such as commodity data system, personal management system, etc.

2.3.1 RFID reader

A significant function of a data reader or interrogator is to receive data sent from RFID tags. Then a data error is examined and the data signal derived is decoded with a microcontroller will transmit the decoded signal and communicate with a computer in order to put the data through other processes. Additionally, a good reader must be able to prevent rereading, for instance, in the case that RFID tags are laid down in the vicinity of an electromagnetic field that the data reader has generated or are within the range of receiving and sending. This may cause the reader to repeatedly and endlessly receive or read data on RFID tags [1].

Therefore, a sound reader has to have a system to prevent such an incident, called a “Hands Down Polling” system, in which a reader will order RFID tags to stop sending data in case the incident occurs. Or in a case where there are several RFID tags in the electromagnetic field at the same time, called “Batch Reading”, a reader should be able to arrange them in order so as to read them one by one.

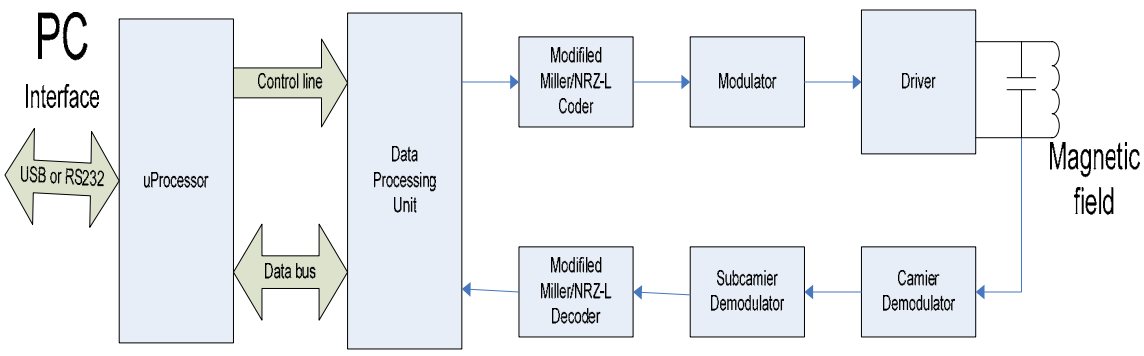


Figure 2.1 RFID Reader Block Diagram

Figure 2.1 reveals a block diagram within an RFID reader in the RFID system. The main components begin with a pulse generator, and PAH frequency to send signal to a driver so as to enhance the efficiency of the power amplifier, which drives the signal toward the coil to induce a magnetic field linked to RFID tags. Simultaneously, the coil will act as an antenna receiving the signal from the magnetic fields PAH wave frequency which is modulated in size from the specific data of RFID tags. Subsequently, an envelope detector will separate data out of the PAH wave signal and amplify it until it is up to the potential level of data based on logic standard, in order to be forwarded to the data processing unit later.

Generally, the data processing unit inside a reader is a microcontroller, which an algorithm within the program will decode the data derived and connect with a computer. Typically, the characteristic, size and shape of readers are different, corresponding with the working type, such as a small hand-held one or one attached to the wall, or even a big one of the gate size, etc.

Figure 2.2 An Example of RFID Reader

Figure 2.2 illustrates an example of RFID readers which are currently used, such as a hand-held one, one attached to the wall, a tunnel-like one, and one of a gate feature for people to walk through.

2.3.2 RFID Tags

RFID tags are sometimes called transponders the word is derived from a transmitter combined with a responder. Literally, RFID tags are responsible for transmitting signal or data recorded on RFID tags and responding toward a reader. The communication between RFID tags and reader is made through radio frequency wave via air. The internal of RFID tags consist of 2 major components, which are IC that acts like an antenna for receiving and sending data. These two parts are connected together, as illustrated in Figure 2.3 [2].

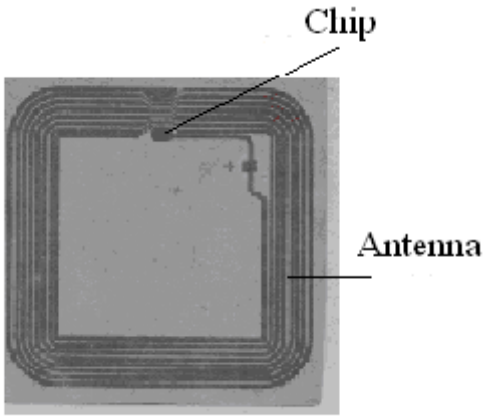


Figure 2.3 RFID Tags Components

Based on Figure 2.3, RFID tags or transponder have a feature of microchip which allows a user to attach it between the stack of papers or plastic which is used to make sign or label. The chip or RFID tags may have various shapes depending on what it is used for. It may be like a credit or of a very small size of lead, 10 millimeters long, which is buried under animal's skin when used in livestock's work. In contrast, it may be of a very large size for RFID tags attached to a machine for transportation. RFID tags may be attached to commodities, which are easy to monitor when they are transported. When RFID tags are used with retail trades, they help prevent stealing because an antenna of big reader is installed at the exit gate to detect stealing. RFID tags will receive energy from the RF signal in order to communicate with a reader, or use energy from a battery contained inside RFID tags. Typically, the battery is Lithium-ion, which has a long working life and is often used with RFID tags.

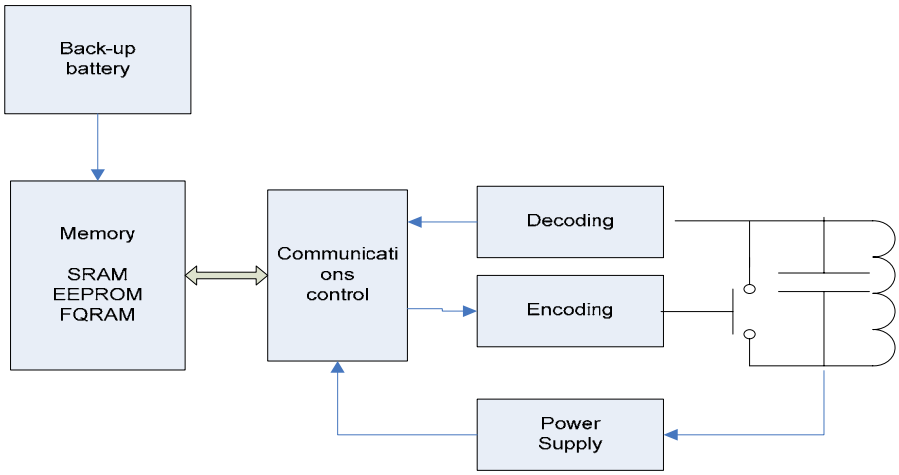


Figure 2.4 Block Diagram of RFID Tags

Figure 2.4 reveals a block diagram of RFID tags, the inside of which consists of the following :

- Memory: is responsible for storing data received from a reader.
- Communication Control: serves to control receiving and sending of data. between a reader and RFID tags.
- Encoding: serves to blend data transmitted from RFID tags.
- Decoding: serves to decode data transmitted from a reader.
- Back-up battery: serves to supply extra (spare) power for active RFID tags.

2.3.3 Types of RFID Tags

RFID tags that are currently used consist of 2 types, both of which differ in use, price, structure and working principle. The following is an explanation of each RFID tags type.

2.3.3.1 Passive RFID Tags

This type has no battery inside or need no power from another source since it performs based on electric energy generated by the electromagnetic wave induction from a reader (having a small electricity generating circuit in itself) called transceiver.

This makes passive RFID tags lighter and smaller than active ones, besides being cheaper and having an unlimited working life. However, a shortcoming is a close distance of receiving and sending data, which is only 1.5 meters at the farthest, considered a short-range reading. This type also has a small-sized memory of 32 to 128 bits and so a data reader has to be sensitive and of high potential. In addition, passive RFID tags frequently encounter a problem when used in the environment interfered by strong electromagnetic signal. Nonetheless, an advantage of this type is a lower price per unit and a longer working life, compared to active RFID tags, making them more popular than the latter. For the ICS of passive RFID tags, they are made in different size and shape, ranging from a small lump or sheet which is rarely visible, to a big one which is conspicuous, each of which is appropriate to respective work [2].

Figure 2.5 Examples of Passive RFID Tags

2.3.3.2 Active RFID Tags

Active RFID tags have a battery inside them, which is a small source of RFID tags' performance. This type of RFID tags has a general working function in reading and writing on itself. Since a battery is needed for their performance, active RFID tags have a limited working life corresponding with the battery age. When the battery power expires, RFID tags are thrown away because they can't be reused as RFID tags body is sealed and so an old battery can't be replaced with a new one. Nevertheless, if RFID tag's electric circuit can be designed to consume a small amount of power, the

tags' working life may be up to 10 years. Active RFID tags typically have a large memory unit up to 1 megabyte and so have a high transmission power, receiving sending data within a distance of 6 meters, which is farther than that of passive RFID tags. Moreover, they also perform well in an area interfered by other signals. Though having many advantages, active RFID tags have some disadvantages as well, for instance, high cost per unit, rather large size, and limited working life, as illustrated in Figure 2.6.

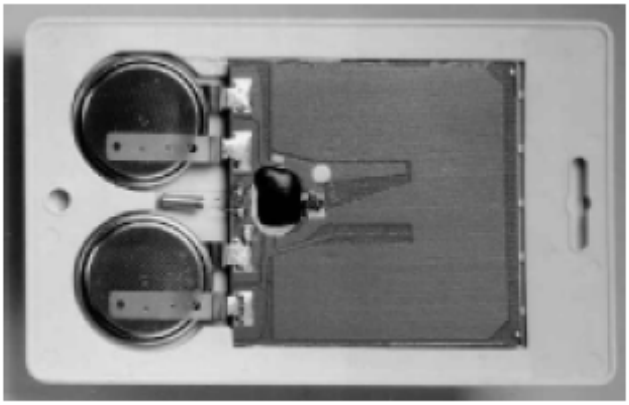


Figure 2.6 Examples of Active RFID Tags

2.4 Performance of RFID Tags: There are 2 types of RFID tags.

2.4.1 Passive RFID Tags

It is the performance between a reader and passive RFID tags, which operate without having to rely on an external power supply source. Generally, Passive RFID tags perform in both low frequency (LF) and high frequency (HF) based on the principle of introductive coupling, incurred by the juxtaposition of coils from an antenna of a reader and an antenna of RFID tags. When the induction of electromagnetic wave occurs between the coils, electric current is generated to feed a minute electric circuit on RFID tags. In the circuit is a diminutive microchip serving to store a small amount of data, and consuming only little power. A working distance of passive RFID tags is about 1 meter, depending on transmission power of a reader. Normally, passive RFID tags have a small memory unit of 16 to 1,024 bytes, light

weight and low cost per unit. Their feature ranges from a bar or small sheet to a big and striking one, each suitable to work RFID tags perform [2].

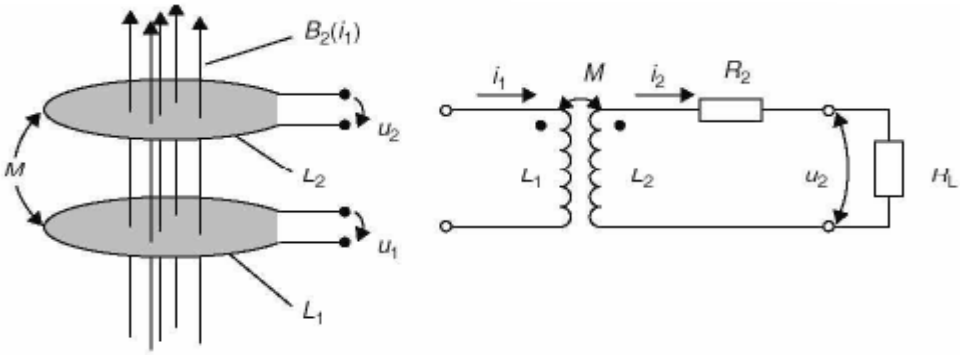
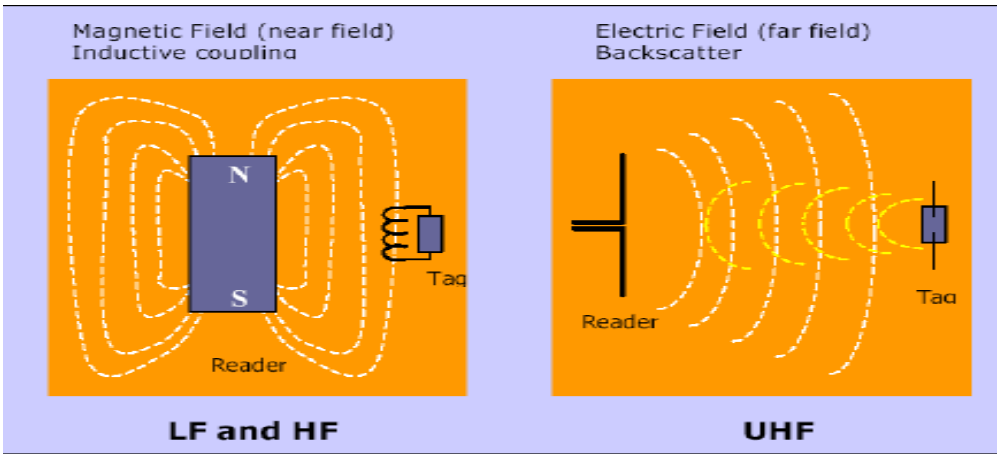


Figure 2.7 the Working Principle of LF, HF, and UHF

For the ultra-high frequency (UHF) system, rather then generate electromagnetic field, propagation coupling is used, with on antenna of a reader transmitting electromagnetic energy in the form of radio wave. When RFID tags receive signal through their antenna, they will perform by reflecting the obtained wave, which is adjusted according to its fixed code, to a reader (called backscattering). In this regard, the performance in different frequencies will engender different penetrating properties while overall efficiency also rests on other factors such as the size of antenna or interfering signal [3].



Picture from Fundamentals and Applications in Contactless SmartCards and Identification Klaus Finkenzeller

Figure 2.8 the Principle of Electric Induction

2.4.2 Active RFID Tags

This type has to rely on an external power source or a battery to supply to an internal circuit for its performance. Typically, it is divided in to 2 main categories based on its working principle: active RFID tags and position indicating machine or beacon. For active RFID tags, they will transmit data only when receiving signal from a reader. Concerning beacon, the signal will be sent out periodically throughout its use. Active RFID tags may be found in a fee payment system for and express way or an in section station while bacon may be found in a real-time locating system (RTLS), for example, goods transportation system management system and so on.

Active RFID tags can have an internal memory unit of up to 1 megabyte and read data within a distance of around 100 meters. However, disadvantages of active RFID tags are their high cost per unit, rather large size, and limited working life of 3 to 7 years based on battery age.

2.5 Principles and Techniques Used to Receive and Send Data between RFID Tags and Readers

Generally, a process of transmitting signal between RFID tags and a reader is a digital communication one, which means a preparation of digital data to be transmitted through the encoding appropriate for sending via a channel. The word “appropriate” here means that there is as little error as possible for the signal to be transmitted via a channel with noise. Typically, there are many approaches of coding, of which a selection relies on a channel through which the signal will be sent. Examples of coding are NRZ coding, Manchester coding, Miller coding and differential coding, as demonstrated in figure 2.9 [3].

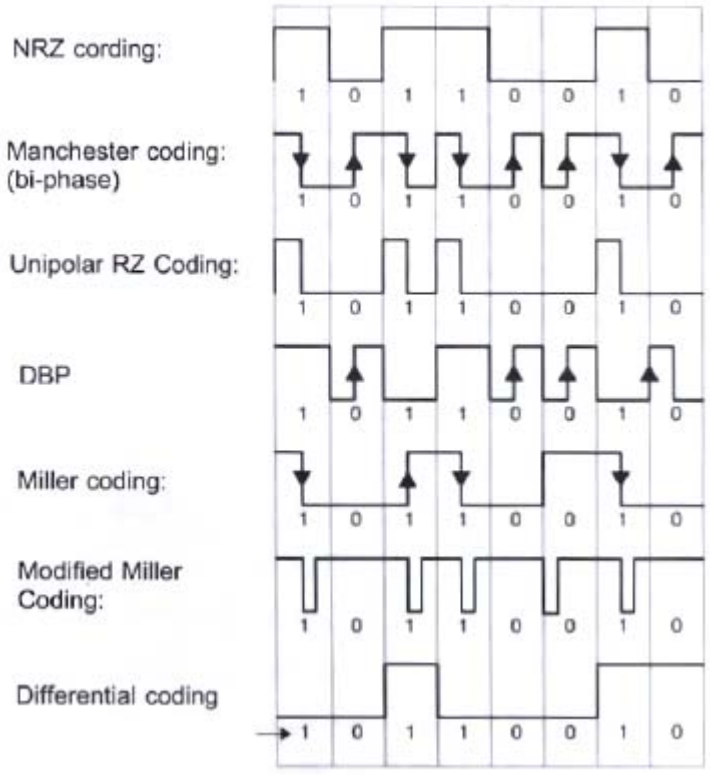


Figure 2.9 Examples of Different Types of Coding

After coding, the signal will be modulated with the wave of higher frequency in order to send and receive data in that frequency. The modulation means an adjustment of conveyance wave, which is electromagnetic field wave such as amplitude phase or frequency, based on the value of data to be delivered. For instance, in the modulation via amplitude shift keying (ASK), the amplitude value of conveyance wave will be adjusted to be between 2 values, depending on the binary value of the encoded signal, as illustrated in Figure 2.10 [3].

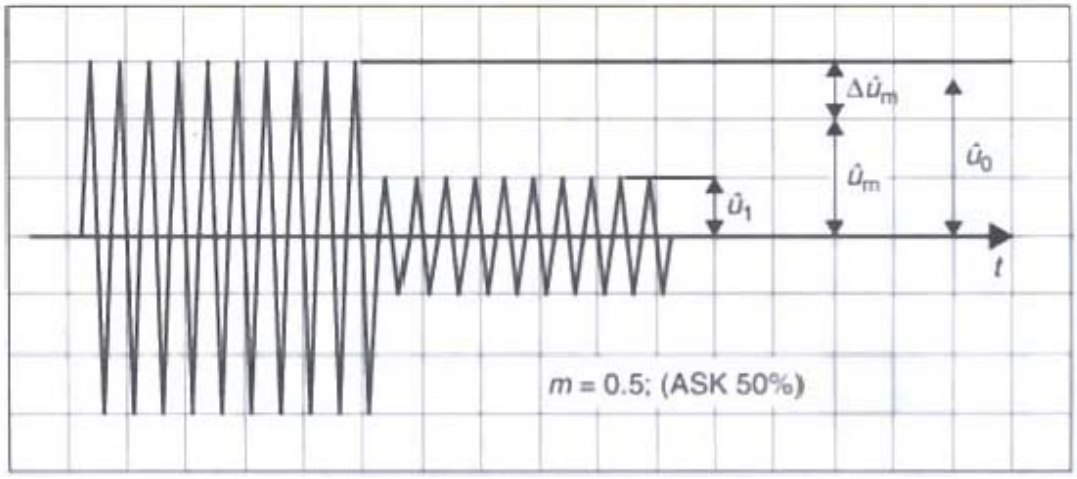


Figure 2.10 Example of ASK Performance

2.6 Anti-Collision of Data Signal

When there are many RFID tags coming near a reader and RFID tags have adequate energy, each RFID tags will attempt to send its data to the reader simultaneously, causing the reader to be unable to distinguish the delivered data. This incident is called data collision. To solve this problem, more functions are added on tags and a reader to prevent such collision. There are a number of techniques of doing this, for example, queuing RFID tags reading, each for a short period. There will be no repeated reading after RFID tags been read, such as techniques of SDMA (space Division Multiple Access), TDMA, FDMA, and CDMA, or high techniques of FTDMA and frequency hopping, as displayed in Figure 2.11 [4].

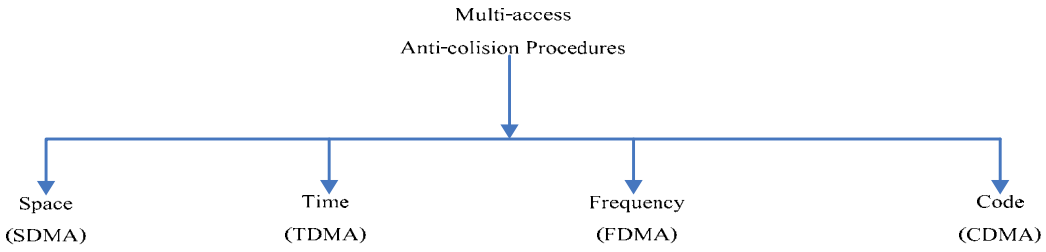


Figure 2.11 Queuing RFID Tags Reading

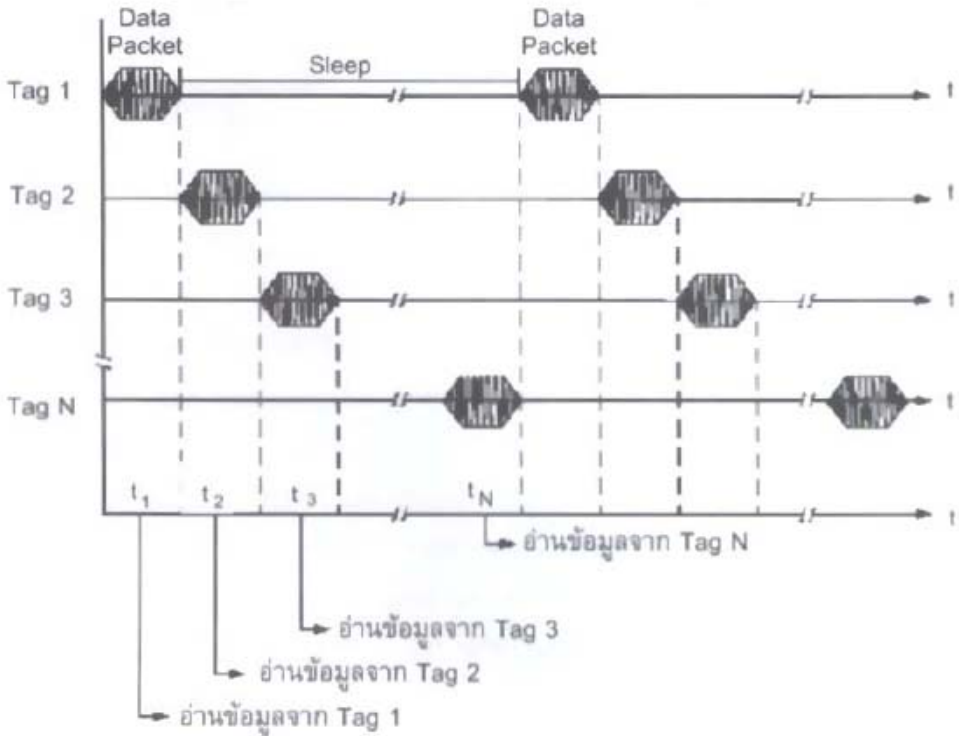


Figure 2.12 Example of Algorithm for Anti-collision of Data on RFID Tags

Figure 2.12 reveals an algorithm used for anti-collision of data on RFID tags. In principle, the reading of data on RFID tags is done in order of time defined. Each RFID tags will not send data to a reader immediately but time slot is arranged for sending data at different time in accordance with an algorithm defined, in no collision of data on the reader, which are simultaneously sent from several RFID tags [4].

2.7 Performance between Reader and RFID Tags

The performance begins with the transmission of the radio signal, causing an induction through coils which are made as an antenna, both at a reader and RFID tags. The radio wave will be modulated with data signal. Details are shown in figure 2.13 [5].

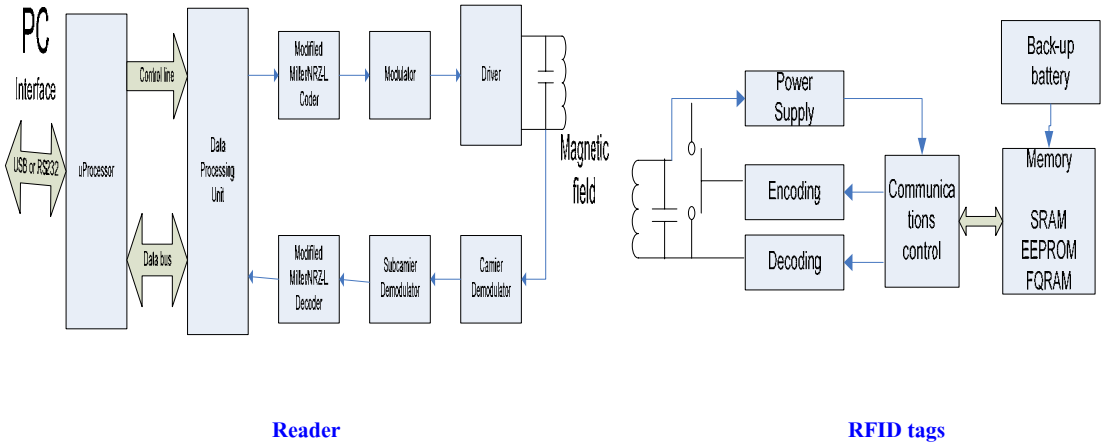


Figure 2.13 Performances between Reader and RFID Tags

Figure 2.13 reveals stages of performance between a reader and RFID tags, of which details are explained below.

- A reader transmits radio signal continuously or periodically and waits for reply signal from RFID tags.
- After RFID tags receives an adequate amount of radio wave signal, sent from the reader, it will be induced to generate energy to be fed to RFID tags for their performance. RFID tags will create clock signal in order to stimulate digital circuit in the RFID tags to work.
- The digital circuit will read data from the in side memory unit and then encode the data and send it to the analog circuit which is responsible for data modulation.
- Modulated data are delivered to coils serving as an antenna, so as to be transmitted to the reader.
- The reader will detect the signal of amplitude change and use a peak detector to transform the data signal modulated from RFID tags.
- The reader decodes data and transmits it to a computer via serial port.

2.8 Distance of Data Reading

The data reading distance rest on such factors as a reader's transmission force and types of RFID tags. For general use, RFID tags of low frequency (LF) have a

reading distance of 10-30 centimeters while of high frequency (HF) have a reading distance for 15-100 centimeters. For those of ultra-high frequency (UHF), They have a reading distance of 15 meters or if they are active RFID tags, a reader can read data on them at a distance of 100 meters [5].

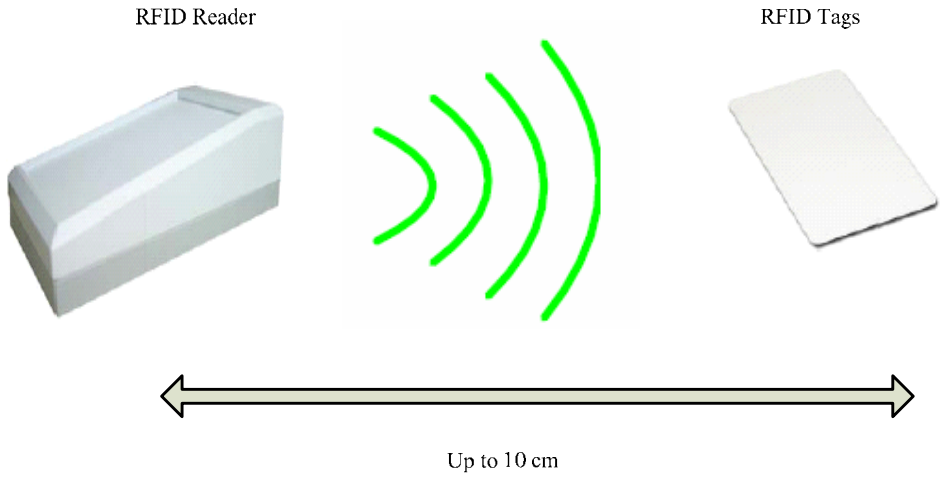


Figure 2.14 Distance of Data Reading

2.9 Data safeguarding

Safeguarding data on RFID tags can be done by encoding and user authentication, consisting of 2 algorithms described below [5].

2.9.1 Symmetric Algorithm

It is, for example, algorithms DES/3DES algorithms. By this algorithm, encoding is carried out with only a coding key [5].

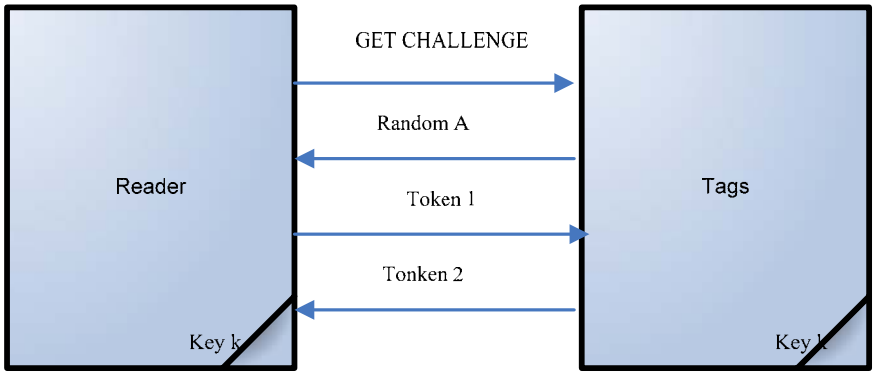


Figure 2.15 Symmetric Algorithm

Advantages

- High security.
- A coding key may be examined on booth sides.
- A coding key is not sent out directly but in the from of Token 1 and Token 2

2.9.2 Asymmetric Algorithm

It is a proof of a coding key by making a derived key from a master key and an ID –Number which is not repetitive [5].

Advantages

As a master key is not used directly, it can't be copied, creating another level of security. For both kinds, secret encoding is done with a secret key. This means that a receiver has to have a right key in order to be able to read data.

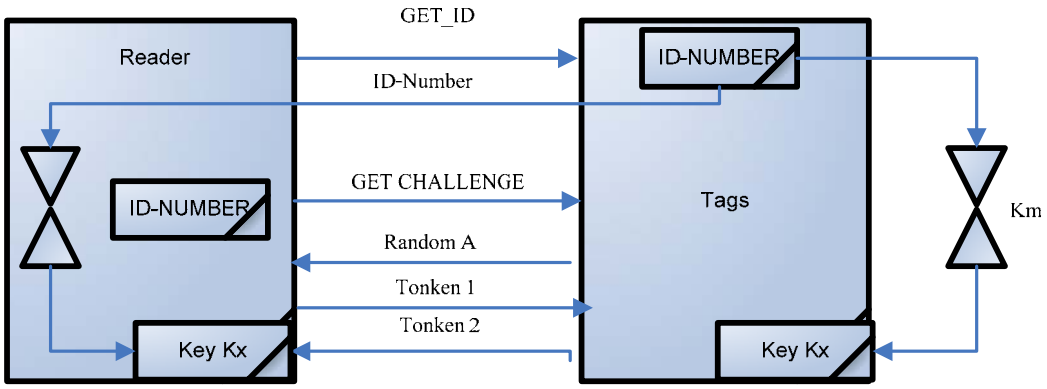


Figure 2.16 Asymmetric Algorithm

2.10 Standardization of RFID

To use the RFID technology, standards have to be defined so that they can be applied worldwide. Therefore, the two organizations defining universal standards have determined 4 aspects of RFID standards as the following [5].

- Standard on technology

- Standard on data format
- Standard on conformance
- Standard on applications

Additionally, there an agency that Japan has given support to define standards to be used inside the country as ubiquitous ID or UID standard, which differs in technical details, or AIM standard (Automatic Identification manufactures) determined by AIDC (Automatic Identification and Data collection), which has initiated a bar code [5].

2.10.1 Standardization of Contact less Smart Card

The standardization of a contact less smart card, which is popular and certified by the ISO (International Organization for Standardization), consists of 3 following standards.

2.10.2 ISO 14443A Standard

The ISO 14443A standard is defined by Phillips, who is the first developer in the world for contact less smart cards, which are used in greatest amount worldwide. Significant details of this standard are given below.

- Receiving and sending data and electric energy between a reader and a smart card is contact less.
- The distance between a reader/writer and a smart card is up to 10 centimeters (depending on an antenna).
- Sending data between a reader/writer and a smart card is of high speed, up to 106 Kilobit per second.
- The radio frequency is 13.56 Megahertz.
- The accuracy of receiving and sending data is high with those techniques of 16 bit CRC, parity, bit coding and bit counting.
- Has a system to prevent data copying.
- Time spent on reading and sending data on a smart card is less than 100 millisecond.

2.10.3 ISO 14443B Standard

ISO 14443B standard is an open one, with many companies being co-developers. It is similar to ISO 14443B standard, but differs only in this its efficiency is improved from that of ISO 14443A, such 10 % signal modulation, ASK, and BPSK (bit encoding). However, it also has many disadvantages since its significant standard is forced by ISO 14443A. But an advantage is that of open standard, making it to have a number of developers, price competition and better quality.

2.10.4 ISO 15693 Standard (I.CODE)

The ISO 15693 standard was co-developed by Phillips and Texas instrument. It has a working objective of being a data sign rather then a general smart card. It has a feature of label which can be attached to commodity boxes or commodities themselves instead of a barcode. It can also be reused by inserting a new program in the chip, and has a working distance of 1 meter from a reader (depending on an antenna design). Besides, a reader can read data from many chips, at the same time, using the procedure of distinguishing data from each chip. Moreover, the ISO 15693 standard is broken down as many types of working standards. For example, when it is used in a goods stocking process or to replace a barcode, there will be an EPC (Electronic product Code) standard agency to define small details.

2.10.5 Mifare Contactless Smart Card

Mifare is the trade name of Phillips of such a product as contact less smart card, including a chip serving as a reader and writer, and various batches of transponders, which differ in memory unit, characteristic of classifying memory unit, and usage feature. Each batch of Miface has the following standard properties.

- ISO 14443A supporting standard.
- A memory unit of EEPROM, storing data for 10 years and repeat writing data for 100,000 times.

- Support multi-application performance by dividing memory units into blocks, each with a password for accessing internal data, allowing the use of one card for several jobs.

- Be able to independently define conditions for accessing each block of memory unit, such as a password, key and A/B.

- Each chip has only one serial number.

- Receiving and sending data is done via RF signal and there is encoding to prevent data espionage.

2.11 Working Frequency Wave of RFID

The working frequency wave in the RFID system is that of ISM (Industrial-Scientific-Medical) civilian frequency, which is used for industrial, scientific and medical purposes. It is working frequency wave that does not interfere with other communicative frequency waves. RFID frequency wave is classified into 4 groups as follows [6].

1. Low frequency (LF): lass than 150 kHz.
2. High frequency (HF): 13.56/27.125 MHz.
3. Ultra high frequency(UHF): 433/868/915 MHz.
4. Microwave frequency: 2.45/5.8 GHz.

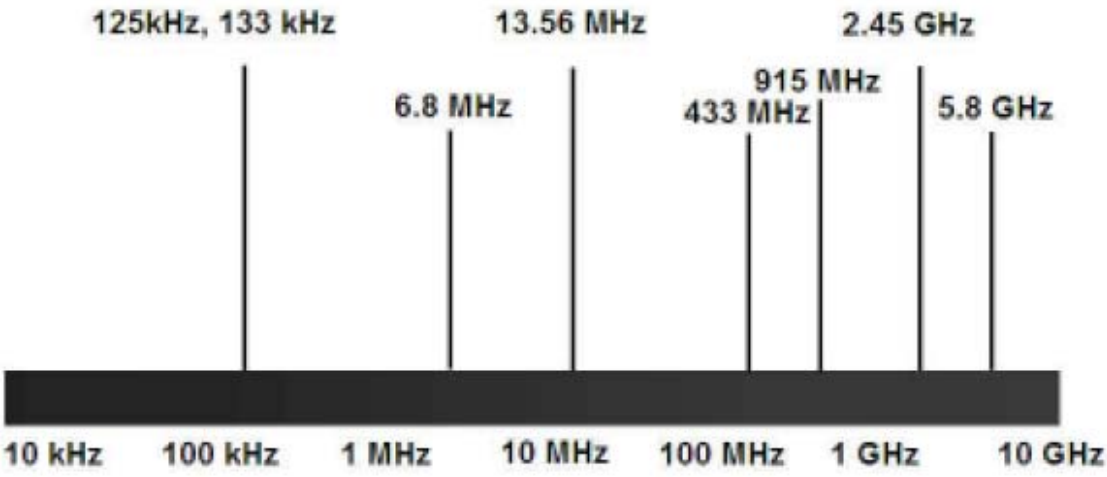


Figure 2.17 RFID Working Frequency

Base on Figure 2.17, the first two working frequencies are suitable for the work with a short distance of data communication (LF for reading distance of about 10-20 meters and HF for reading distance of around 1 meters), for example, the monitoring of entering and leaving an area, and detection and keeping of animal records. For the ultra-high frequency, it is typically used for work with a long distance of data communication (UHF for reading distance of about 1 – 10 meters), for instance, the payment system for an expressway. Currently, the RFID system is being researched and developed with the microwave frequency of 2.4 Ghz and 5.8 Ghz, for use at a reading distance of over 10 meters, etc.

	Low Frequency (LF)	High Frequency (HF)	Ultra High Frequency (UHF)	Microwave frequency
Frequncy	125-134 Khz	13.56 Mhz	860-930 Mhz	2.45-5.8 Ghz
Read Distance	1.2 meter	0.1-1.2 meter	4 meter	15 meter
Application	Access Immobilizer, gas, laundry	Smart cards: identification, electronic ID, ticketing	Palletts' Registration, trucks registry, trailer tracking	Road tolling, container tracking

Table 2.1 Comparison of RFID Working Frequency

2.12 Application of RFID Technology

At present, RFID is applied to many categories of work such as warehouse system, transportation system, military purpose, medical and public health services, Agricultural and livestock purposes, aviation business, financial business, education, tourism, manufacturing industry, etc. Examples of RFID technology application are given below.

2.12.1 Transportation System

RFID technology is applied to commodities management in warehouses such as goods transportation and storage. For example, concerning the goods purchase in a supermarket, when there is a calculation of total price, a reader can read and compute total price at once without having to scan a barcode attached to each piece of goods, as done earlier. Likewise, a buyer may be warned if the goods quality expires. Besides, RFID technology is also applied to goods portage, called secure trade or operation safe commerce, which helps enhance safety for goods transportation [5].

Picture from Fundamentals and Applications in Contactless SmartCards and Identification Klaus Finkenzeller

Figure 2.18 RFID Applications to Goods Transportation

2.12.2 Medical Services

For medical and public health services, the RFID system is utilized for the registration of expensive medical instruments, making it possible to conveniently and swiftly inspect the storage of medical instruments. Furthermore, RFID is used to implement medical production in order to verify fake drugs. This is aimed at avoiding a loss by producers from imitated goods while preventing patients from getting poor-quality or fake drugs [5].

Picture from Fundamentals and Applications in Contactless SmartCards and Identification Klaus Finkenzeller

Figure 2.19 RFID Applications to Patient Data Collection in Hospitals

2.12.3 Agricultural Purpose

RFID technology may be used for an agricultural purpose like in livestock circle. Farmers are experimenting on attaching RFID sheets to cow' allowing cowboys and government agencies to follow up the travel or location of cows. This also benefits for following up diseases and impeding the spread of diseases among pets. Moreover, RFID technology is also used to follow up shrimp farming activities such as recording data on foods and drugs given to shrimps. These data will be forwarded to factories exporting shrimps to a foreign country [5].

Picture from Fundamentals and Applications in Contactless SmartCards and Identification Klaus Finkenzeller

Figure 2.20 RFID Attached to Cows' Ears

RFID tags having a microchip inside them and attached to swine breeders' ears contain data on swine age and weight, offspring's yield and the amount of food to be fed each day (3 kilograms per swine per on the average). A working principle of a feeding control system is not difficult, just design a passage for swine breeders to walk in to take food one by one and there is only one entrance. When it comes the time to eat, as trained, swine breeders will walk into a feeding one by one. Once they reach a crib inside the pen, a reader at the crib will read data on RFID tags attached to their ears and send data through a data receiving sending box attached to swine's neck to a control system so that the feeder releases food for swine breeders in the amount determined, generally for 1 stroke at a time until the time set in the control system is due. After the swine's have eaten enough or in an amount set, they will walk out the other side of the feeding pen. Subsequently, a new swine breeder will walk in. for this feeding method, swine breeders have to be trained on how to walk into a feeding pen so as to take food [5].

2.12.4 System Controlling Entering /Leaving a Building

RFID can be applied to a personal management system, making it possible to follow up staff's working time and where about in the factory. However, this may encounter a problem of personal right. For a safeguarding system, RFID is applied in similarity with that of the personal management system, by accommodating data on systems access in RFID in order to be able to work in different sections. The benefits of RFID to a management and security system are monitoring staff's working time and an access to various sections, including use of data in combination with other systems like salary payment system. In addition, for new batches of cars, currently RFID is exploited to hinder car robbery since a car can be used only by a person who has data in the key [5].

Figure 2.21 RFID Technology Is Used for Entering and Leaving a Building

2.12.5 System of Metropolitan Rapid Transit Fare Collection by RFID Tickets

Presently, an increasing number of people prefer to use the services of the metropolitan rapid transit authority because this helps save their gas apart from reducing a problem of traffic jam. Apparently, the number of private cars will be diminished on the streets in Bangkok while people's traveling time can be decreased tremendously [5].

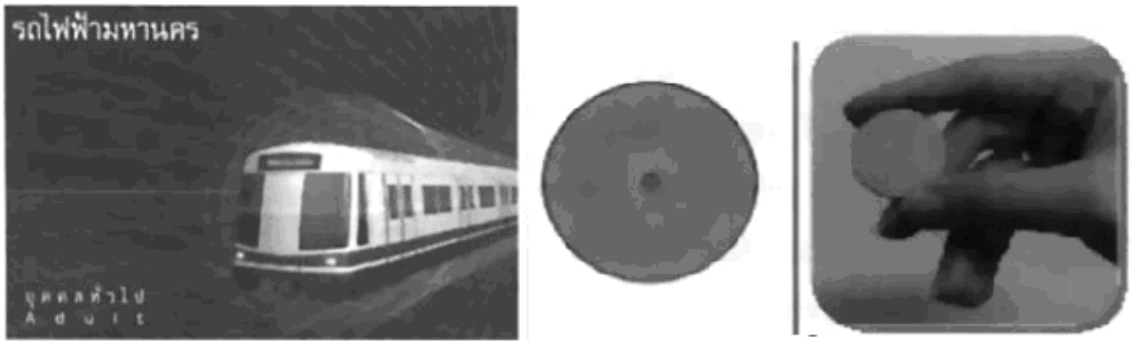


Figure 2.22 RFID Is Used for Selling Train Tickets

2.12.6 Smart Library System

Currently, a university library in Thailand is trying using RFID for a library system. This is carried out by attaching RFID tags to library books and inserting data on those books on RFID tags, for instance. Data on book titles, categories and shelves where books are kept. A reader is also installed at various places in the library. Of course, an application of RFID to a library system helps increase convenience for library officers and service users [5].

Figure 2.23 RFID Use in a Library

2.13 Problem of RFID

2.13.1 Radio Frequency

With respect to the frequency used to receive and send data of the RFID system, the use of radio wave frequencies has to be under control of an agency taking of frequency use, causing the selection of RFID tags quite capable of sending signal to be limited. The use of low frequency generally results in an easier inference by nearby radio wave, such as mobile wave, television wave, etc. This is because RFID tags typically used have frequencies of 135 KHz and 27.125 MHz. A higher frequency is 2.45 GHz and the RFID tags price will be higher but interference by noise will be less. As a consequence, any agency exploiting the RFID technology has to scrutinize the environment that is vulnerable to noise, for example, the installation of a reader close to a radio transmitter or television, or the use of mobile phone. These

variables inevitably diminish the performance capability of the RFID system, possibly causing erroneous data.

2.13.2 Personal Right

Though the RFID technology has a number of advantages, It also yields some adverse impacts on the people or consumers. Due to the smart properties of the technology, goods purchase history or personal data of shops' customers may be recorded when they buy commodities and such data can be exploited by the shops' owners to make advertisements of their goods corresponding with the purchasing behavior of customers. This means that people or customers will always be intruded by these advertisements. Or in the case ones have RFID tags with them, whether or not they RFID tags are attached to their clothes, shoes or other stuffs, when ones are within a reader's reading range, data of one selves will be revealed, causing ones' personal right to be violated by such advanced technology. Nonetheless, many countries have given importance to the issue and have enacted laws to protect private data with an aim to prevent such transgression of right. In contrast, in Thailand people give little importance to private data. Thus, the people concerned should disseminate the idea and encourage people to realize the significance of the issue in parallel with developing laws to protect people's private data more efficiently. This, of course, aims to avoid risks incurred by the advanced technology both at present and in the future.

2.13.3 Inventory

Typically, the radio wave has the properties of reflection, refraction, diffraction and interference of wave. The refraction of the movement of radio wave is due to the different speed of radio wave in a medium, which has different electric property. For instance, radio wave travel a times showers in pure water than in the air. As a result, some products can't be attached with RFID tags.

2.13.4 Security and Data

Since what is needed is just an RFID reader that can write data on RFID tags, to optimize RFID technology, its working system and processes of technology application will have to be improved so that criminals may have the least chance of taking an advantage over it.

CHAPTER III
METHODOLOGY

This chapter discusses approaches of utilizing RFID technology for the Revenue Department's tax installment. It is divided in to 8 sections as the following:

3.1 Proposed Architecture

It is an architecture of exploiting RFID for tax installments by connecting such instruments as reader and RFID tags with a computer via RS232 port, and displaying data through HTML, VB Script and Java Script languages, as well as linking with MySQL database via PHP language. The system performs with a web application.

3.2 Network Architecture

It is an architecture of applying RFID to a network system which the Revenue Department has across the country, such as the Intranet, which RD can via a web application nationwide. Thus, more investment in networking is not needed.

3.3 Structure Chart

It is a chart displaying a breakdown of the system performance or modules, which are arranged in order, based on data retrieval. Meanwhile, the relationship among modules is revealed. Module reading and retrieval begins from top to bottom and left to right.

3.4 Data Flow Diagram

It is an explanation of details of data appearing in each data flow line of a data flow diagram.

3.5 ER_Diagram

It is a tool used for a design to explain data in the form of entity and the relationship between entities, or describe data what we want to store in database.

3.6 Data Dictionary

It is an explanation or a detail of data structure to reveal of which data element it is composed. It is also a description of data storage emerging in the work system, including document files and files stored in a computer, which may be viewed in a data flow dictionary (DFD)**.**

3.7 File Structure

It is a classification of data schedule for each record in data files so that a computer can take them for processing.

3.8 Flow Chart

It is a display of performance stages of the program or system stage by stage, including the direction of data flow from the beginning to receiving the consequences needed.

The following are detailed discussions of the 8 sections mentioned earlier.

3.1 Proposed Architecture

It is an architecture of exploiting RFID for tax installments by connecting such instruments as reader and RFID tags with a computer via RS232 port, and displaying data through HTML, VB Script and Java Script languages, as well as linking with MySQL database via PHP language. The system performs with a web application.

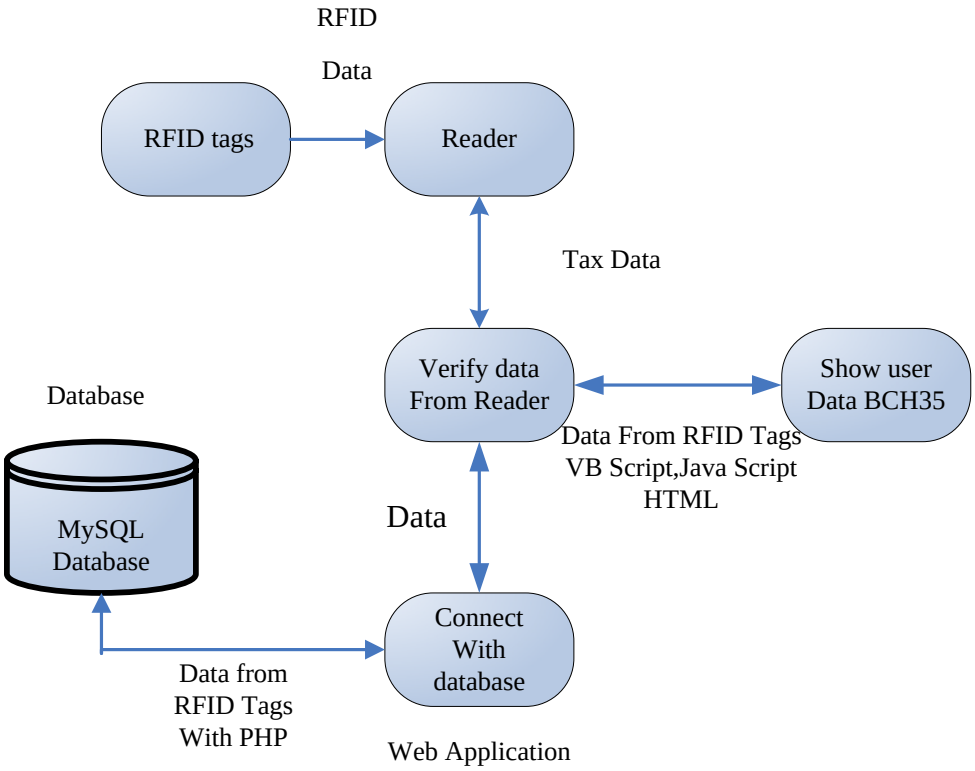


Figure 3.1 RFID System Architecture

Figure 3.1 reveals an architecture of using RFID for tax installments, with each stage described below.

When RFID tags are within a reader's reading range, the data will be sent to the reader, which subsequently forwards it to an application system including the hardware and software systems or database system, all through a serial port (RS232). Afterwards, the data will go through an ID verification process of RFID tags via such languages as HTML, PHP, VB Script. If the verified data are found in database, the system will display data in RFID tags for RD officials to verify. For the various processes that have occurred, the data will be stored in database, using PHP language to communicate with MySQL database. Therefore, the system performance has to have a relationship between the PHP language and MySQL database. However, a contact between the program and RFID will use VB Script and Java Script as supports.

3.2 Network Architecture

It is an architecture of applying RFID to a network system which the Revenue Department has across the country, such as the Intranet, which RD can via a web application nationwide. Thus, more investment in networking is not needed.

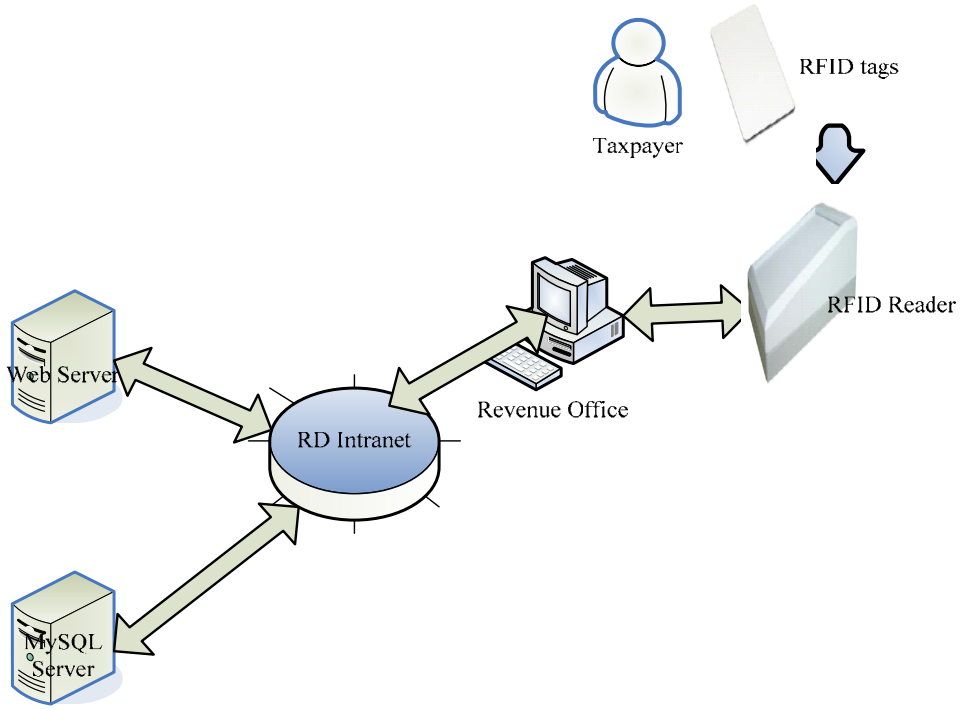


Figure 3.2 Network Architecture

Figure 3.2 illustrates the system performance via a networking system which has a network nationwide through a high-speed line. Since RD has its own Intranet system, using a tax installment system via RFID can take an advantage over the existing network and so additional investment is not needed, while the can be applied throughout the country. In this regard, a program of web application is utilized with the VB Script acting as a link between a reader and a computer. To display a consequence, HTML is used in combination with the web page is retrieved via RD Intranet. Similarly, there have to be web server and database server to facilitate the services for RD officials and tax payers.

3.3 Structure Chart

A Structure Chart used for a tax installment system via an RFID card consists of 4 modules listed below.

3.3.1 Officer Managment: is to confirm one's identity to access the system.

3.3.2 Validation Data: is to calculate the amount of money in order to divide it into 3 installments.

3.3.3 Tax payments: is a stage of tax payment.

3.3.4 Utility: the work system will display various items such as reports and receipts.

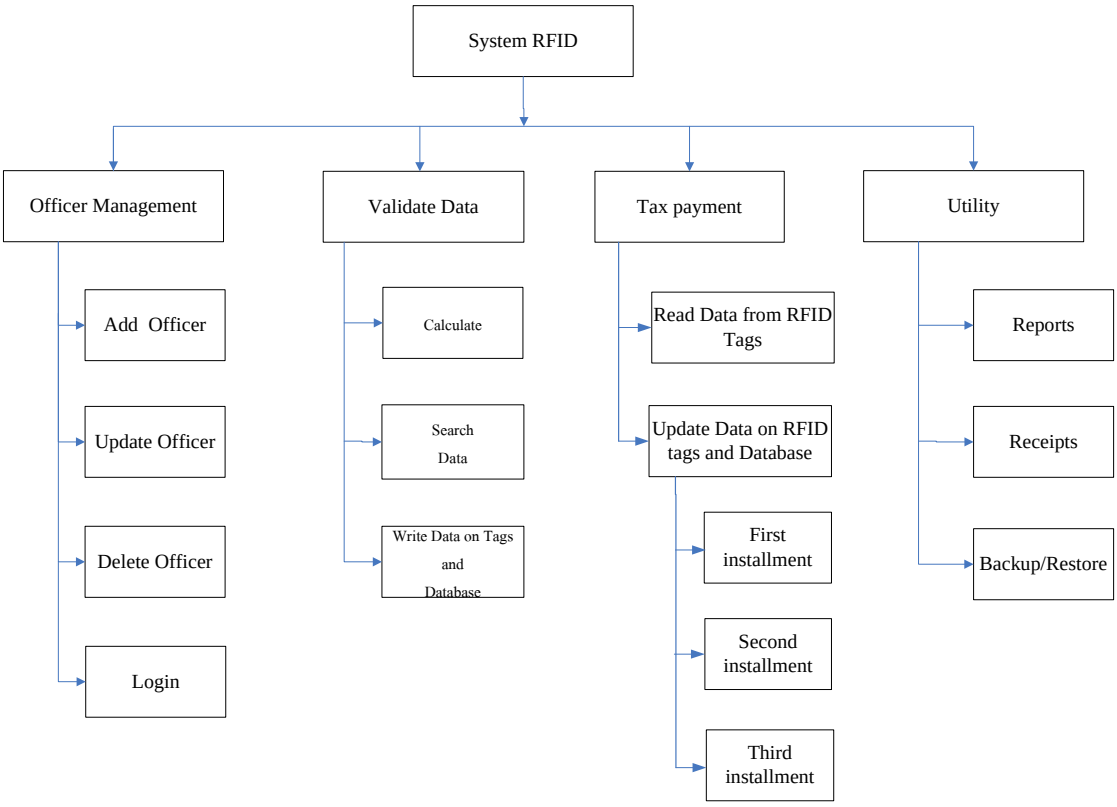


Figure 3.3 Structure Chart of Modeling of Tax Installment by Radio Frequency Identification (RFID)

Figure 3.3 reveals the system structure, which includes the following:

3.3.1 Officer Management serves to verify an access to the system by RD officials. It consists of the following.

3.3.1.1 Add Officer: This process add users to the system by defining the access right to use the system based on suitability.

3.3.1.2 Update Officer: When an error occurs or there is a need to modify data, users can do it.

3.3.1.3 Delete Officer: When an official resigns or dose not take charge of that duty any more, that user (official) may be deleted from the system.

3.3.1.4 Login: It is a verification of the access right to use the system by RD officials, for instance, the right of an administrator, who is allowed to use all types of work existing in the system.

3.3.2 Validate Data: The performance starts when a taxpayer expresses his need to pay tax in installments. RD officials will calculate his tax based on an amount first paid to RD. Meanwhile, the taxpayer submits a payment form based on his ID card number. His payment is made in 3 installments, the first of which is made along with tax form submission. The two remaining installments, each being equal in the amount, will be paid a month and two months later, respectively.

3.3.2.1 Calculate: Tax calculation when a tax payer expresses his desire to pay tax in 3 installments.

3.3.2.2 Search Data from Database: Subsequently, the tax payer data are searched and if they are in database, they will be retrieved by the system. When tax amount is calculated, data will be stored in database for each installment, along with data month and year when each installment will have to be made.

3.3.2.3 Write Data on RFID tags: The system will retrieve taxpayer data that RD has, and display them on the screen for RD officials to verify once again. Subsequently, the data will be written on RFID tags.

3.3.3 Tax Payment: It is a stage of starting tax installment. When a taxpayer submit his RFID tags to an RD official, who later place them on an RFID reader, the system will begin to verify the RFID tags' ID which is recorded during validation stage. If it is found to be invalid, the official can't have an

access to view data. But if it is valid, the system will retrieve data in RFID tags and display them on the screen. The official will record data for each installment in parallel with storing data on RFID tags and in database and issuing a receipt for the taxpayer.

3.3.3.1 Read Data from RFID tags: The system performance deals with RFID technology. Thus, for a process of system performance, data will have to be read on RFID tags. Typically, the process consists of algorithms for encoding and decoding, using radio frequency wave as a medium for sending data on tax payment form and displaying them on a screen.

3.3.3.2 Update Data in RFID tags and Database: The system performance deals with RFID technology, using radio frequency wave as a medium for sending data. Besides modifying data in database, modification of data in RFID tags is also made, making data in RFID tags always identical with that in database. A tax payment form shown on the screen is 'บช.35' form, which is for tax installment, with data on each installment as the following:

3.3.3.2.1 First installment: Make payment and record data on RFID tags and in database.

3.3.3.2.2 Second installment: Make payment and record data on RFID tags and in database.

3.3.3.2.3 Third installment: Make payment and record data on RFID tags and in database.

3.3.4 Utility

3.3.4.1 Report: A preparation of tax installment report is made, for example, personal data, monthly and annual data, etc.

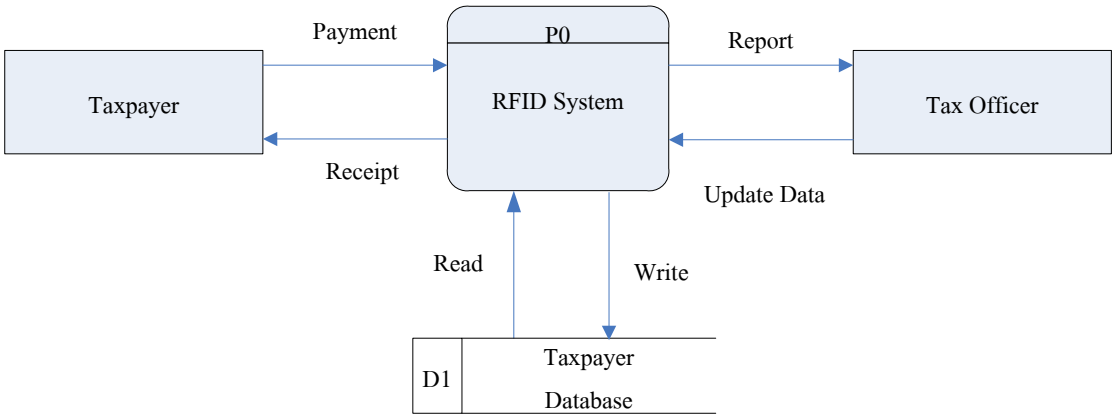
3.3.4.2 Receipts: Every time there is a payment in installment, the system will issue a receipt for the taxpayer, meanwhile record data in database. In case of a spare receipt demand, this can always be done.

3.3.4.3 Backup/restore: The system will backup the current data. In case of an error, all existing data can be restored.

3.4 Data Flow Diagram

The system's Data Flow may be displayed as follows:

- Figure 3.4 shows context diagram of modeling of tax installment by radio frequency identification (RFID).
- Figure 3.5 shows DFD of modeling of tax installment by radio frequency identification (RFID).
- Figure 3.6 shows DFD authentication of modeling of tax installment by radio frequency identification (RFID).
- Figure 3.7 shows DFD validate of modeling of tax installment by radio frequency identification (RFID).
- Figure 3.8 shows DFD tax payment of modeling of tax installment by radio frequency identification (RFID).
- Figure 3.9 shows DFD utility of modeling of tax installment by radio frequency identification (RFID).



Project : Modeling of tax installment by RFID	**Description:** DFD Diagram Level 0
Written by : SUPOT SORNSANG	**Issued/Revision :** October 31 2008

Figure 3.4 Context Diagram of Modeling of Tax Installment by Radio Frequency Identification (RFID)

Figure 3.4 reveals a context diagram of the tax installment system using RFID technology consisting of modeling of tax installment by RFID, which is a system facilitating services to taxpayers and RD officials. Taxpayers just notify their desire to pay in installment. A calculation is then made for the first installment along with a submission of the tax payment form. The system will record data on RFID tags and in database of MySQL type. A payment is made in 3 monthly installments in accordance with the duration identified in a tax payment form, beginning on the day the form is submitted to RD officials. Data on each payment will be recorded on RFID tags and in database. Simultaneously, taxpayers will obtain a receipt every time a payment is made. Meanwhile, RD officials can view a report on taxpayer data. Based on figure 3.5, RFID tags serve as taxpayers' ID card, storing taxpayer's data. When all the 3 installments have been made, RFID tags may be brought back to use.

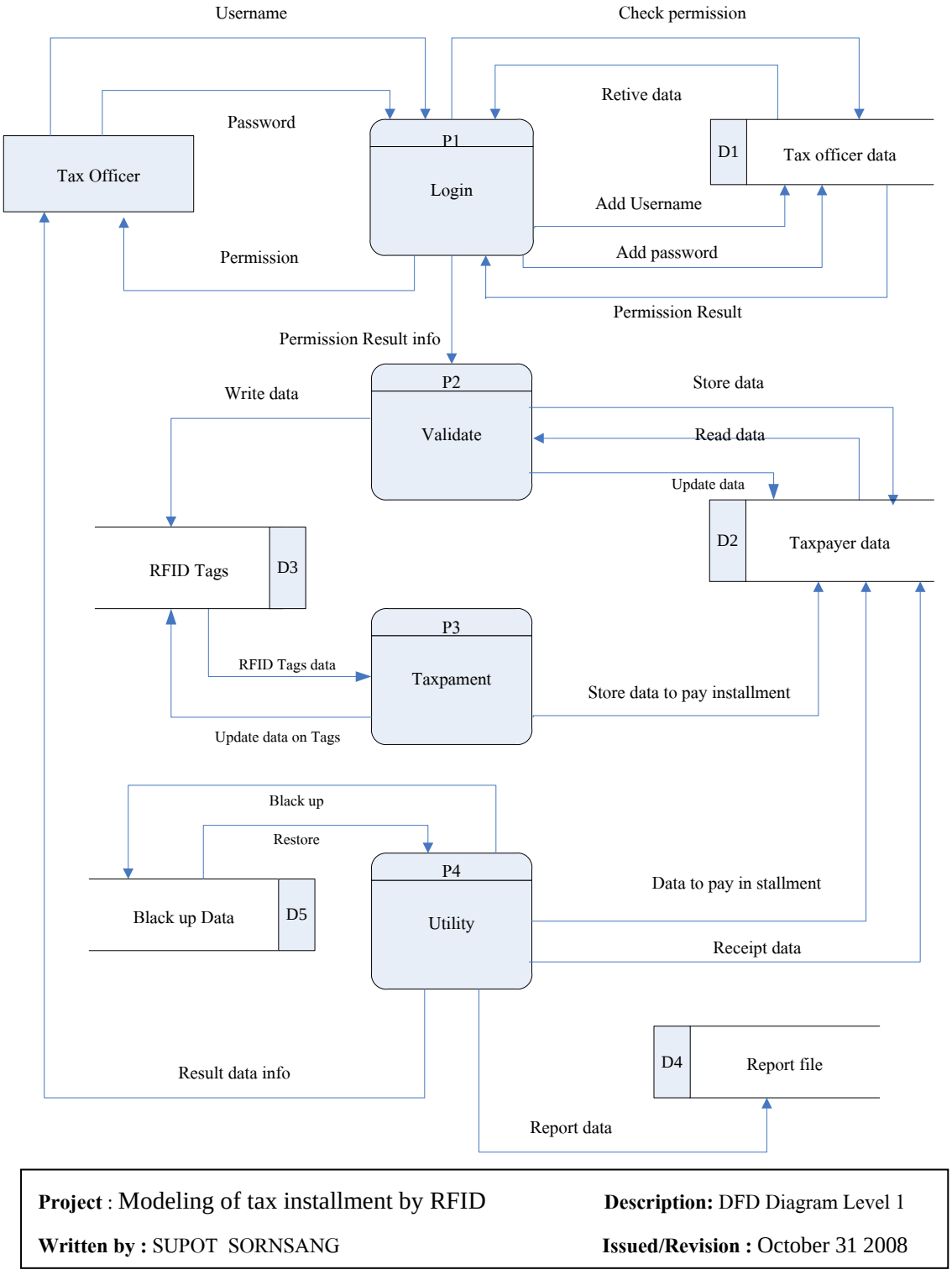


Figure 3.5 Data Flow Diagram of Modeling of Tax Installment by Radio Frequency Identification (RFID)

Figure 3.5 describes the system performance in detail, starting with RD officials login into the system to provide a service of tax payment to liable taxpayers, all based on the officials' right. The officials' data in database are examined. Various menu items they receive based on their right will appear for them to work. Major stages are, for example, tax calculation based on taxpayers' ID card number. Each taxpayer's personal data are stored in RD database. When there is a verification of ID card number, if it is found to be valid or in database, the data can be retrieved and display on "ภ.ง.ด.35" tax form. Meanwhile, the money to be paid in 3 monthly installments, each equal in the amount, is calculated. Afterwards, the data will be recorded on RFID tags and provided to taxpayers so that they will keep it for the next payment until the third installment is paid, after which RFID tags will be returned to RD officials. In case tags are lost, a fine of 100 baht per tag will have to be paid. Or when all 3 installments are due but not paid, RD will increase the amount a taxpayer has to pay by 15 %. Or when any one installment is skipped, the other installments are regarded as terminated. In such a case, a taxpayer will have to pay the remaining amount at one time, including 15 % additional amount. When a taxpayer wants to pay for the second or third installment, he can contact RD officials at all RD regional offices, and in all areas, throughout the cores of payment determined by RD. An RD official will take the taxpayer's RFID tags. A payment process starts when a reader, which is open for radio signal all the time, reads data in the RFID tags. This means when an RFID tags comes within a reader's reading range, the system will compare the RFID tag's ID with the ID stored in database, which was obtained during the first installment, when an amount to be paid was calculated. If the ID is not found in database, the RD official will verify it once again. If it is certain that the ID can't be found it is sure to be a fake one. But in case is found, the system will retrieve data RFID tags and display them to the official for verification one more time. Then the data on the first installment are recorded on RFID tags and in database. Similarly, data on date, month and year of each installment will be stored in database. Thus, when a problem arises, verification can be made.

Whenever there is data recording, a taxpayer will receive a receipt for each installment as an evidence of payment. In addition, RD officials may view a daily report.

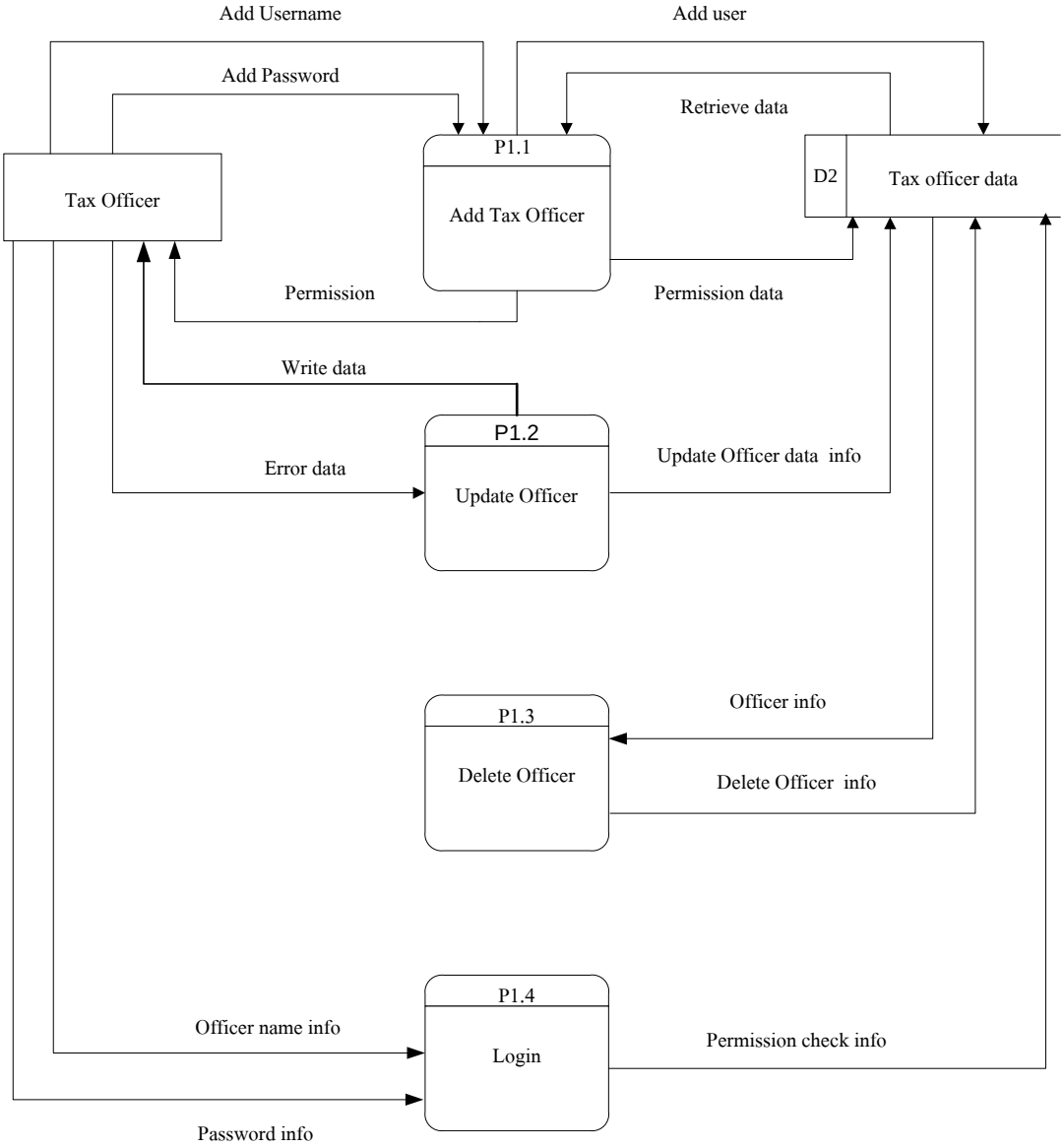


Figure 3.6 DFD Authentication of Modeling of Tax Installment by Radio Frequency Identification (RFID) (Level 2)

Figure 3.6 displays an authentication for an access to system use, which consists of the following processes.

- **Add Tax officer:** It is the system access in order to increase a name list of RD officials. The duties of officials are defined as the following:
    - **Admin:** oversees overall system such as adding users and defining a right to use the system for RD officials.
    - **User:** Accesses the system in order to service taxpayers based on the right defined by an admin.
        - **Update officer:** It is a stage of system access so as to verify user data in database. It data are there, the user will have a right to use the system as defined. The data are also recorded in database each time the system the system is used.
        - **Delete officer:** Whenever an RD official is revoked of his duty or no longer has no right to access the system, he will be deleted from the system so that he can no longer do anything with the data.
        - **Login:** It is a start to access the system by filling in username and password in order for the system to verify the right to access it.

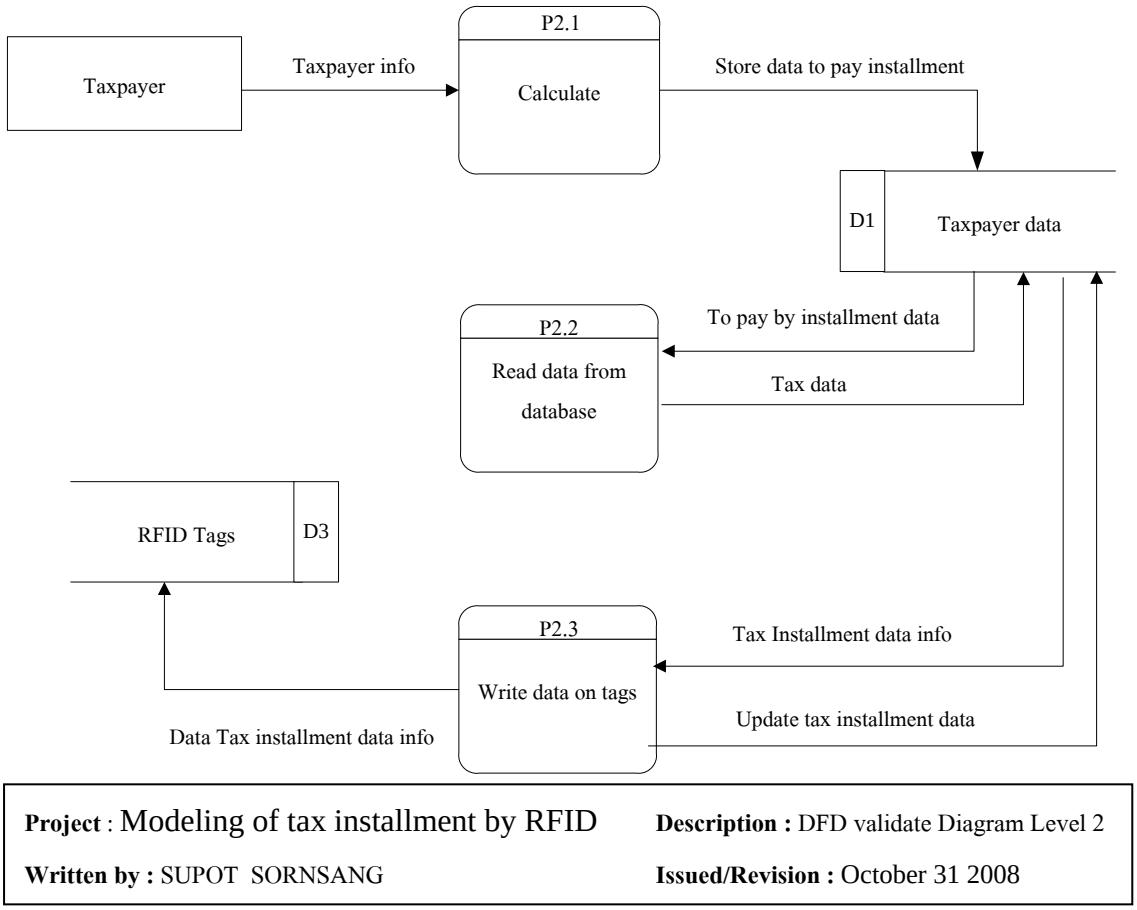
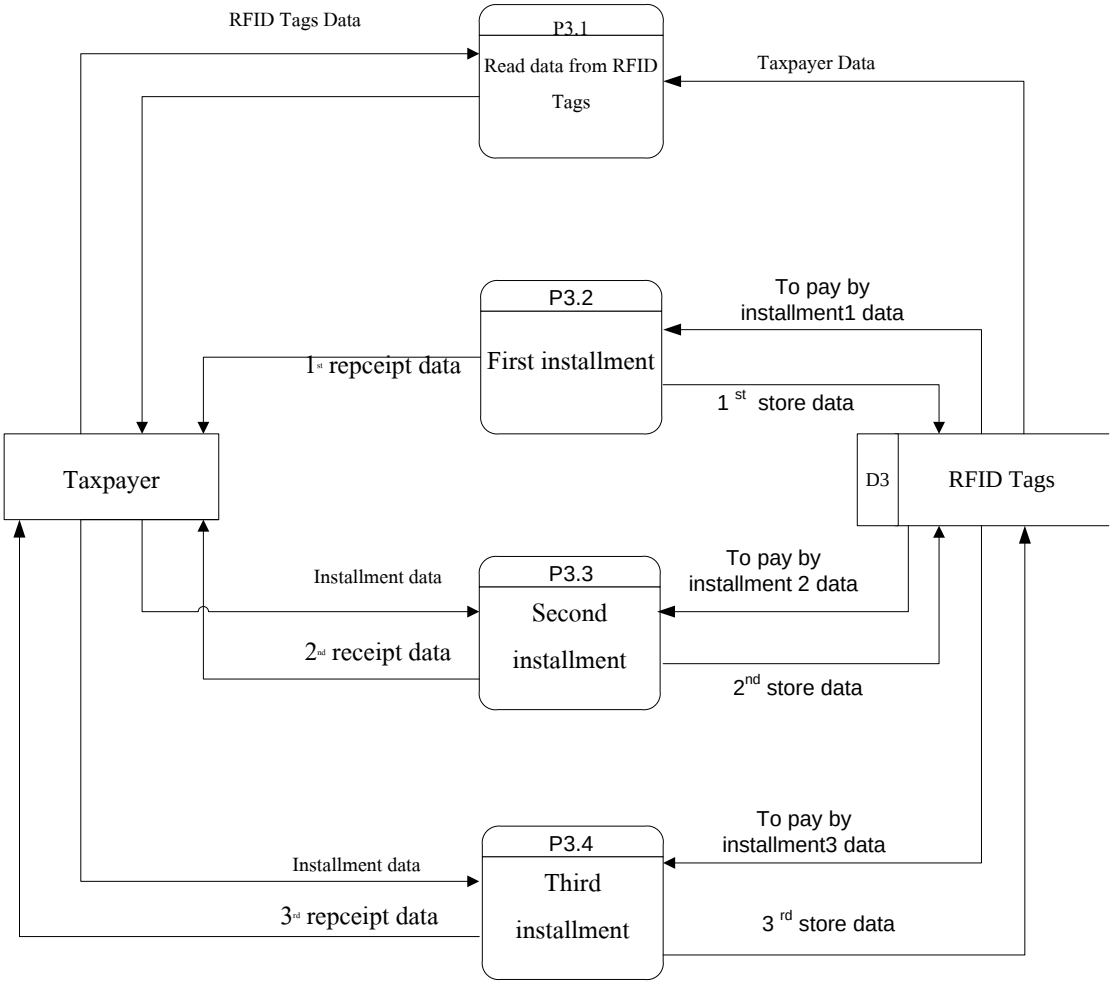


Figure 3.7 DFD Validate of Modeling of Tax Installment by Radio Frequency Identification (RFID) (Level 2)

Figure 3.7 demonstrates the DFD of tax calculation after RD officials have accessed the system. It begins with a taxpayer informing his desire to pay tax in 3 monthly installments. An amount to be paid for the first installment will be subtracted from the whole amount that a taxpayer is liable to pay. The system will then display the "ภ.ง.ด.35" tax form and calculate the amounts of the two other installments, each being equal. The stages are listed below.

- A taxpayer informs his desire to pay in 3 installments.
- An RD official goes on the screen to calculate the tax amount. The system itself will automatically do this while recording data in the taxpayer's database.

- The system will display the "ภ.พ.35" tax form, which is a tax installment form according to RD regulation, including the detailed taxpayer data and calculated amount.
- Start writing data displayed on the screen on RFID tags.
- Submit the RFID tags to the taxpayer so that he brings it for the next installment to be made on the data defined.

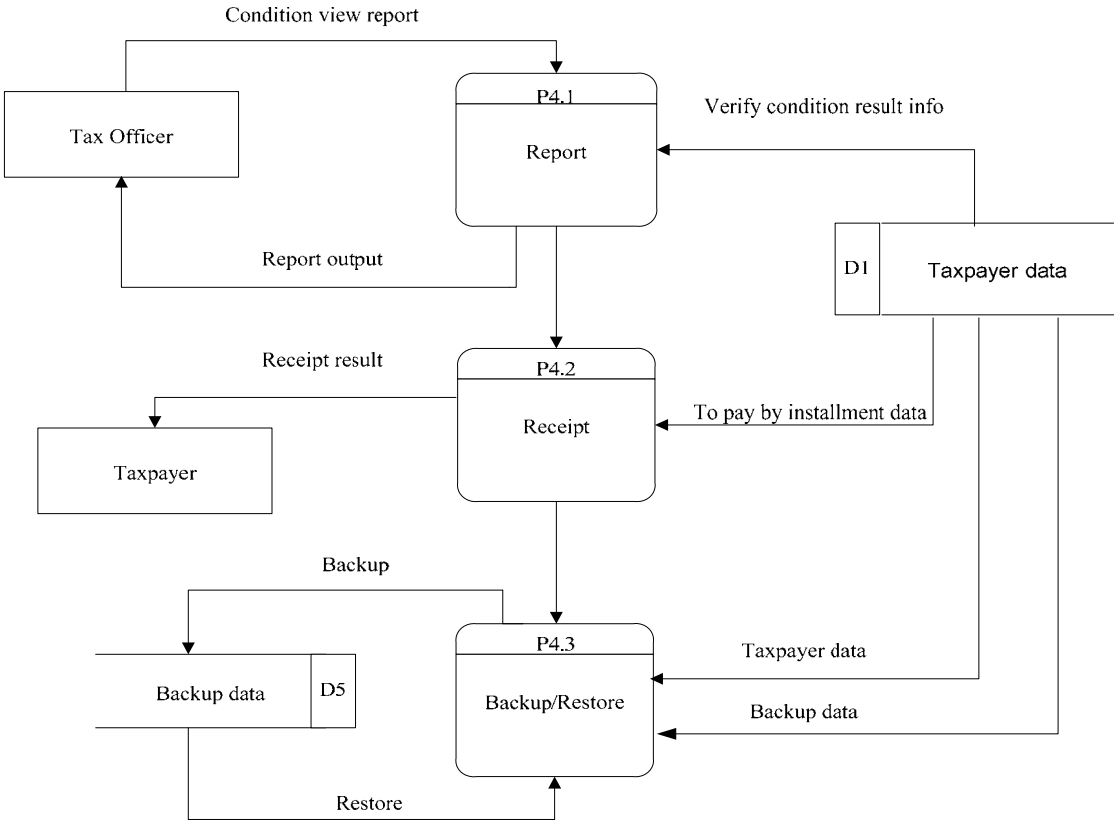


Project : Modeling of tax installment by RFID	**Description :** DFD Diagram Tax payment Level 2
Written by : SUPOT SORNSANG	**Issued/Revision :** October 31 2008

Figure 3.8 DFD Tax payment of Modeling of Tax Installment by Radio Frequency Identification (RFID) (Level 2)

Figure 3.8 reveals the DFD of a tax installment system. The system will perform the following stages.

- A taxpayer contacts RD officials at their office and shows his RFID tags to an official concerned, who will place the tags on a reader.
- The system reads data on RFID tags displayed.
- The RD official selects the installment the taxpayer wants to pay. The transaction will be recorded on RFID tags and in database.
- For each installment paid, the system will issue a receipt for taxpayers.



Project : Modeling of tax installment by RFID	**Description:** Utility DFD Diagram Level 2
Written by : SUPOT SORNSANG	**Issued/Revision :** October 31 2008

Figure 3.9 DFD Utility of Modeling of Tax Installment by Radio Frequency Identification (RFID) (Level 2)

Figure 3.9 illustrates an output of the system in case a taxpayer requires it, for example:

- **Report:** The system will display a report on taxpayers' data, whether daily, monthly or annually.
- **Receipt:** The system will issue a receipt to taxpayers every time a tax payment is made. If there is a need for it afterwards or the original copy is lost, a new one may be asked for at RD.
- **Backup /Restore:** The system will have to be designed in a way that it can back up data in order to prevent an unexpected incident that may cause a loss of data stored in database.

3.5 ER-Diagram

It is a tool used for a design to explain data in the form of entity and the relationship between entities, or describe data what we want to store in database.

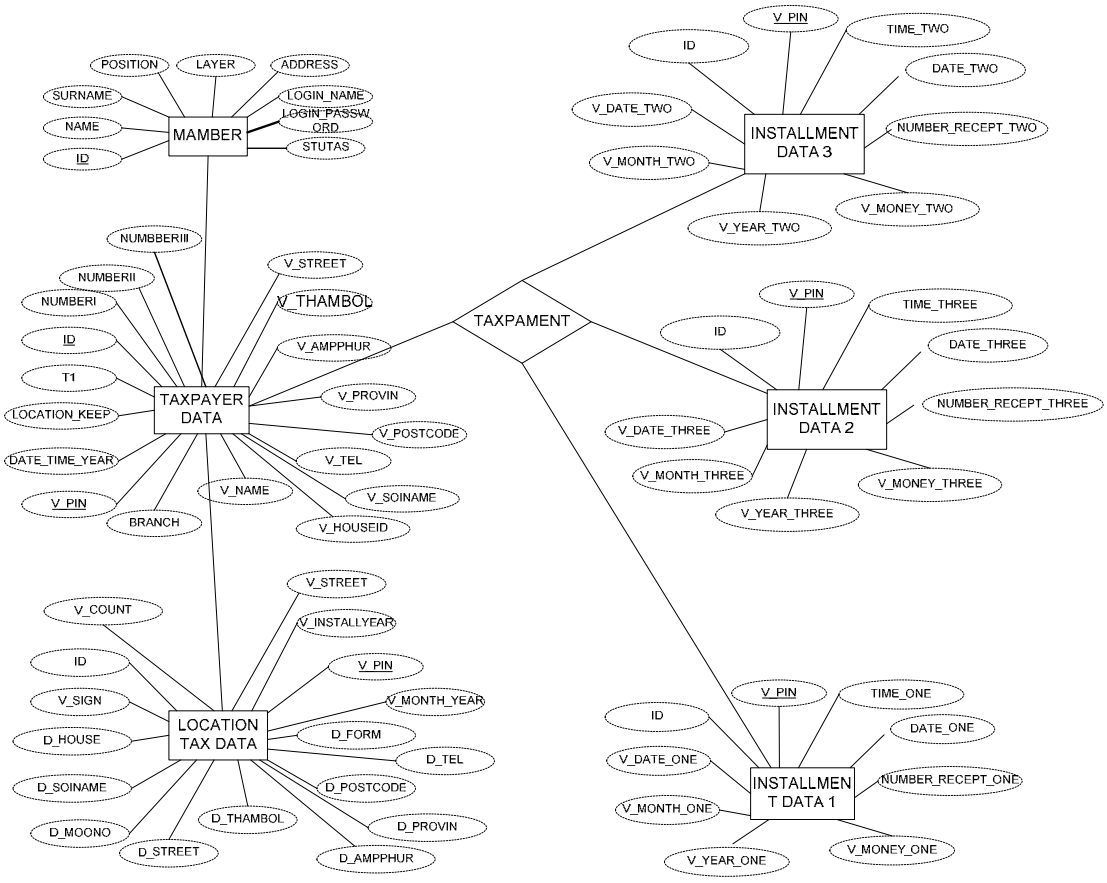


Figure 3.10 ER-Diagrams

Figure 3.10 illustrates an entity relation diagram or ER-Diagram, consisting of 6 following entities.

- MEMBER is a table keeping data defining, A right to access the system, consisting of the following attributes: ID, NAME, SURNAME, Position, Layer, Address, Login_name, Login_password, Status
- TAXPAYER DATA is a table keeping taxpayer data which RD already has and can be used. It consists of the following attributes: ID,T1,NUMBER_I, NUMBER_II,NUMBER_II, LOCATION_KEEP, DATE_TIME_YEAR,V_PIN,BRANCH,V_NAME,V_HOUSEID,V_SOINAME,V_MOONO,V_STREET,V_THAMBOL,V_AMPPHUR, V_PROVIN, V_POSTCODE, V_TEL.
- LOCATION is a table keeping taxpayers' addresses, consisting of the following attributes: V_PIN, D_HOUSEID, D_SOINAME, D_MOONO, D_STREET, D_THAMBOL, D_AMPPHUR, D_PROVIN, D_POSTCODE, D_TEL,V_TEL, V_FROM, V_MONTH_YEAR, V_COUNT, V_INSTALLYEAR.
- INSTALLMENT DATA 1 is a table keeping data on installment 1, consist of the following attributes. ID,V_PIN,V_DATE_ONE,V_MONTH_ONE,V_YEAR_ONE,V_MONEY_ONE,NUMBER_RECEPT_ONE,DATE_ONE,TIME_ONE
- INSTALLMENT DATA 2 is a table keeping data on installment 2, consist of the following attributes. ID,V_PIN,V_DATE_TWO,V_MONTH_ TWO,V_YEAR_ TWO,V_MONEY_ TWO,NUMBER_RECEPT_ TWO,DATE_ TWO,TIME_ TWO.
- INSTALLMENT DATA 3 is a table keeping data on installment 3, consist of the following attributes: ID,V_PIN,V_DATE_THREE,V_MONTH_ THREE,V_YEAR_ THREE,V_MONEY_ THREE,NUMBER_RECEPT_ THREE,DATE_ THREE,TIME_ THREE,V_SIGN.

3.6 Data Dictionary for Modeling of Tax Installment by Radio Frequency Identification (RFID)

A data dictionary is a centre compiling details of all data in the system. Data contents that are collected are, for instance, external entities, data process, data flow and data stored. Details of each content are as follows:

3.6.1 External Entities

A person, organization unit, other system, or other organization that lies outside the scope of the project but that interacts with the system being studied. External entities provide the net inputs into a system and receive net outputs from the system. This and the others are definitions from the book. Basically, external entities are those entities that are outside the scope of the project or system at hand. External Entities Listing: Same as above.

Table 3.1 External Entities

Name	Tax Officer
Entry Type	Character
Alias	-
Description and Comment	RD officials responsible for tax collection
Input Data Flows	Report
Output Data Flows	Update Data

Table 3.1 External Entities (Cont.)

Name	Taxpayer
Entry Type	Character
Alias	-
Description and Comment	Taxpayers liable to pay takes
Input Data Flows	Receipt
Output Data Flows	Payment

3.6.2 Data Process

Work performed on or in response to, incoming data flows or conditions. The FSS Context Diagram includes "FSS System" and all the inputs and outputs of the FSS system. The DFD Diagram 0 (if you'd included everything, just as an example) would be 1. Accounts Payable, 2. Order Processing, 3. Catering Processing, 4. Payroll Processing, 5. Accounts Payable Processing, 6. Warehouse Processing, 7. Inventory Processing, and 8. Store Processing. Each of these processes has inputs and outputs that are independent of the other.

Table 3.2 Data Process

Process Name	RFID System
Purpose	RFID technology is use for tax payment in 3 monthly installment
Process Number	P0
Input Data Flows	Payment Update data
Output Data Flows	Report Receipt
Process Description	The system records taxpayers' installment data on RFID tags, which serve as a paper containing tax data. When each installment is paid, RFID tags have to be presented to RD officials. For each payment, a receipt is issued as an evidence.

Table 3.2 Data Process (Cont.)

Process Name	P1 Authentication
Purpose	For system security and verification of officials' access to the system.
Process Number	P1
Input Data Flows	Username / password
Output Data Flows	Check permission Retrieve data
Description	Verify RD officials' right to access the system for the sake of system security.

Table 3.2 Data Process (Cont.)

Process Name	Validate
Purpose	For tax calculation via 3 monthly installments. First installment is paid along with a tax form submitted.
Process Number	P2
Input Data Flows	Tax payer info
Output Data Flows	Write data Update data
Description	Tax calculation is made for 3 installments. The data derived are written on RFID tags. When a taxpayer wants to pay his installment, he has to present his RFID tags to RD officials.
Module Specification	Has three functions follows as: 1 Calculate. 2 Read data from database. 3 Write data on RFID Tags.

Table 3.2 Data Process (Cont.)

Process Name	Tax payment
Purpose	Pay in 3 installments
Process Number	P3
Input Data Flows	RFID Tags data
Output Data Flows	Store data to pay installment Update data on RFID Tags
Description	A taxpayer presents his RFID tags to RD officials. The system will notify which installs are not paid, and start to collect each installment.
Module Specification	Has four functions as follows: 1 Read data from RFID Tags 2 First installment 3 Second installment 4 Third installment

Table 3.2 Data Process (Cont.)

Process Name	Utility
Purpose	Output of tax payment is displayed
Process Number	P4
Input Data Flows	RFID Tags data
Output Data Flows	Receipt Report data
Description	Result of each function - Report - Receipt
Module Specification	Has three functions as follows: 1 Report 2 Receipt 3 Backup

Table 3.2 Data Process (Cont.)

Process Name	Add Tax Officer
Purpose	Add system user - Admin - User
Process Number	P1.1
Input Data Flows	User name / password ,Add permission
Output Data Flows	Check permission
Description	Add user data such as - Add user - Permission
Module Specification	-

Table 3.2 Data process (Cont.)

Process name	Update officer
Purpose	Modify data when there is a change position or agency - Admin - User - Permission
Process Number	P1.2
Input Data Flows	User name / password, add permission
Output Data Flows	Update data
Description	Modify RD officials data and their right to access the system
Module Specification	-

Table 3.2 Data Process (Cont.)

Process Name	Delete officer
Purpose	Delete RD officials data when they change jobs, resign or die.
Process Number	P1.3
Input Data Flows	officer info
Output Data Flows	Delete officer
Description	Delete RD officials data when they change jobs, resign or die
Module Specification	-

Table 3.2 Data Process (Cont.)

Process Name	Login
Purpose	Define system access by using Username/Password to safeguard the system
Process Number	P1.4
Input Data Flows	Username/password data
Output Data Flows	Permission
Description	Login into the system by filling in Username / password. If the system verifies and finds user registration with the system, the user is then authorized to access it.
Module Specification	-

Table 3.2 Data Process (Cont.)

Process Name	Calculate
Purpose	Calculate tax and divide it into 3 installments
Process Number	P2.1
Input Data Flows	Taxpayer info
Output data flows	Store data to pay installment
Description	When a taxpayer desires to pay in 3 installments base on the rule, the system will calculate the amounts and then record then on RFID tags and in database
Module Specification	-

Table 3.2 Data Process (Cont.)

Process Name	Read data from database
Purpose	Read data in database and display them on screen to examine the money amounts calculated, and record them on RFID tags and database
Process Number	P2.2
Input Data Flows	To pay by installment data
Output Data Flows	Tax data
Description	Rd official places RFID tags on a reader. The system will retrieve data from database and display them on screen to examine the calculation result, and is ready to write data on RFID tags and database
Module specification	-

Table 3.2 Data Process (Cont.)

Process Name	Write data on RFID Tags
Purpose	Write data on RFID tags and database.
Process Number	P2.3
Input Data Flows	Tax data
Output Data Flows	Write data
Description	After verification of the data displayed, the system will begin writing data on RFID tags and in database.
Module Specification	-

Table 3.2 Data Process (Cont.)

Process Name	Read data from RFID Tags
Purpose	When a taxpayer submits his RFID tags to an RD official, the latter will place it on a reader. The system will read taxpayer data on RFID tags to process each payment of tax installment.
Process Number	P3.1
Input Data Flows	RFID Tags data Tax payer data
Output Data Flows	Show data
Description	Begin when a taxpayer presents his RFID tags to an RD official, who will place it on a reader. The system will read taxpayer data on tags to process each payment of tax installment.
Module Specification	-

Table 3.2 Data Process (Cont.)

Process Name	First installment
Purpose	When a taxpayer submits his RFID tags to an RD official, the latter will place it on a reader. The system will read data on the RFID tags in order to process the first installment.
Process Number	P3.2
Input Data Flows	1st to pay by installment data
Output Data Flows	1st receipt 1st store data
Description	It begins when a taxpayer submits his RFID tags to an RD official, who will place its on a reader. The system will read data on the RFID tags in order to process the first installment.
Module specification	-

Table 3.2 Data Process (Cont.)

Process Name	Second installment
Purpose	When a taxpayer submits his RFID tags to an RD official, the latter will place it on a reader. The system will read data on the RFID tags in order to process the second installment.
Process Number	P3.3
Input Data Flows	2nd to pay by installment data
Output Data Flows	2nd receipt 2nd store data
Description	It begins when a taxpayer submits his RFID tags to an RD official, who will place its on a reader. The system will read data on the RFID tags in order to process the second installment.
Module Specification	-

Table 3.2 Data Process (Cont.)

Process name	Third installment
Purpose	When a taxpayer submits his RFID tags to an RD official, the latter will place it on a reader. The system will read data on the RFID tags in order to process the third installment.
Process Number	P3.4
Input data flows	3rd to pay by installment data
Output data flows	3rdreceipt 3rd store data
Description	It begins when a taxpayer submits his RFID tags to an RD official, who will place its on a reader. The system will read data on the RFID tags in order to process the third installment.
Module specification	-

Table 3.2 Data Process (Cont.)

Process Name	Report
Purpose	Display a report on tax payment
Process Number	P4.1
Inbound Data Flows	Condition view report Verify condition result info
Outbound Data Flows	Report output
Description	A report for RD officials
Module specification	-

Table 3.2 Data Process (Cont.)

Process name	Receipt
Purpose	Display a receipt on tax payment
Process Number	P4.2
Input Data Flows	To pay by installment data
Output Data Flows	Receipt result
Description	After each installment payment, A taxpayer will get a receipt.
Module Specification	-

Table 3.2 Data Process (cont)

Process Name	Backup/Restore
Purpose	Back up data
Process Number	P4.3
Description	Back up data to avoid data loss.
Input Data Flows	Tax payment data Taxpayer data \Restore
Output Data Flows	Backup
Module Specification	-

3.6.3 Data Flow

It is an explanation of details of data appearing in each data flow line of a data flow diagram.

Table 3.3 Data Flow

Data flows Name	Username
Alias	-
Description	User name and password access to system
Original	Tax Officer
Destination	Authentication
Where Used	Login
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Password
Alias	-
Description	User name and password access to system
Original	Tax Officer
Destination	Authentication
Where Used	Login
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows Name	Permission
Alias	-
Description	Define a right for officials who will use the system
Original	Authentication
Destination	Tax officer
Where Used	Tax officer
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	Add Username
Alias	-
Description	Add RD officials data, store data on name, surname, agency, level, etc
Original	Loin
Destination	Tax Officer Data
Where Used	Login
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Add Password
Alias	-
Description	Add RD officials data which are passwords
Original	Login
Destination	Tax Officer Data
Where Used	Login
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Check permission
Alias	-
Description	Permission for tax officer
Original	Login
Destination	Tax Officer Data
Where Used	Authentication
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	Retrieve data
Alias	-
Description	Retrieve data on RD officials data addition
Original	Tax Officer data
Destination	Login
Where Used	Login
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Write data
Alias	-
Description	After tax calculation, data on 3 tax installments are written on RFID tags.
Original	Validate
Destination	Tags RFID and Tax officer data
Where Used	Validate
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows Name	Permission Result
Alias	-
Description	After tax calculation, data on 3 tax installments are also stored in database
Original	Validate
Destination	Taxpayer data
Where Used	Validate
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	Read data
Description	Taxpayer data are retrieved and displayed on a screen for each installment payment.
Original	Taxpayer data
Destination	Validate
Where Used	Validate
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows Name	Store data
Description	After tax calculation, data on 3 tax installments are also stored in database.
Original	Validate
Destination	Taxpayer data
Where Used	Validate
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows Name	Update data on RFID Tags
Description	Data on tax installment stored on RFID tags retrieved for tax payment, and modified when each installment is paid.
Original	Tax payment
Destination	RFID Tags
Where Used	Tax payment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Update data
Description	Data on tax installment stored on RFID tags retrieved for tax payment, and modified when each installment is paid.
Original	Tax payment
Destination	RFID Tags
Where Used	Tax payment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	Store data to pay installment
Description	Data on tax installment stored on RFID tags retrieved for tax payment, and modified when each installment is paid. For each modification, data will be recorded in taxpayer database.
Original	Tax payment
Destination	Taxpayer data
Where Used	Tax payment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Data to pay installment
Description	Data on tax installment are also stored in taxpayer database.
Original	Utility
Destination	Taxpayer data
Where Used	Utility
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Result data info
Description	Data on tax installment are reported to RD official.
Original	Utility
Destination	Tax Officer
Where Used	Utility
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Report data
Description	Data on tax installment are stored in a file.
Original	Utility
Destination	Report file
Where Used	Utility
How used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	Receipt data
Description	A receipt is issued for taxpayers every time an installment is paid.
Original	Utility
Destination	Taxpayer data
Where Used	Utility
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Add user and permission
Description	Add user and define his right to access the system.
Original	Add Tax Officer
Destination	Tax Officer data
Where Used	Add Tax Officer
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Check Permission
Description	Authenticate RD officials right to access the system.
Original	Add Tax Officer
Destination	Tax Officer data
Where Used	Add Tax Officer
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Update officer data info
Description	RD officials data may be modified when
Original	Update officer
Destination	Tax Officer data
Where Used	Update officer
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	User info
Description	RD officials data that need to be deleted after he is revoked of his right to use the system.
Original	Delete officer
Destination	Tax Officer data
Where Used	Delete officer
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows Name	Delete officer info
Description	User data are deleted from the system.
Original	Delete officer
Destination	Tax Officer data
Where Used	Delete officer
How Used	output

Table 3.3 Data Flow (Cont.)

Data flows name	Permission check info
Description	Verify the right to access the system.
Original	Login
Destination	Tax Officer data
Where Used	Login
How used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Taxpayer info
Description	Taxpayer data are retrieved when he desires to pay tax in 3 installments.
Original	Login
Destination	Tax Officer data
Where Used	Calculate
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Store data to pay installment
Description	After tax calculation, data are stored in taxpayer database.
Original	Calculate
Destination	Taxpayer data
Where Used	Calculate
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	To pay by installment data
Description	Tax installment data are retrieved when each installment is paid.
Original	Taxpayer data
Destination	Read data from database
Where Used	Read data from database
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows Name	Taxpayer info
Description	Taxpayer data are retrieved and displayed for tax calculation.
Original	Taxpayer
Destination	Calculate
Where Used	Taxpayer
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows Name	Tax data info
Description	Taxpayer data are retrieved and displayed to view his status.
Original	Read data from database
Destination	Show data
Where Used	Read data from database
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows Name	Tax Installment data info
Description	Data on each installment are recorded on RFID tags.
Original	Show data
Destination	Write data on RFID Tags
Where Used	Write data on RFID Tags
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Update Tax installment data info
Description	Data are updated for each installment.
Original	Show data
Destination	Write data on RFID Tags
Where Used	Write data on RFID Tags
How Used	output

Table 3.3 Data Flow (Cont.)

Data flows Name	Data Tax installment data info
Description	Data are updated for each installment
Original	Write data on RFID Tags
Destination	RFID Tags
Where Used	Write data on RFID Tags
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	RFID tags data
Description	Taxpayer data are sent in when RFID tags are presented to officials.
Original	Taxpayer
Destination	Read data from RFID Tags
Where Used	Read data from RFID Tags
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Installment data
Description	Tax payment data are displayed when RFID tags are placed on a reader.
Original	Read data from RFID Tags
Destination	Taxpayer
Where Used	Read data from RFID Tags
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	To pay by installment1 data
Description	Installment 1 data
Original	RFID Tags
Destination	Read data from RFID Tags
Where Used	First installment
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	1st store data
Description	Store installment 1 data
Original	First installment
Destination	RFID Tags
Where Used	First installment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	1st receipt data
Description	A receipt that taxpayers obtain when installment 1 is paid.
Original	First installment
Destination	Taxpayer
Where Used	First installment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	To pay by installment2 data
Description	Installment data
Original	RFID tags
Destination	Second installment
Where Used	Second installment
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	2nd store data
Description	Store installment 2 data
Original	Second installment
Destination	RFID Tags
Where Used	First installment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	2nd receipt data
Description	A receipt that taxpayers obtain when installment 2 is paid.
Original	Second installment
Destination	Taxpayer
Where Used	Second installment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data flows name	To pay by installment 3 data
Description	installment 3 data
Original	Second installment
Destination	RFID Tags
Where Used	Third installment
How used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	3rd store data
Description	Store installment 3 data
Original	Second installment
Destination	RFID Tags
Where Used	Third installment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	3rd receipt data
Description	A receipt which taxpayers obtain when installment 3 is paid.
Original	Second installment
Destination	RFID Tags
Where Used	Third installment
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	Condition view report
Description	If RD officials want to view daily or monthly report, they can insert required conditions.
Original	Second installment
Destination	RFID Tags
Where Used	Report
How Used	Input

Table 3.3 Data Flow (Cont.)

Data flows name	Report output
Description	Data from inserted conditions are displayed to officials for analysis.
Original	Second installment
Destination	RFID Tags
Where Used	Report
How used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	To pay by installment data
Description	After each installment payment, a taxpayer will get a receipt.
Original	Second installment
Destination	RFID Tags
Where Used	Receipt
How Used	Input

Table 3.3 Data Flow (Cont.)

Data Flows Name	Receipt result
Description	A receipt that taxpayers obtain when installment 3 is paid, along with tax payment detail.
Original	Second installment
Destination	RFID Tags
Where Used	Receipt
How Used	Output

Table 3.3 Data Flow (Cont.)

Data Flows Name	Backup data
Description	Data in taxpayer database are always backed up and will be restored when main data have a problem.
Original	Second installment
Destination	RFID Tags
Where Used	Backup/Restore
How Used	Input

3.6.4 Data store

A inventory of data. The whole of the data in a small system. A database. Very large systems may have more than one database. Data Store Listing: The a page is a reference to the page number of each data store description. More than one data store description on each page is OK.

Table 3.4 Data Store

Data Store Name	RD Officials Data
Data Store Number	D1
Alias	-
Description	Database of RD officials whose duty is to collect tax, and such details as name, surname, position, level , etc.
Input Data Flows	
Output Data Flows	2,500 persons

Table 3.4 Data Store (Cont.)

Data store name	Taxpayer Data
Data store Number	D2
Alias	-
Description	Database of RD officials taking charge of collection of people's income tax.
Input data flows	- Add Username/Password - Check permission
Output data flows	- Permission Result - Retrieve Data
Record name	-
Volume and Frequency	20 million Records – 25 million Records

Table 3.4 Data Store (Cont.)

Data Store Name	RFID Tags
Data Store Number	D3
Alias	-
Description	Tax installment data are stored in RFID tags
Input Data Flows	Write Data
Output Data Flows	RFID tags Data
Record Name	-
Volume and Frequency	20 million Records – 25 million Records

Table 3.4 Data Store (Cont.)

Data Store Name	Report file
Data Store Number	D4
Alias	-
Description	To prevent unexpected damage, data have to be backed up.
Input Data Flows	Report Data
Output Data Flows	-
Record Name	-
Volume and Frequency	20 million Records – 25 million Records

Table 3.4 Data Store (Cont.)

Data Store Name	Black up Data
Data Store Number	D5
Alias	-
Description	To prevent unexpected damage, data have to be backed up.
Input Data Flows	Black up Data
Output Data Flows	Restore
Record Name	-
Volume and Frequency	20 million Records – 25 million Records

File Structure

It is a classification of data schedule for each record in data files so that a computer can take them for processing.

Table 3.5 File Structure of Member Consists of:

Attribute		Type	Size	Constrain	Description
PK	Id	int	10	Not Null	Code
	Name	char	50	Not Null	Name
	Surname	char	50	Not Null	Surname
	Position	char	50	Not Null	Position
	Layer	char	10	Not Null	Level
	Address	char	50	Not Null	Address
	Login_name	char	10	Not Null	Login_name
	Login_password	char	20	Not Null	Login_password
	Status	int	2	Not Null	Status

Table 3.6 File Structure of Tax payer Data Consists of:

Attribute		Type	Size	Constrain	Description
PK	Id	int	5	Not Null	
PK	t1	char	50	Not Null	RFID Number
3	NUMBER_I	char	50	Not Null	Installment 1
4	NUMBER_II	char	50	Not Null	Installment 2
5	NUMBER_III	char	50	Not Null	Installment 3
6	LOCATION_ KEEP	char	50	Not Null	Collection unit
7	DATE_TIME _YEAR	char	50	Not Null	Date of filling in the form
PK	V_PIN	char	13	Not Null	ID No.
	BRANCH	char	50	Not Null	Branch No.
	V_NAME	char	50	Not Null	Title surname

Table 3.6 : File Structure of Taxpayer Data Consists of (Cont.)

Attribute		Type	Size	Constrain	Description
	V_HOUSEID	char	50	Not Null	House code
	V_SOINAME	char	50	Not Null	Lane
	V_MOONO	char	50	Not Null	Moo
	V_STREET	char	50	Not Null	Street
	V_THAMBOL	char	50	Not Null	Sub-district
	V_AMPPHUR	char	50	Not Null	District
	V_PROVIN	char	50	Not Null	Province
	V_POSTCODE	Char	50	Not Null	Postcode
	V_TEL	Char	50	Not Null	Phone No.

Table 3.7 File Structure of Location Tax Payer Data Consists of:

Attribute		Type	Size	Constrain	Description
PK	Id	Int	5	Not Null	
PK	V_PIN	char	13	Not Null	ID card No.
	D_HOUSEID	char	50	Not Null	No. of commercial establishment
	D_SOINAME	char	50	Not Null	Lane of commercial
	D_MOONO	char	50	Not Null	Moo of commercial
	D_STREET	char	50	Not Null	Street of commercial
	D_THAMBOL	char	50	Not Null	Sub-district
	D_AMPPHUR	char	50	Not Null	District
	D_PROVIN	char	50	Not Null	Province
	D_POSTCODE	char	50	Not Null	Postcode
	D_TEL	char	50	Not Null	Phone No.
	V_FORM	char	50	Not Null	According form
	V_MONTH_YEAR	char	50	Not Null	To month/year
	V_COUNT	char	50	Not Null	For accounting cycle
	V_INSTALLYEAR	char	50	Not Null	Tax installment of year

Table 3.8 File Structure of Installment data1 consists of:

Attribute		Type	Size	Constrain	Description
PK	Id	int	5	Not Null	PK
PK	V_PIN	char	50	Not Null	ID card No.
	V_DATE_ONE	char	50	Not Null	Date of first installment
	V_MONTH_ONE	char	50	Not Null	Month of first installment
	V_YEAR_ONE	char	50	Not Null	Year of first installment
	V_MONEY_ONE	char	50	Not Null	Amount of first installment
	NUMBER_RECEPT_ONE	char	50	Not Null	Receipt No. of first installment
	DATE_ONE	char	50	Not Null	Date of first installment payment
	TIME_ONE	char	50	Not Null	Time of first installment payment

Table 3.9 File Structure of Installment Data 2 Consists of:

Attribute		Type	Size	Constrain	Description
PK	id	int	5	Not Null	PK
PK	V_PIN	char	13	Not Null	ID card No.
	V_DATE_TWO	char	50	Not Null	Date of second installment
	V_MONTH_TWO	char	50	Not Null	Month of second installment
	V_YEAR_TWO	char	50	Not Null	Year of second installment
	V_MONEY_TWO	char	50	Not Null	Amount of second installment
	NUMBER_RECEPT_TWO	char	50	Not Null	Receipt No. of second installment
	DATE_TWO	char	50	Not Null	Date of second installment payment
	TIME_TWO	char	50	Not Null	Time of installment 2 payment
	V_DATE_TWO	char	50	Not Null	Date of second installment payment
	V_MONTH_TWO	char	50	Not Null	Month of second installment payment

Table 3.10 File Structure of Installment Data3 Consists of:

Attribute		Type	Size	Constrain	Description
PK	id	int	5		
PK	V_PIN	char	13	Not Null	ID card No.
	V_DATE_ THREE	char	50	Not Null	Date of third installment payment
	V_MONTH_ THREE	char	50	Not Null	Month of third installment payment
	V_YEAR_ THREE	char	50	Not Null	Year of third installment payment
	V_MONEY_ THREE	char	50	Not Null	Amount of third installment payment
	NUMBER_RECEPT_ THREE	char	50	Not Null	Receipt of third installment payment
	DATE_ THREE	char	50	Not Null	Date of third installment payment
	TIME_THREE	char	50	Not Null	Time of third installment payment
	V_SIGN	char	50	Not Null	Signature

3.7 Flow Chart

It is a display of performance stages of the program or system stage by stage, including the direction of data flow from the beginning to receiving the consequences needed.

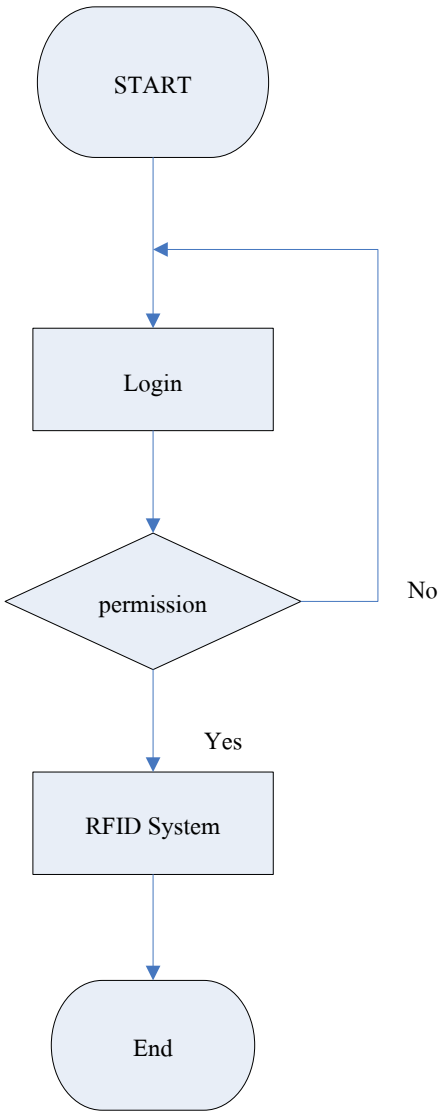


Figure 3.11 Flow Chart of Login into the System

Based on Figure 3.11 an RD official is entitled to access the based on his right. The system will perform the following stages.

- An official fills in Username and Password.

- The system verifies the official's access right. If there are no data, the system will begin waiting to fill in Username and Password once again.
- If is found that the official is entitled to access the system, he'll be authorized to access the system's main page.
- If he is not entitled to access, the system will go back to start once again so that official may contact the admin. To define the formers right later.

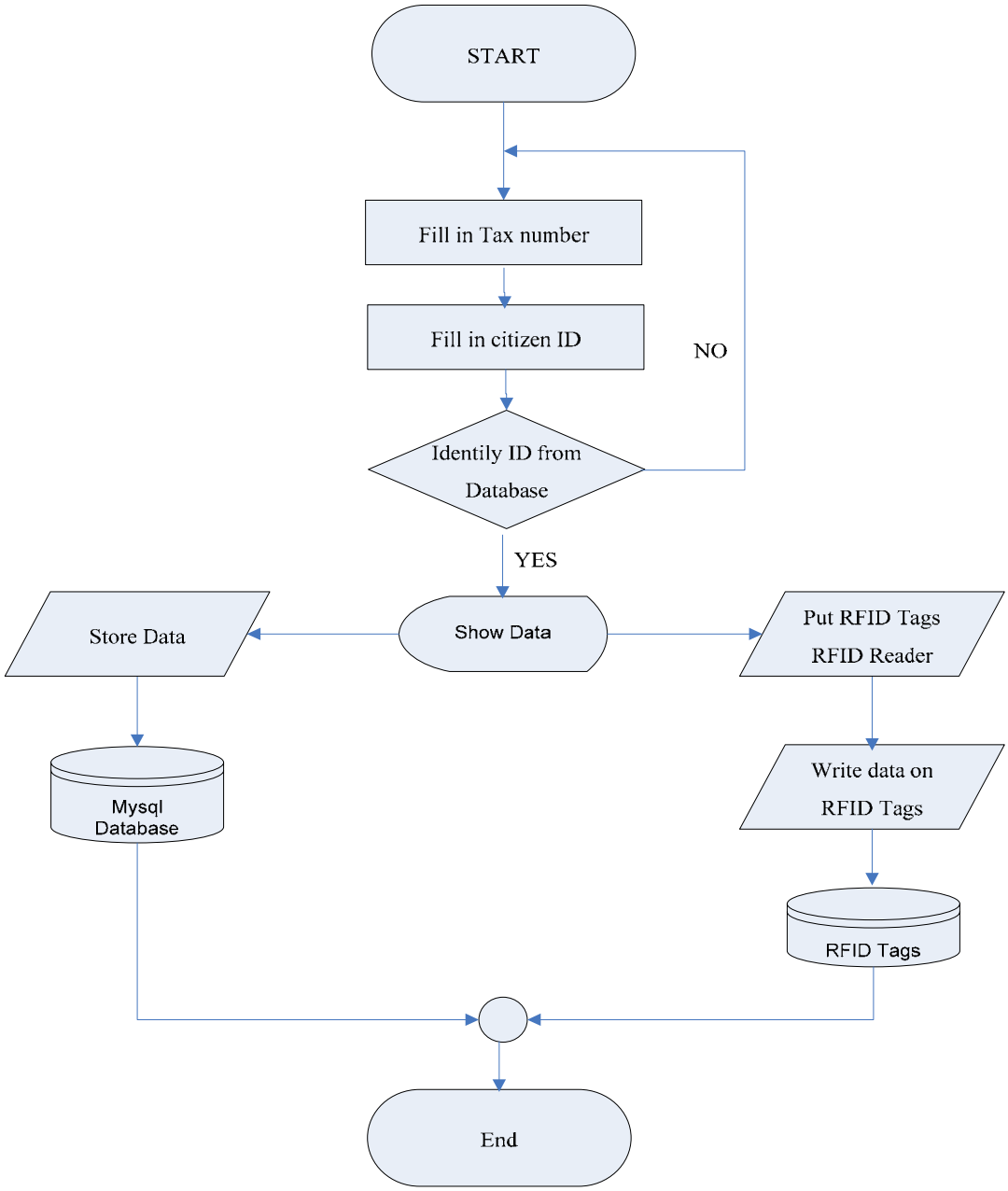


Figure 3.12 Tax Calculation

Figure 3.12 reveals stages of tax amount calculation. Each stage is described below.

- If starts when an RD official opens menu ‘Validate’. He will fill in a taxpayer’s ID card number in 13 figures.
- Fill in the tax amount that amount that a taxpayer wants to pay in installments. The system will mainly use ID card number by verifying it in RD database.
- If ID card number is found in database, the system will calculate tax amount divided into 3 installments, along with date, mouth year of payment. The first installment is paid while a tax form is submitted.
- If ID number is found in database, the system will display data on the screen so that the official may reexamine to check whether the tax amount is accurate or not. If correct, data will be written on RFID tags, which are subsequently given to the taxpayer so that he will come back to pay tax when the next installment is due. A payment has to be made on the date defined and the transaction data is recorded in MySQL database.

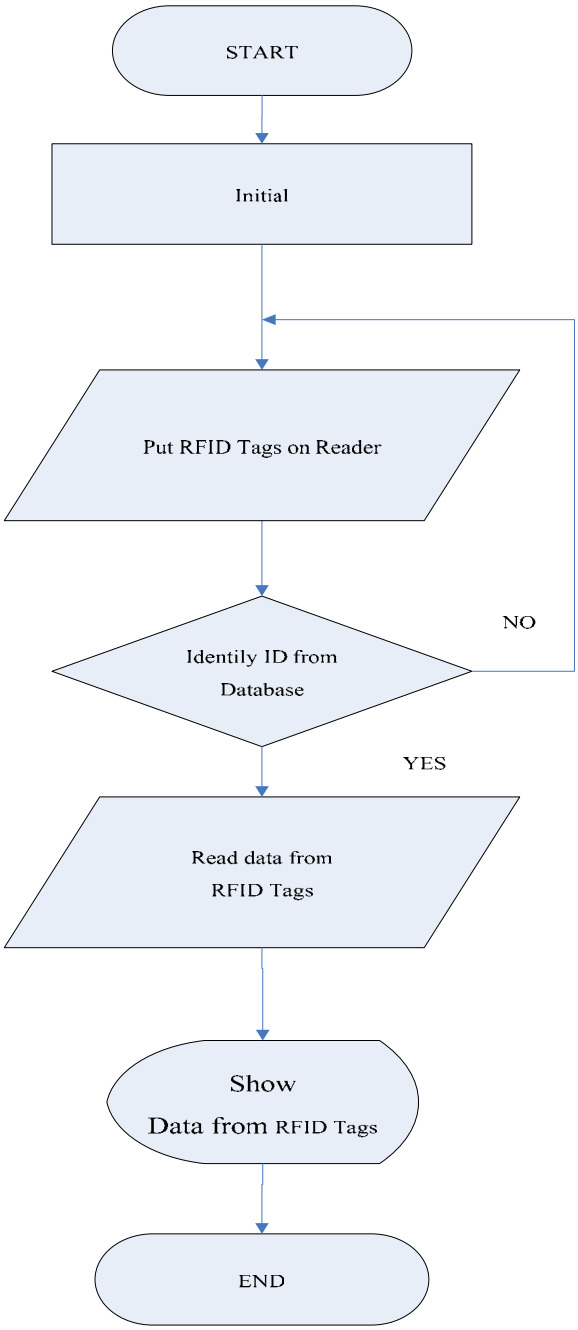


Figure 3.13 Reading Data on RFID Tags

Figure 3.13 illustrates the reading of data on RFID tags. The working process is as follows:

- The performance begins with checking whether there are RFID tags or not. If not, spin around to wait for RFID tags to come.

- An official places RFID tags on a reader or put them within a reader's reading range, and the system will check whether there is RFID tags' ID in database. It is a preliminary verification of a taxpayer with RFID tags. The ID is added to database the first time a taxpayer reports his desire to submit the tax form for 3 installments.
- If RFID tags' ID is found in database, this indicates that there is an entry to express one's desire for payment in installments. The system will commence data on RFID tags and display them on screen.
- If there are no data on RFID tags, it indicates that the RFID tags are fake. The process will start again until there are valid RFID tags coming in.
- When data are shown on screen, they tell about details of a particular taxpayer, who may verify the accuracy in this process.

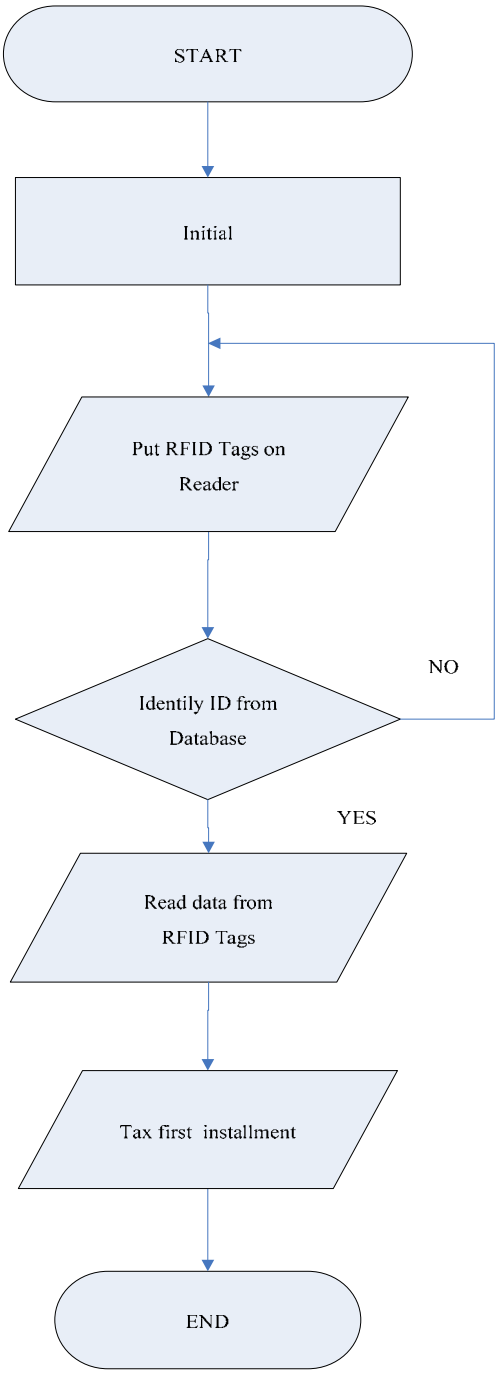


Figure 3.14 first Installment

Figure 3.14 consists of the following working stages:

- A taxpayer submits RFID tags to an RD official.
- The RD official places RFID tags on a reader or put the tags within a reader's reading range. In case there are no RFID tags, the system will begin with checking whether there are RFID tags or not, the reader will spin around and wait for RFID tags to come within its reading range.
- When RFID tags are placed on a reader or put within its reading range, the system will check whether RFID tags 'ID is in database, which is a verification of a taxpayer. ID is found, this indicates that there is an expression of need to use the system for tax installment payment. The system will start reading data on RFID tags and display them on the screen.
- If RFID tags' ID data are not found, it points out that the RFID tags are fake. The process will then start again until there are valid RFID tags coming in.
- The data displayed on the screen will in form about details of that taxpayer including tax amount to be paid for each installment. The system allows paying each installment one by one. For the first installment, the RD official concerned will click on the button 'pay installment 1'. After payment, the system will record data on RFID tags and in database. The data recorded are, for example, installment 1 has already been paid, and data of payment. Simultaneously, a receipt is also issued for the taxpayer while RFID tags are returned to the taxpayer for his payment of installment 2 later on.

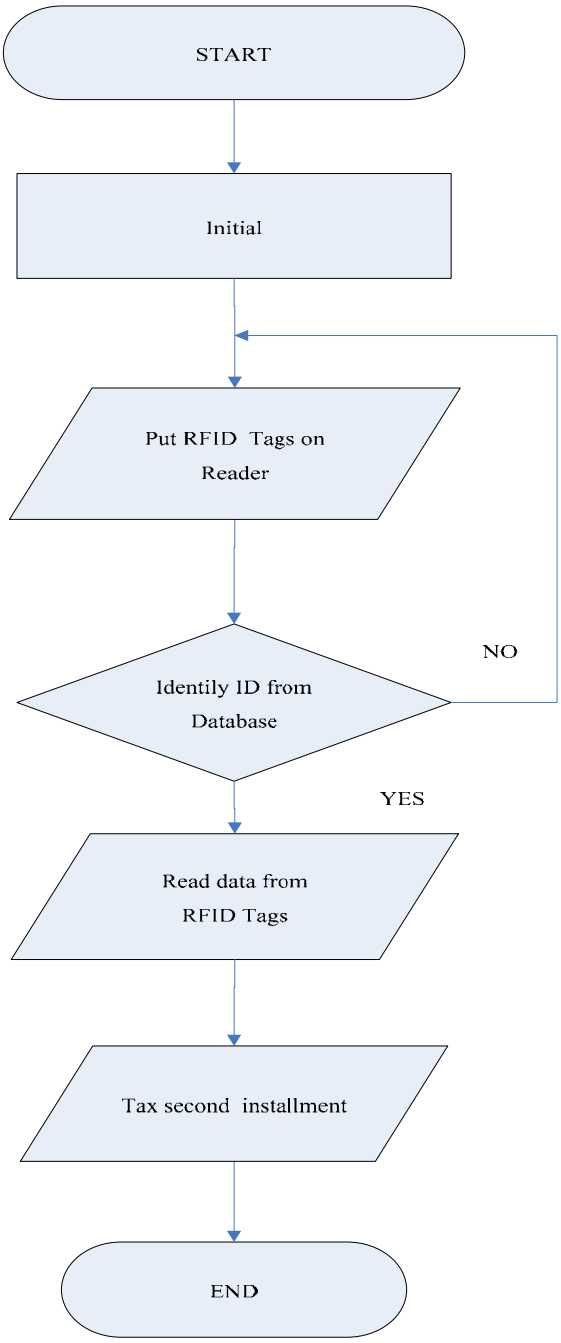


Figure 3.15 Second Installment

Figure 3.15 consists of the following working stages.

- A taxpayer submits RFID tags to an RD official.
- The RD official places RFID tags on a reader or put the tags within a reader, s reading range. In case there are no RFID tags, the system will

begin with checking whether there are RFID tags or not, the reader will spin around and wait for RFID tags to come within its reading range.

- When RFID tags are placed on a reader or put within its reading range, the system will check whether RFID tags 'ID is in database, which is a verification of a taxpayer. ID is found, this indicates that there is an expression of need to use the system for tax installment payment. The system will start reading data on RFID tags and display them on the screen.
- If RFID tags' ID data are not found, it points out that the RFID tags are fake. The process will then start again until there are valid RFID tags coming in.
- The data displayed on the screen will in form about details of that taxpayer including tax amount to be paid for each installment. The system allows paying each installment one by one. For the second installment, the RD official concerned will click on the button 'pay installment 2'. After payment, the system will record data on RFID tags and in database. The data recorded are, for example, installment 2 has already been paid, and data of payment. Simultaneously, a receipt is also issued for the taxpayer while RFID tags are returned to the taxpayer for his payment of installment 3 later on.

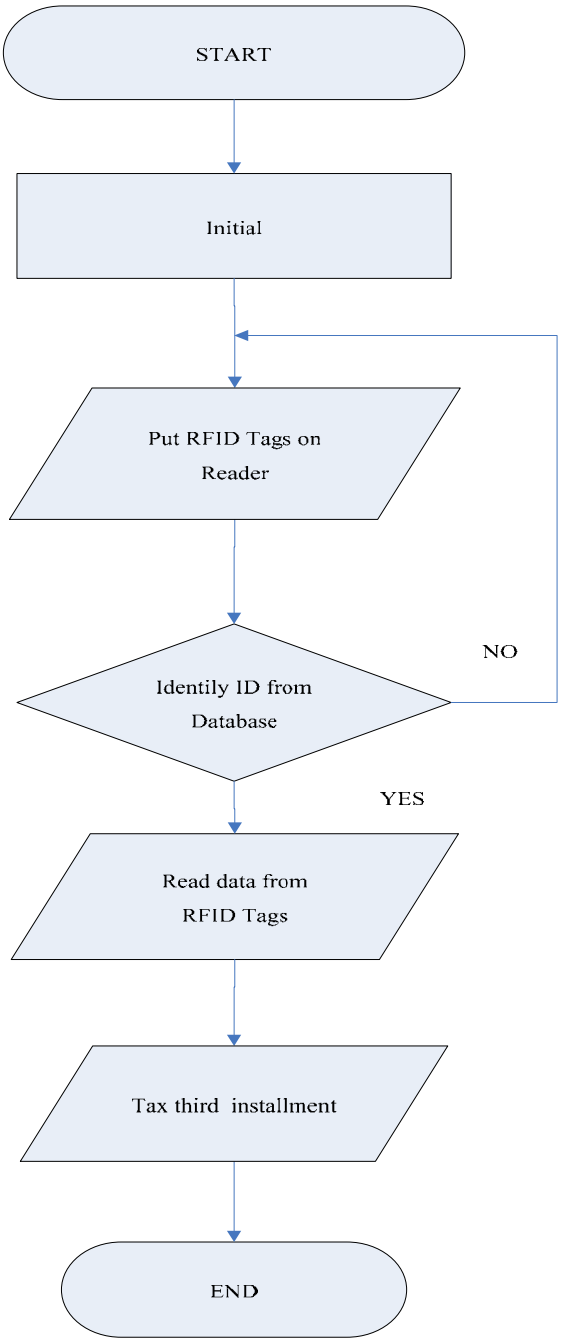


Figure 3.16 Third Installment

Figure 3.15 consists of the following working stages.

- A taxpayer submits RFID tags to an RD official.
- The RD official places RFID tags on a reader or put the RFID tags within a reader, s reading range. In case there are no RFID tags, the system will begin with checking whether there are RFID tags or not,

the reader will spin around and wait for RFID tags to come within its reading range.

- When RFID tags are placed on a reader or put within its reading range, the system will check whether RFID tags 'ID is in database, which is a verification of a taxpayer. ID is found, this indicates that there is an expression of need to use the system for tax installment payment. The system will start reading data on RFID tags and display them on the screen.
- If RFID tags' ID data are not found, it points out that the RFID tags are fake. The process will then start again until there are valid RFID tags coming in.
- The data displayed on the screen will in form about details of that taxpayer including tax amount to be paid for each installment. The system allows paying each installment one by one. For the third installment, the RD official concerned will click on the button 'pay installment 3'. After payment, the system will record data on RFID tags and in database. The data recorded are, for example, installment 3 has already been paid, and data of payment. Simultaneously, a receipt is also issued for the taxpayer while RFID tags are kept by the RD official so that they will be used for other taxpayer.

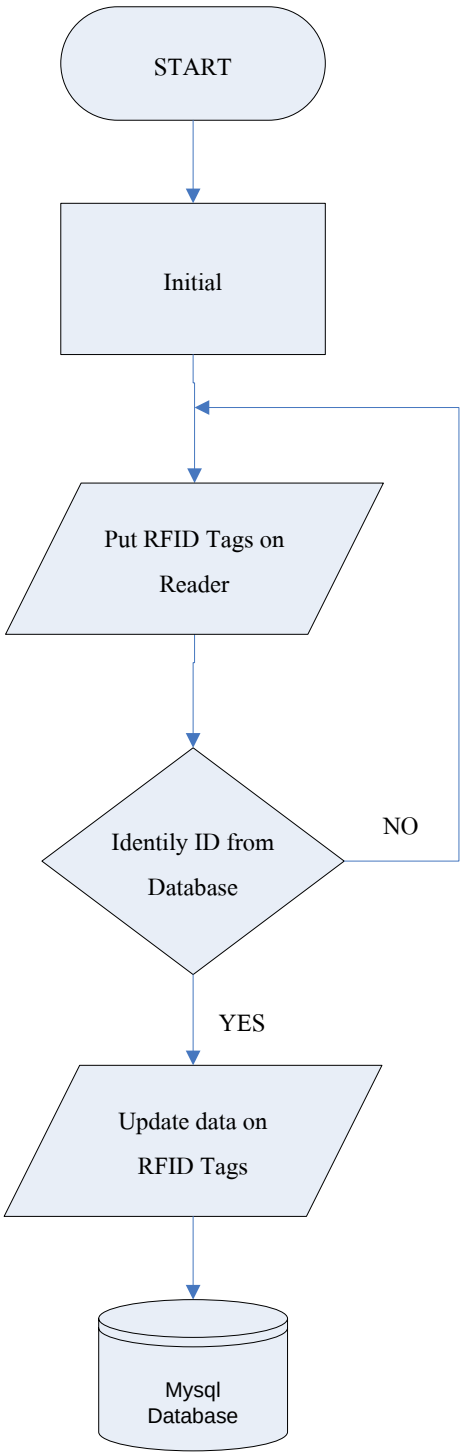


Figure 3.17 Flow Chart of Updating Data on RFID Tags

Figure 3.17 reveals updating data on RFID tags, which consists of the following working stages.

Figure 3.17 consists of the following working stages.

- A taxpayer submits RFID tags to an RD official.
- The RD official places RFID tags on a reader or put the tags within a reader, s reading range. In case there are no RFID tags, the system will begin with checking whether there are RFID tags or not, the reader will spin around and wait for RFID tags to come within its reading range.
- When RFID tags are placed on a reader or put within its reading range, the system will check whether RFID tags 'ID is in database, which is a verification of a taxpayer. ID is found, this indicates that there is an expression of need to use the system for tax installment payment. The system will start reading data on RFID tags and display them on the screen.
- If RFID tags' ID data are not found, it points out that the RFID tags are fake. The process will then start again until there are valid RFID tags coming in.
- In case of valid RFID tags, the system will read data on RFID tags and display them on screen. The data inform of taxpayer detail. The RD official then checks data accuracy. If they are found to be incorrect, they may be modified r updated.

3.8 Specification of RFID Tags

- MIFARE RF Interface (ISO 14443A)
- Contactless transmission of data and supply energy(no battery needed)
- Operating distance: Up to 100 mm (depending on antenna).
- Operating frequency 13.56 MHz
- High data integrity 16 bit CRC, parity, bit coding, bit counting
- True anti-collision
- EEPROM 4kbyte
- User definable access condition for each memory block
- Data retention of 10 years.

- Write endurance 100,000 cycles

3.9 Memory Management on RFID Tags

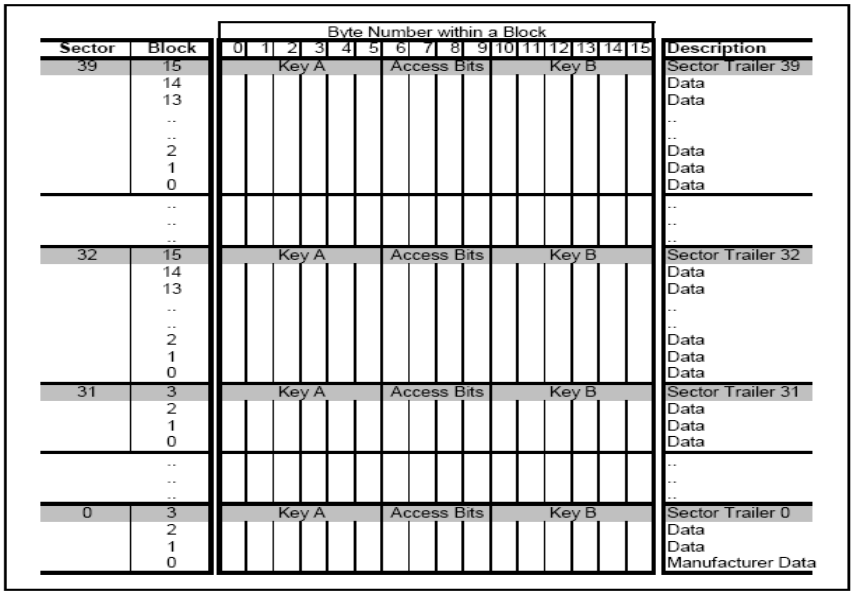


Figure 3.18 Memory Management on RFID Tags

The 4 kByte EEPROM memory is organized in 32 sectors with 4 blocks, and 8 sectors with 16 blocks. One consists of 16 bytes. EEPROM memory consists of 40 Sectors:

32 First sectors consists of 4 Blocks

8 Sector end first consists of 16 Blocks

1 Block consist of 16 bytes.

Total = (32 x 4 x 16) + (8 x 16 x 16) = 4,096 Bytes or 4 KBytes

This is the first data block (block 0) of the first sector(sector 0). It contains the IC manufacturer data. Due to security and system requirements this, block is write proteced after having been programmed by the IC manufacturer at production.

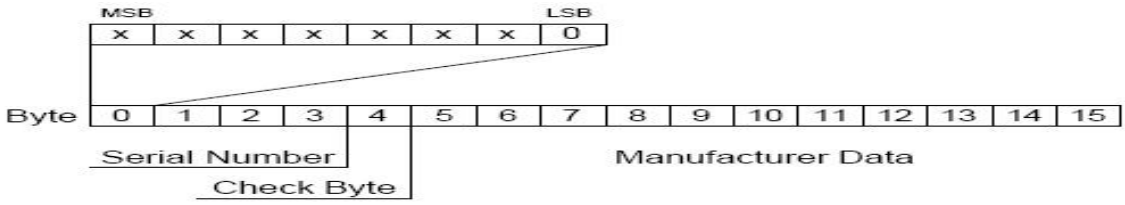


Figure 3.19 Data Memory on RFID Tags

3.10 Data Blocks

Sector 0..31 contain 3 blocks and sectors 32..39 contain 15 blocks for storing data.sector 0 contains only two data blocks and the read-only manufacturer block.

The data blocks can be configured by the access bits as

- Read/write blocks for e.g. contacless access control
- Value blocks for e.g. electronic purse application, where additional commands like increment and decrement for direct control of the stored value are provided

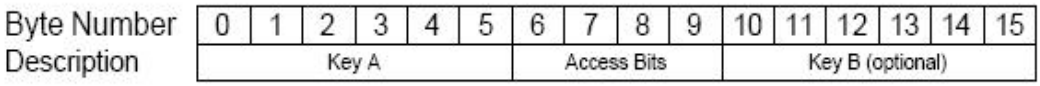


Figure 3.20 Working Blocks

3.11 Sector Trailer

Each sector has a sector trailer. Due to the memory configuration of the MIFARE, this sector trailer is located in block 3, each sector in the first two kByte of the NV-memory, respectively in block 15 of each sector in the upper 2 kByte of the 4 kByte Nv-memory.

Each sector trailer holds two things as follows:

- Sector keys A and B (optional) of the sector, which returns logical”0”s when read and
- The access conditions for all blocks of that sector, which are stored in 6..9. The access bits also specify the type (read/write or value) of the data blocks.

If key B is not needed, the last 6 bytes of the sector trailer can be used as the bytes. Byte 9 of the sector trailer is available for user data. For this byte apply the same access rights as for byte 6, 7 and 8.

Byte Number	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Description	Key A						Access Bits				Key B (optional)					

Figure 3.21 The Rear Which is Unusable

However, memory on tags has:

Sector 0 = 2 x 16 = 32 Bytes

Sector 1-31 = 31 x 3 x16 = 1488 Bytes

Sector 32-39 = 8 x 15 x16 = 1920 Bytes

Total 3440 Bytes

CHAPTER IV
IMPLEMENTATION

4.1 System Specification

The modeling of tax installment by radio frequency identification (RFID) needs the following minimum hardware and software requirements.

4.1.1 Hardware System

- Hardware requirements are:
  - Notebook HP Compaq Model nc6000
  - Intel Pentium M 1.7 GHz, 533 MHz FSB, 2 MB L2 cache)
  - 60 GB HDD
  - 512 MB DDR2
  - 14.1 WXGA wide TFT LCD
  - ATI MOBILITY RADEON 9700 Series
  - Combo Drive TSST corp CDW/DVD TS-L462A
  - 802.11b/g wireless LAN
  - Server Xseries226
  - Intel Xeon 3.0 GHz, 800 MHz FSB, 1 MB L2 cache)
  - 73.8 GB SCSI HDD
  - RAM 2 GHZ DDR2
  - ATI RADEON 7000-M video controller
  - CD ROM
- RFID Reader Model LA'OR-SR Series RS232 Specification

Figure 4.1 RFID Reader

- RFID 13.56MHz ISO14443 standard compliant reader
- Provide Reading range up to 100 mm.
- High data integrity 16 bit CRC, parity, bit coding, bit counting
- Simple RS232 interface for embedded and PC applications (converter RS232 to USB Cable & Driver optional)
- Complete package with sample tags, power supply, communication cable

- RFID Tags Specification Tags

Figure 4.2 Use RFID Tags

- MIFARE ISO1443 A
- Provide Reading ranges up to 100 mm.
- Read and Write
- Operating distance: Up to 100 mm (depending on antenna).
- Operating frequency 13.56 MHz

- High data integrity 16 bit CRC, parity, bit coding, bit counting
- Data retention of 10 years.
- Write endurance 100,000 cycles

- Cable RFID RS232

Figure 4.3 Serial Cable

Figure 4.3 Serial cable illustrates a port of serial cable connecting between a reader and a computer.

4.1.2 Software System

Software requirements are:

- Operation System
  - Microsoft Windows 2000
  - Microsoft Windows XP
  - Internet Explorer 5 or higher
- Software Tool Development
  - VB Script
  - PHP Language
  - IIS Web Server
  - Text editors Edit Plus 2

4.1.3 Database Specification Advantages of MySQL

- MySQL is database management system (DBMS) Database has a structure of data compilation. To add, access or process data stored in database, the database management system (DBMS) will have to be used. DBMS serves as a medium in dealing with data in database both for a specific job and supporting other applications' performance, which needs to use data in database. This is to gain much convenience for coping with a large amount of data. MySOL acts both as database it's self and DBMS.
- MySQL is relational DBMS relational database store all data in the format of table instead of a file only, the performance rapid and flexible. In addition, each table storing data can be linked, making it possible to compile or group the data as needed, using the SQL language, which is part of the MySQL program, which is a standard language for accessing database.
- MySQL is open source database all MySQL users can use or adjust it as needed and download the MySQL program from the internet, apart from using it without any expenses.
- Database used RDBMS that has chosen MySQL becase MySQL works on many different platforms—including AIX, BSDi, FreeBSD, HP-UX, GNU/Linux, Mac OS X, NetBSD, Novell NetWare, OpenBSD, OS/2 Warp, QNX, SGI IRIX, Solaris, SunOS, SCO OpenServer, SCO UnixWare, Tru64, Windows 95, Windows 98, Windows ME, Windows NT, Windows 2000, Windows XP and Windows Vista. A port of MySQL to OpenVMS is also available.
- MySQL performance is very swift and reliable to use and can be effectively used in combination with the PHP language because both MySQL and PHP are open sources.

4.2 User Interfaces

Interface for utility page. The system is developed using the HTML and PHP languages. User can retrieve it via the Microsoft Internet Explorer 5.0 or higher without any problems. Besides, the HTML language is web-application technology and so may be used on many computers simultaneously. Details of each interface of the modeling of installment by RFID system consist of the following.

4.2.1 Interface for Login.

4.2.2 Interface for tax amount calculation Validate.

4.2.3 Interface for data reading.

4.2.4 Interface for tax installment.

4.2.5

4.2.6 Interface for new user registration page.

4.2.1 Login Page

Before an access to the system, an RD official has to fill in username and password to verify his right to use it. For the modeling of tax installment by RFID system, a user can login at URL http://localhost/installment/login.php, as illustrated in figure 4.4.

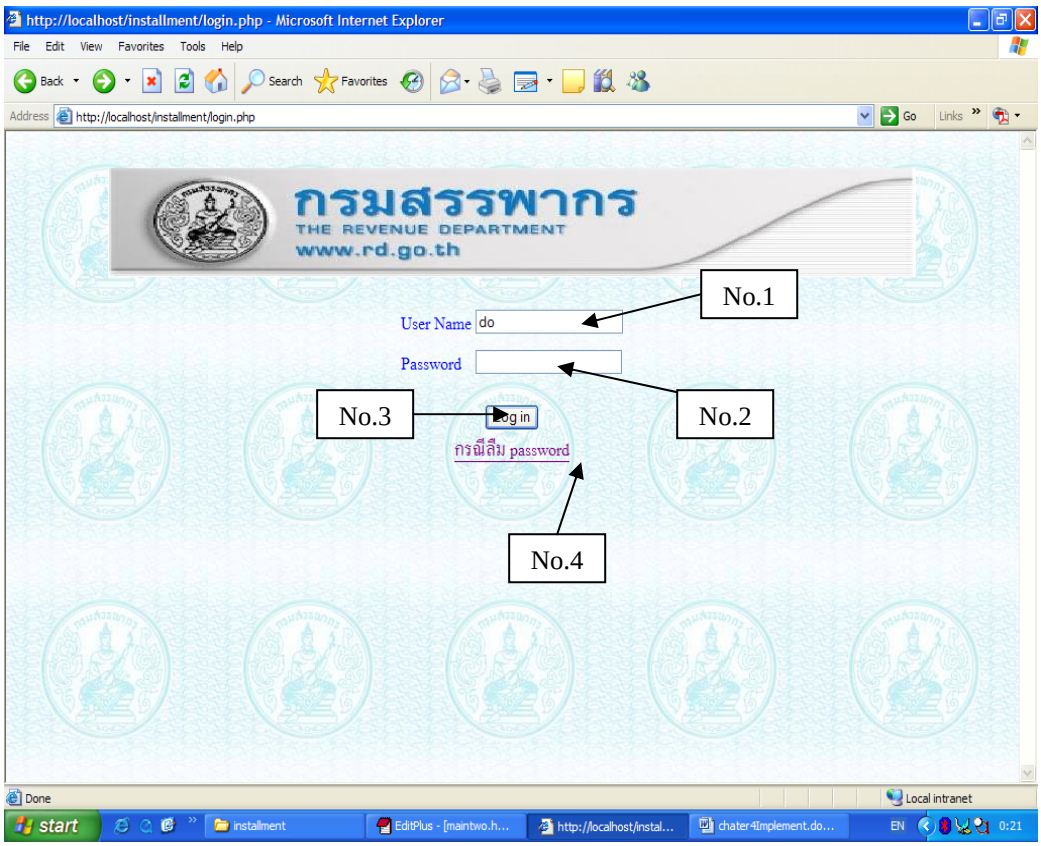


Figure 4.4 Login Page for RD Officials

Figure 4.4 reveals details of Login page consisting of the following:

- “No.1” is textbox for an RD official to fill in username to login into the system.
- “No.2” is textbox for an RD official to fill in password to login into the system.
- “No.3” is a bottom for sending what is filled to verify user name and password registered in the system.
- “No.4” is a bottom for use when the official forgets username and password.

The performance of this menu begins with verification whether an RD official who wants to access the system has registered with the system. If not, the system will display on screen that he is not entitled to access the system and thus has to contact the admin, as shown in figure 4.5.

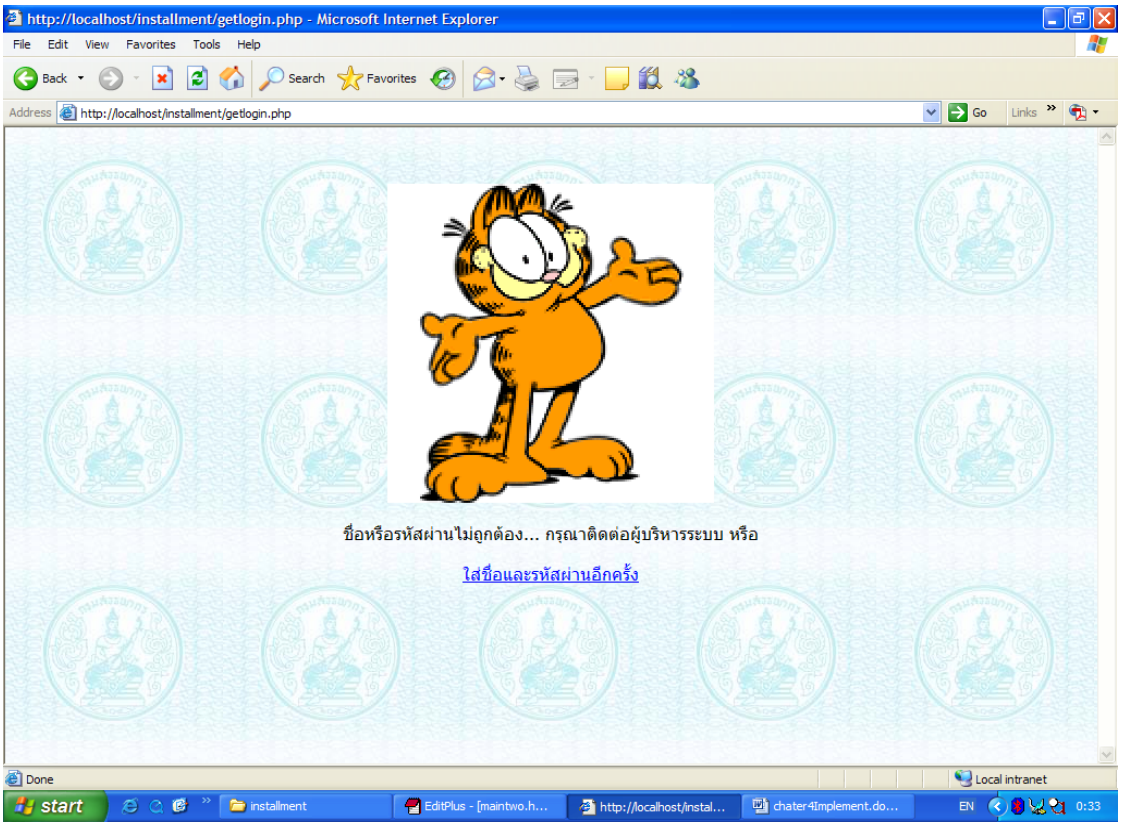


Figure 4.5 In Case RD Official is not entitled to Access System

Based on figure 4.5, if the RD official has not registered with the system or incorrectly fill in username or password, the system will notify the inability to access it and inform the official to contact the admin or try again. However, in case found to have registered, the official is entitled to access the system with 2 statuses, namely,

- **Admin** is entitled to oversee and use the entire system.

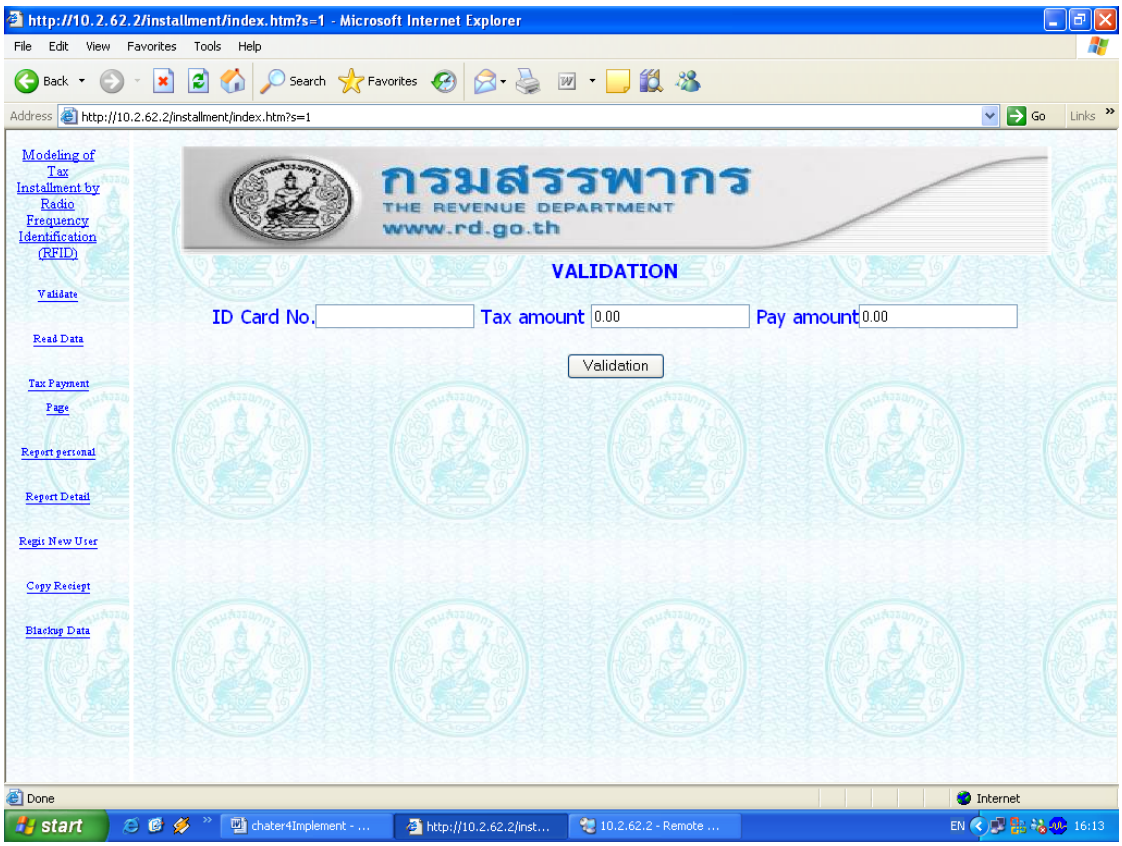


Figure 4.6 Interfaces for Admin

Based on figure 4.6 admin oversees the entire system. So he is entitled to access various menus and utilize the entire system.

- **Validate:** This menu serves to calculate tax amount. After a taxpayer expresses his desire to pay tax in 3 monthly installments, according to RD regulations, the system will calculate the tax amount divided into 3 installments based on the tax form submitted by the taxpayer.

- **Read Data:** This menu serves to verify whether taxpayer data on RFID tags are accurate. The data can be modified or updated.

- **Tax payment:** This is an initial stage of installment payment. When a taxpayer submits his RFID tags to an RD official, when will place it on a reader, the system will start to verify the RFID tags' ID which was recorded during the validation stage.

- **Report personal:** An RD official may access to view individual taxpayer data.

- **Report Detail:** An RD official may access to view daily or monthly report.

- **Register New User:** This menu serves to add users and define a right to access the system. In this regard, admin is entitled to oversee the entire system while a user can use menus concerning overall services to taxpayers. A new user may be added to the system.

- **User:** Is entitled to access the system corresponding with what is defined by admin only.

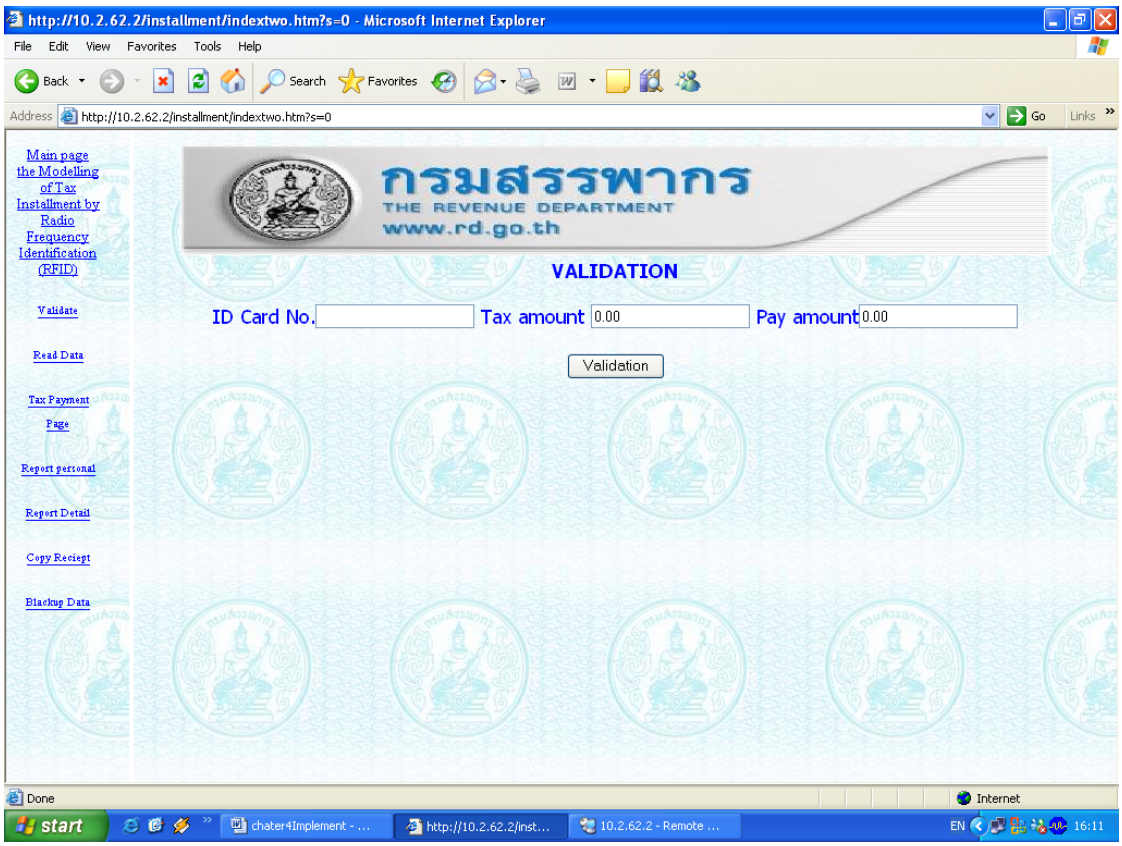


Figure 4.7 System's Main Page

Based on figure 4.7, users are entitled to use the system as follows:

- **Validate:** This menu serves to calculate tax amount. After a taxpayer expresses his desire to pay tax in 3 monthly installments, according to RD regulations, the system will calculate the tax amount divided into 3 installments based on the tax form submitted by the taxpayer.

- **Read Data:** This menu serves to verify whether taxpayer data on RFID tags are accurate. The data can be modified or updated.

- **Tax Payment:** This is an initial stage of installment payment. When a taxpayer submits his RFID tags to an RD official, when will place it on a reader, the system will start to verify the RFID tags' ID which was recorded during the validation stage.

- **Report Personal:** An RD official may access to view individual taxpayer data.

- **Report Detail:** An RD official may access to view daily or monthly report.

4.2.2 Validate Page

This menu serves to calculate tax amount when a taxpayer submits a tax form for installment payment to an RD official.

- The process starts when a taxpayer expresses his desire to pay tax in 3 monthly installments, each equal in the amount. An RD official will calculate the amount based on the form submitted, using taxpayer's ID card number.
- Later, tax calculation data are record for each installment in database along with the dates of payment of installments 2 and 3.
- The system will retrieve taxpayer data that RD has in database and display them on screen for the RD official to verify once again. Afterwards, the data are written on RFID tags.
- The RD official returns RFID tags to the taxpayer so that the latter will use them for next installment payment. However, he has also to submit the RFID tags to an RD official for verification.

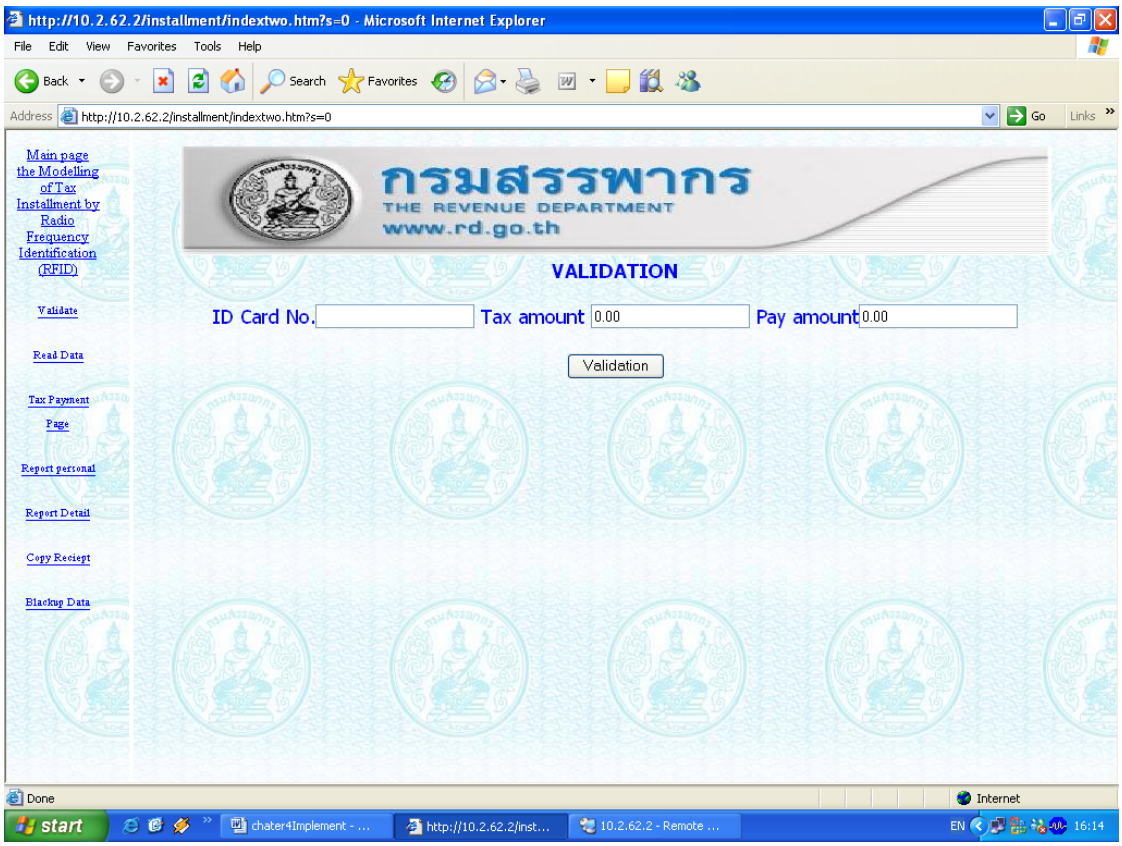


Figure 4.8 Tax Calculations and Main Page

Based on figure 4.8, an RD official is requested by a taxpayer to pay tax in 3 monthly installments. The official is entitled to access the system and main page is displayed. The system will define validation as the first interface.

Figure 4.9 Tax Validation

Based on figure 4.9, an RD official is entitled to access the system for tax validation (money calculation). He fills in a taxpayer's ID card No. currently, RD requires that one's ID card No. is used instead of taxpayer's ID No.

- "No.1" is textbox for an RD official to fill in a taxpayer's ID card no.
- "No.2" is textbox for an RD official to fill in tax amount.
- "No.3" is textbox for an RD official to fill in tax amount to be paid for the first installment.
- "No.4" is a button to click for validation (tax amount calculation).

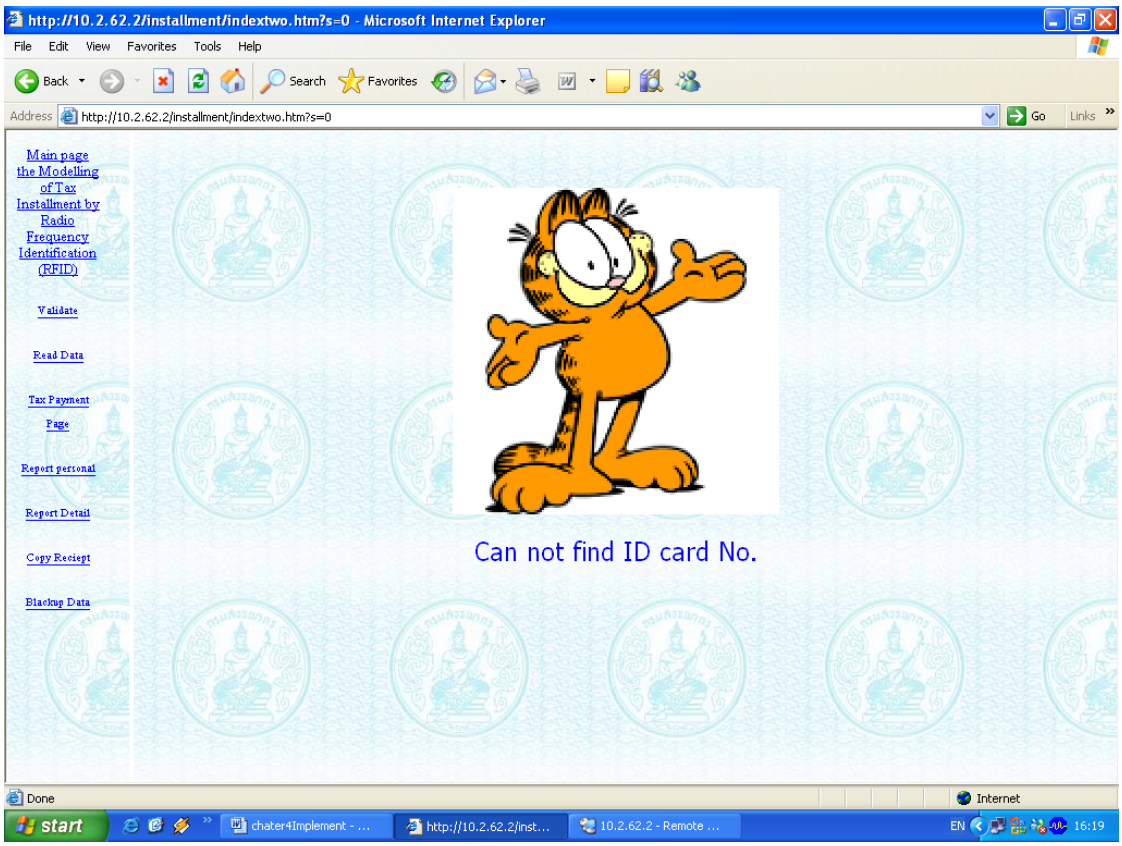


Figure 4.10 In Case no Data on Taxpayer's ID card no. are found in the System

Based on figure 4.10, in case a taxpayer's ID card no. is filled in but it is not found in RD database, the system will report that a further transaction can not proceed and so has to contact the admin for a registration to access the RD system.

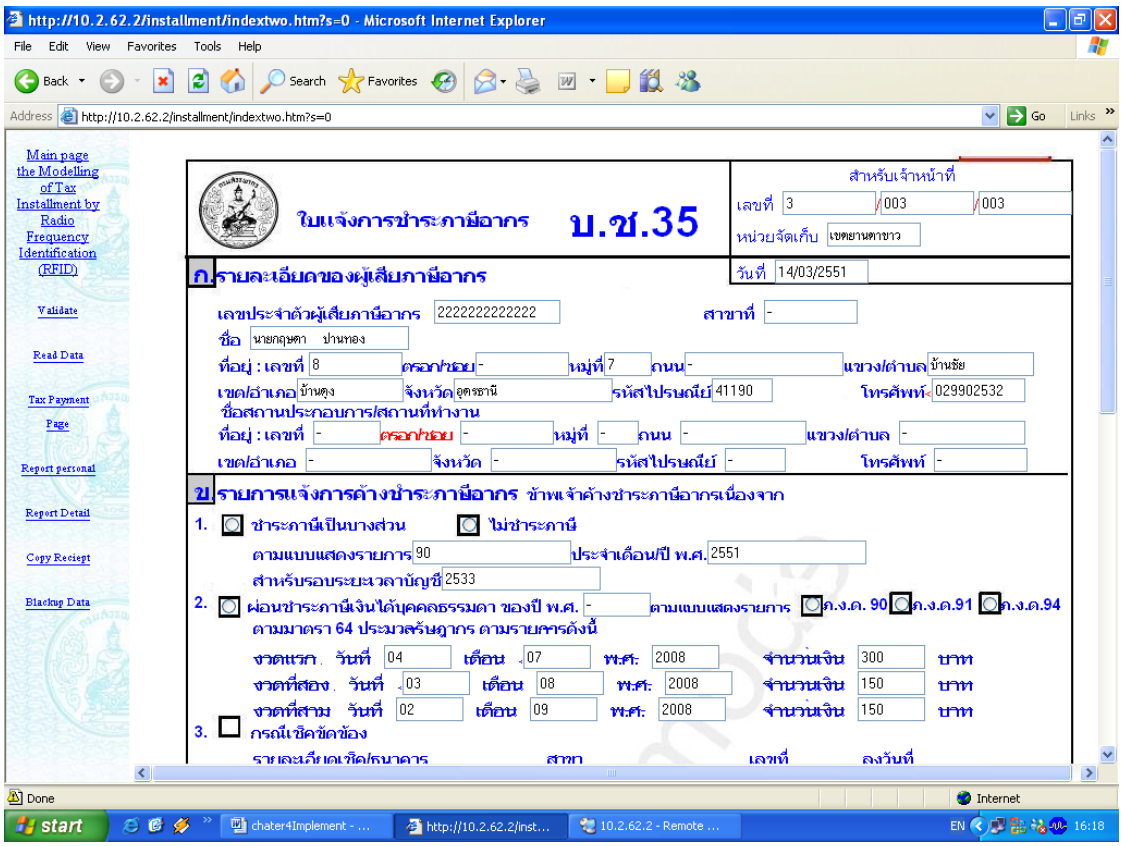


Figure 4.11 The System Found Taxpayer Data

Based on figure 4.11, an RD official fills in a taxpayer's ID card no. 'Validate' button. The system will verify the ID card No. in RD database. If data are found, the system will display all taxpayer data and date/month/year when each installment has to be paid.

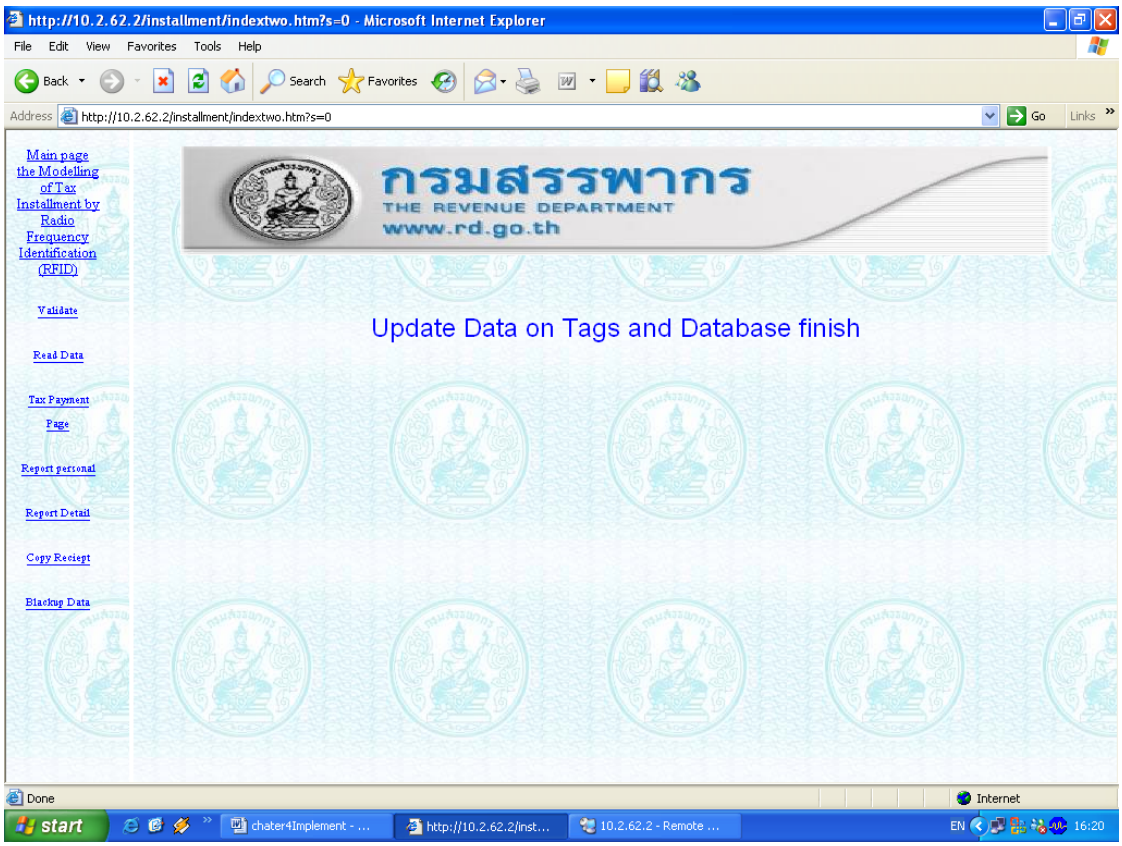


Figure 4.12 Update Data on RFID Tags and in Database

Based on figure 4.12 when the system displays tax amount calculation data and verify if once more, then he clicks on ‘write’ button and places RFID tags on a reader or within its reading range. The system will update all data displayed on screen on RFID tags and in RD database simultaneously.

4.2.3 Read Data Page

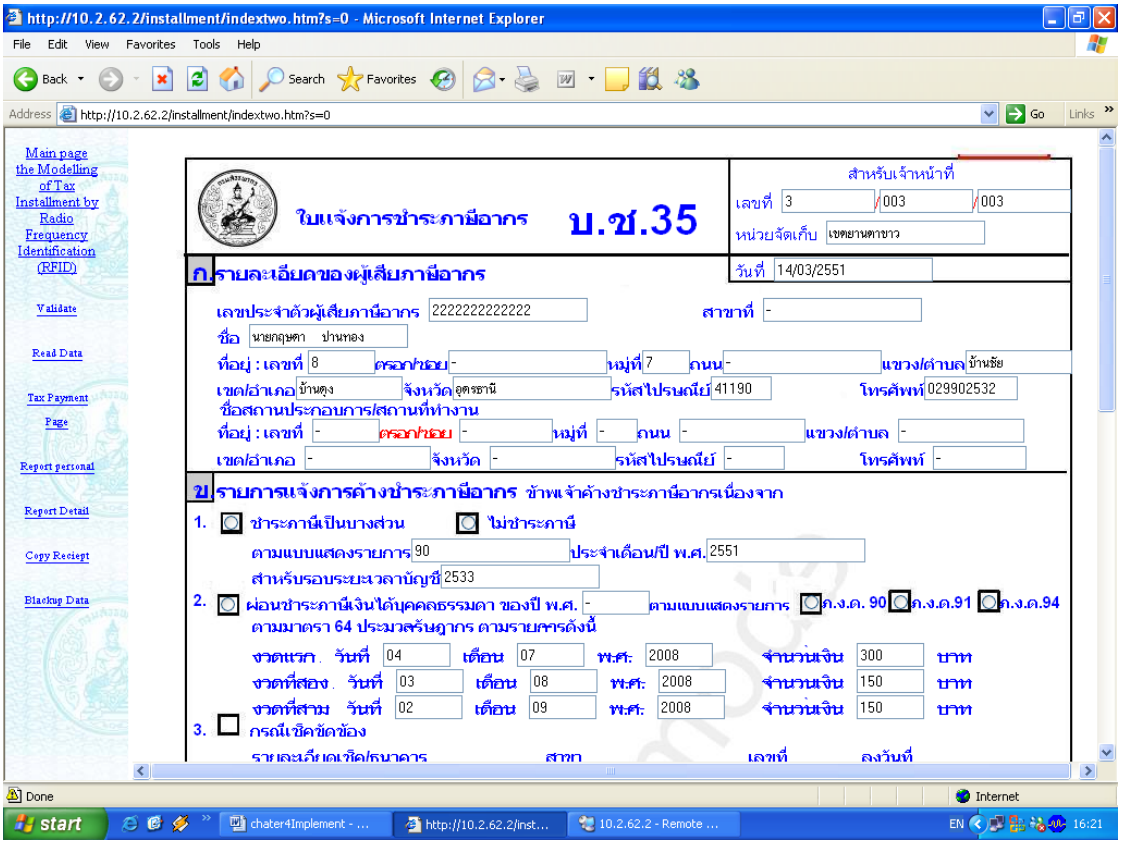


Figure 4.13 Read Data on RFID Tags

Based on Figure 4.13, reading data on RFID tags (Read Data Page) is displayed. An RD official receives RFID tags from a taxpayer and places them on a reader or put them within its reading range. The system will verify RFID tags' ID and if it is found in the system, data will be displayed on screen for verification. Data updating or modification may be done in this stage.

4.2.4 Tax Payment Page

It is a stage of tax installment payment. The system will check whether there are RFID tags. If not, it will wait until RFID tags come and then verify whether RFID tags 'ID is in database, which is a verification of a taxpayer as well. If the ID is found, the system will begin reading data on RFID tags and display them on screen. If data are not found in database, the process will start again until there are RFID tags

coming in. when the taxpayer submit his RFID tags to be RD official, who will place then on a reader, the system will commence to verify RFID tags' ID, which is recorded during a validation stage. If it is invalid, the official cannot view taxpayer data. But if it is valid, the system will retrieve data on RFID tags and display them on screen. The official will update data for each installment payment while recording them on the RFID tags and in database. A receipt is also issued for the taxpayer. The afore-mentioned stages are as follows:

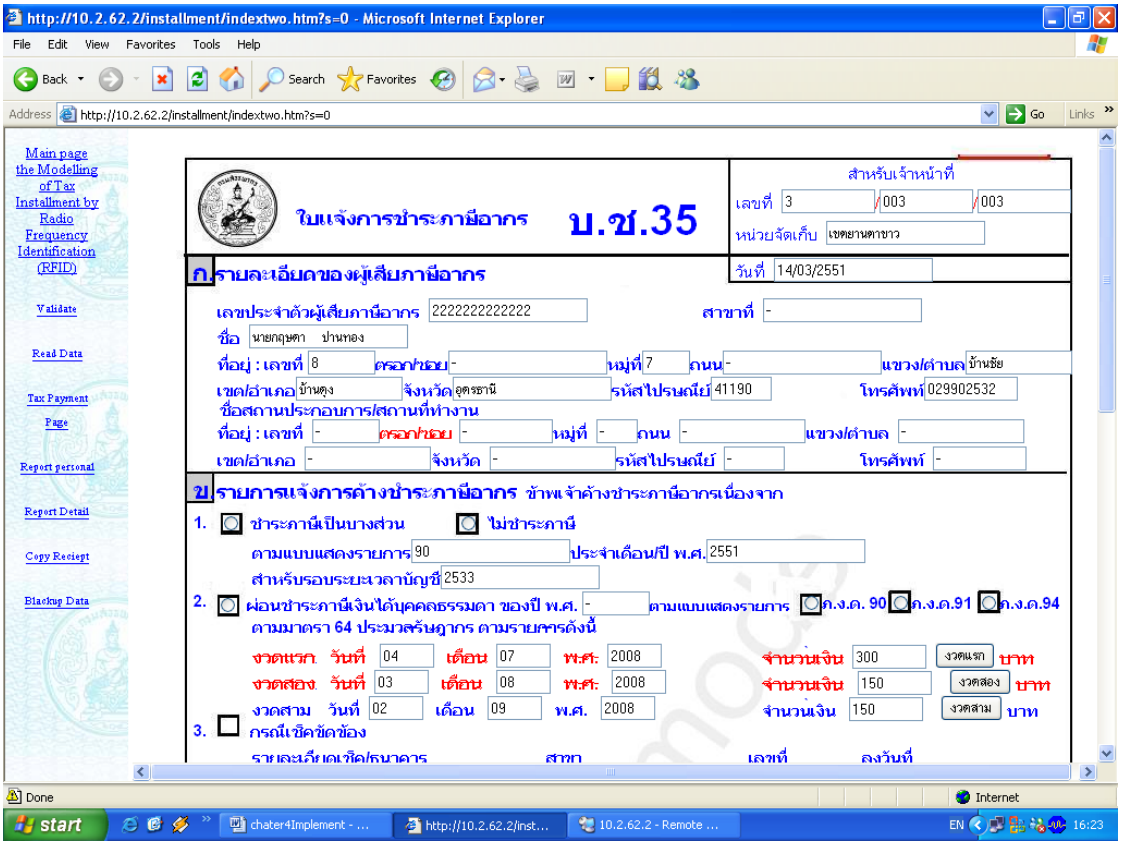


Figure 4.14 Installment 2 Payments

Based on figure 4.14, installment 2 is paid since installment 1 has been paid along with a tax form submission.

- To pay installment 2, a taxpayer submits his RFID tags to an RD official, who will place them on a reader. Installment 2 data are displayed on screen. The RD official clicks on 'Installment 2' and issues a receipt for the taxpayer while returning the RFID tags to him.

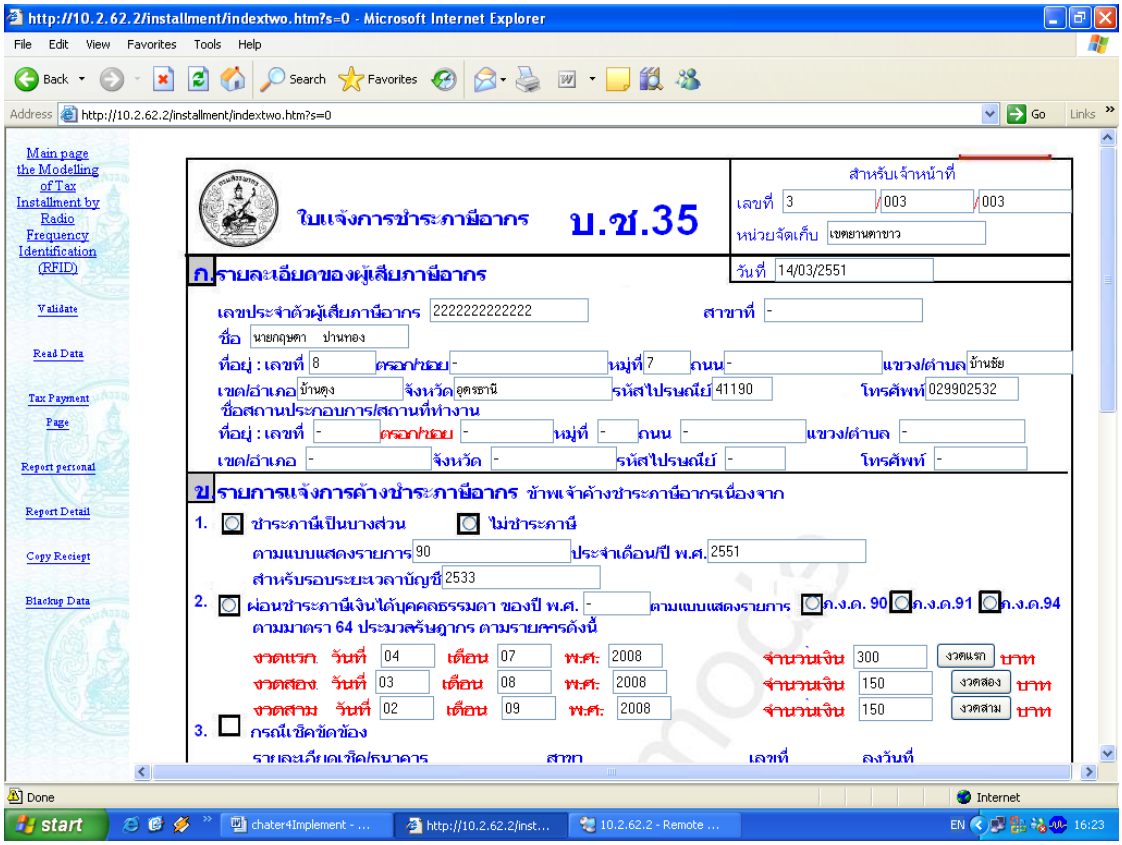


Figure 4.15 Installment 3 Payments

Figure 4.15 reveals a payment of installment 3. A taxpayer submits his RFID tags to an RD official, who will place them on a reader. Installment 3 data will be displayed on screen and the RD official clicks on ‘Installment 3’ as well as issues a receipt and keeps RFID tags to give them to other taxpayers later.

4.2.5 Utility Page consists of 2 subsystems:

4.2.5.1 Receipt Page

For each installment payment, the system will issue a receipt for a taxpayer while updating data in database. In case a spare receipt is needed, it is always available.

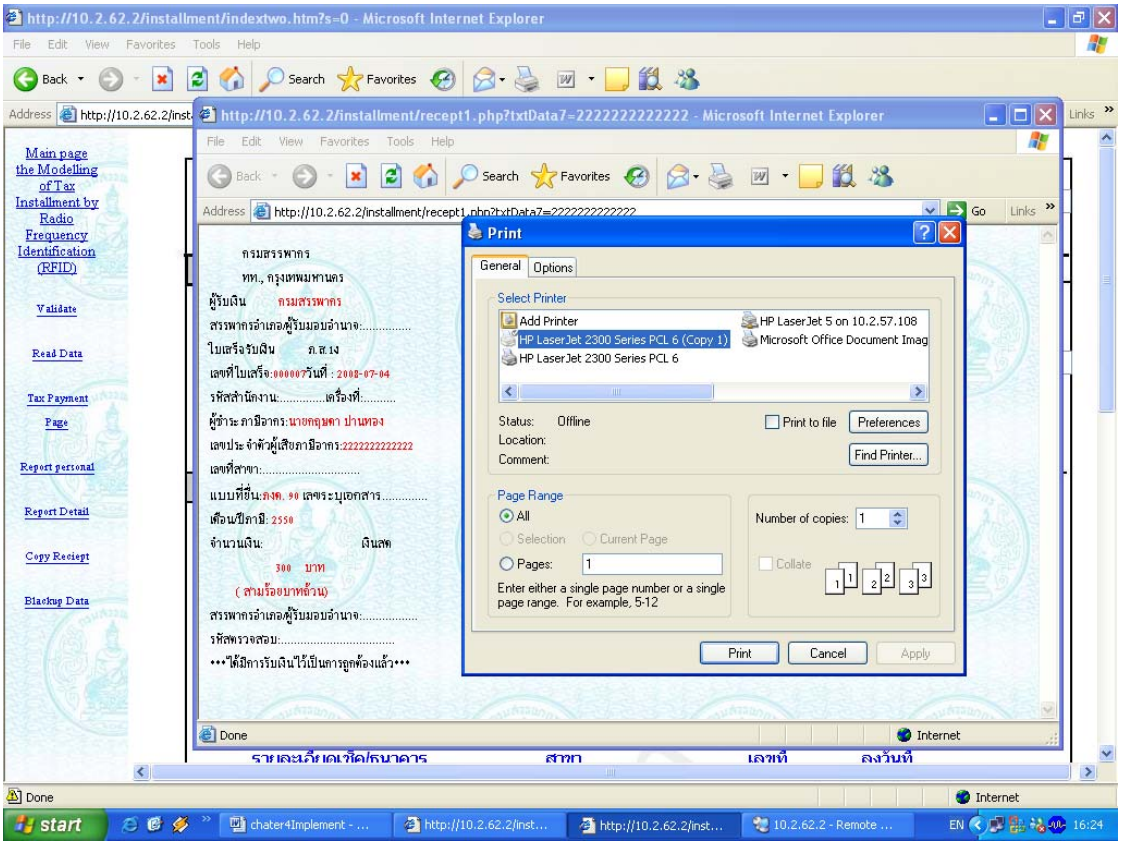


Figure 4.16 Receipts for Installment 1

Figure 4.16 shows an issuance of a receipt for a taxpayer who pays installment 1. The receipt also has a number on it to make it easy for a subsequent verification. Data on each receipt will be stored in database on every transaction for later checking.

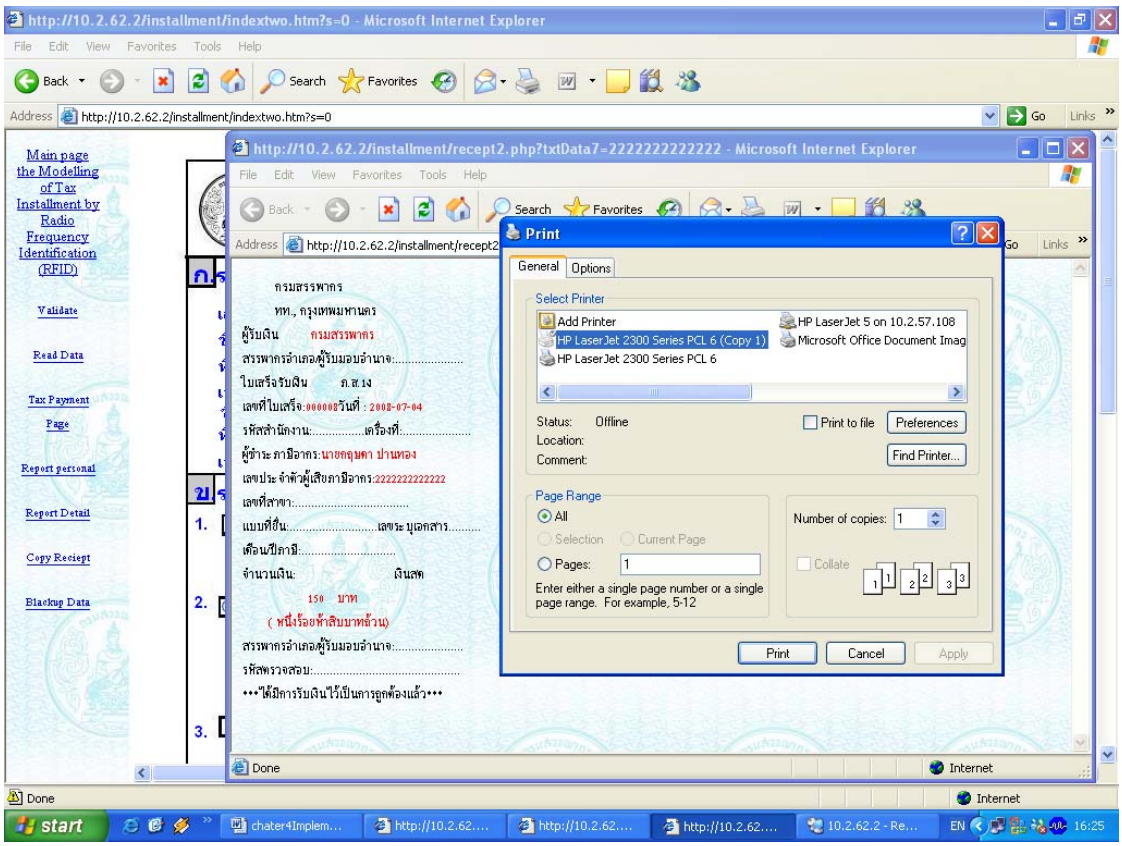


Figure 4.17 Receipts for Installment 2

Figure 4.17 reveals an issuance of a receipt for a taxpayer who pays installment 2. The receipt also has a number on it to make it easy for a subsequent verification. Data on each receipt will be stored in database on every transaction for later checking.

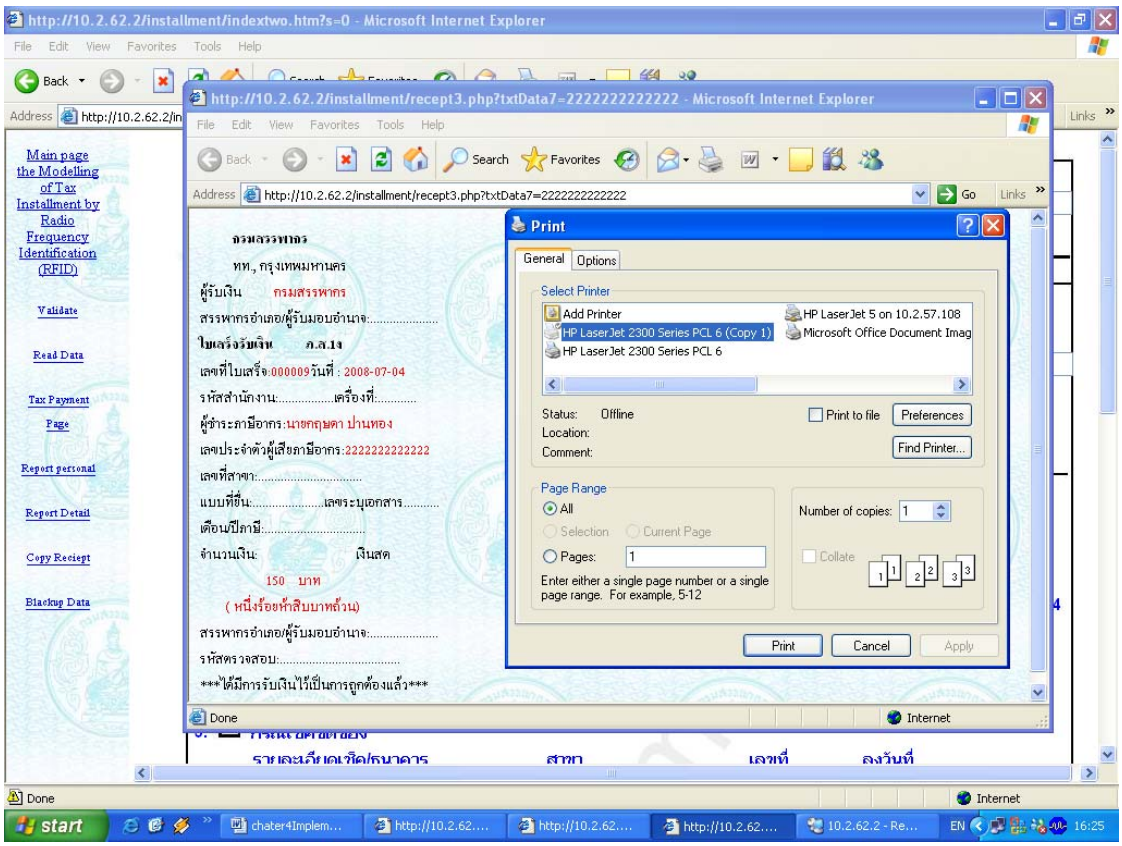


Figure 4.18 Receipts for Installment 3

Figure 4.18 reveals an issuance of a receipt for a taxpayer who pays installment 3. The receipt also has a number on it to make it easy for a subsequent verification. Data on each receipt will be stored in database on every transaction for later checking. After a taxpayer has paid installment 3, RD official will keep his RFID tags in order to be used for other taxpayers later.

4.2.5.2 Report Page

- **Personal Report:** The system will display data on individual taxpayers.

Figure 4.19 Interfaces for Individual Taxpayer Report Search

Figure 4.19 display a report. An RD official can view individual taxpayer data by filling in taxpayer's ID card No. and retrieving data. The system will search for the needed.

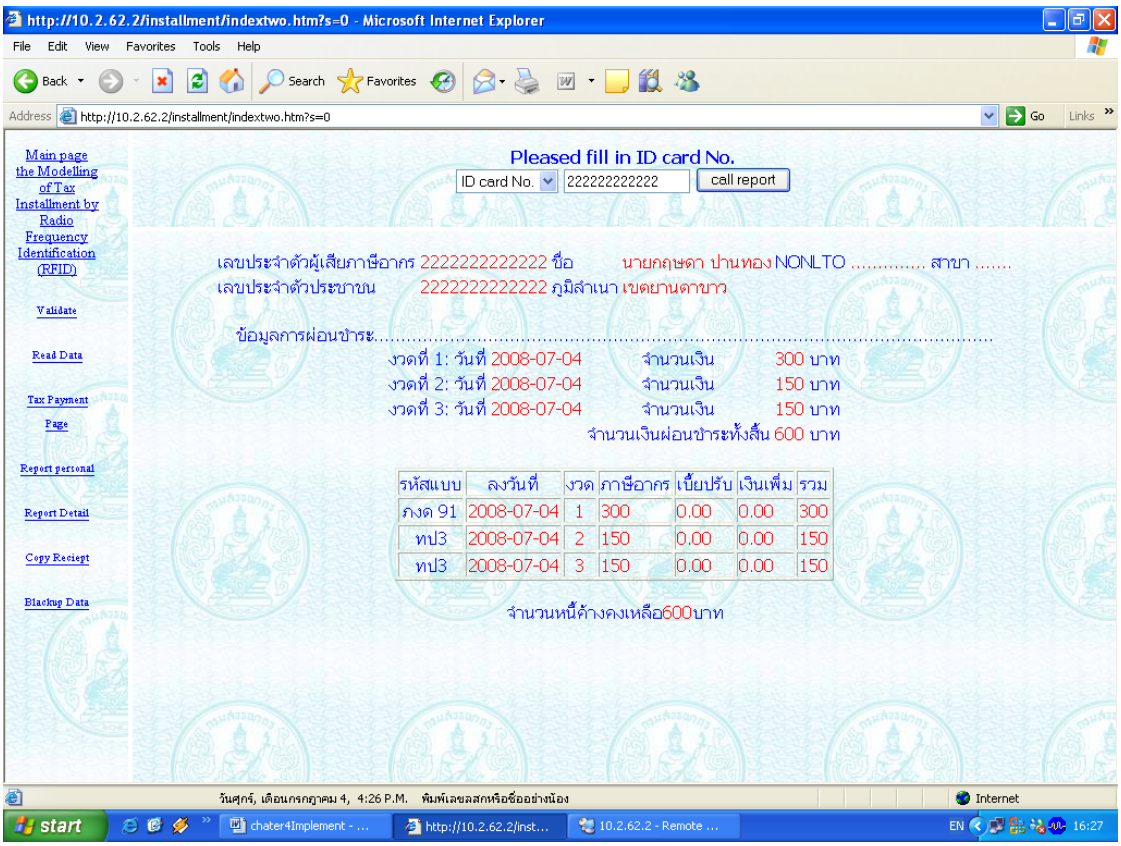


Figure 4.20 Individual Taxpayer Report Result

Based on Figure 4.20, when an RD official retrieves to view data after having filled in each taxpayer's ID card No., tax payment data will be reported in terms of payment type, dates of payment of installment 1 through 3, tax amount paid for each installment, a fine, and total sum of tax amount.

4.2.5.3 Payment Period Report: The system will report data on each payment period.

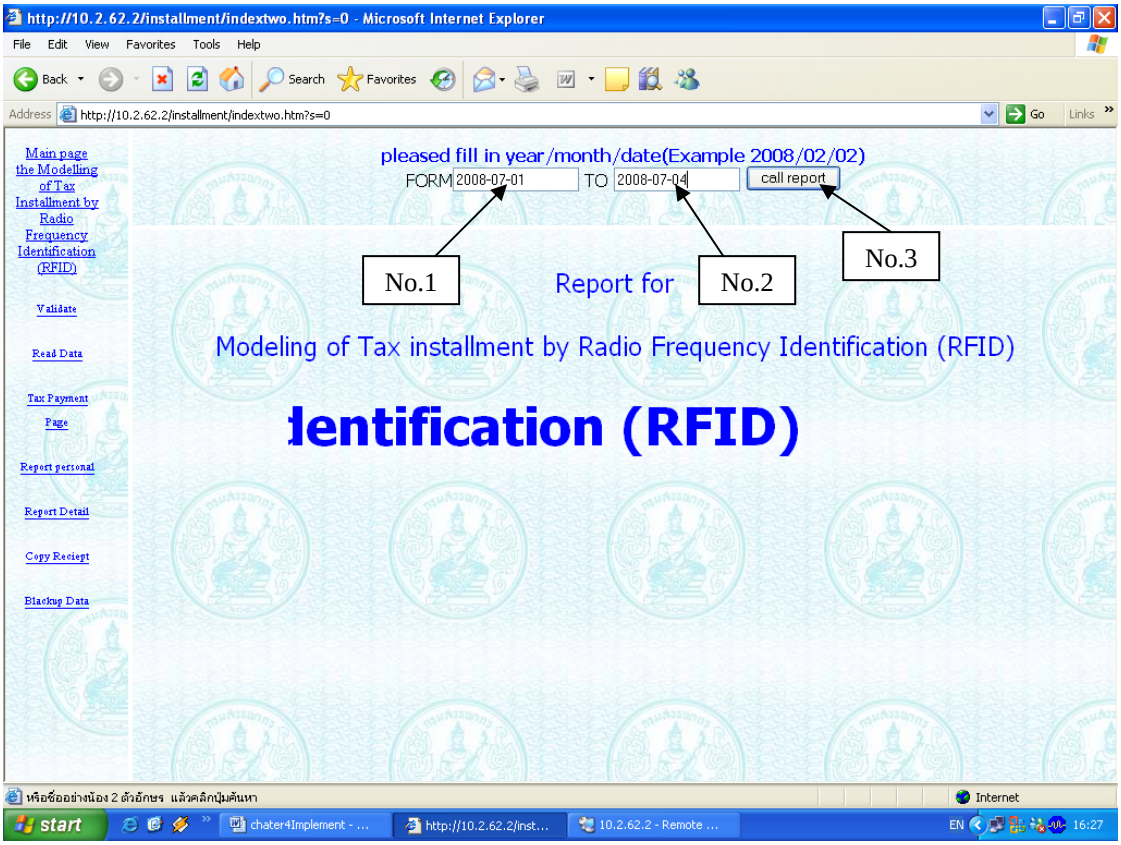


Figure 4.21 Interface for Tax Payment Period Report

Based on Figure 4.21, apart from individual taxpayer data report an RD official may view tax payment period report as well.

- "No.1" is textbox for an RD official to fill in data on start data of payment.
- "No.2" is textbox for an RD official to fill in data on end date of payment.
- "No.3" is a button for sending what is filled in to search for data based on the time defined.

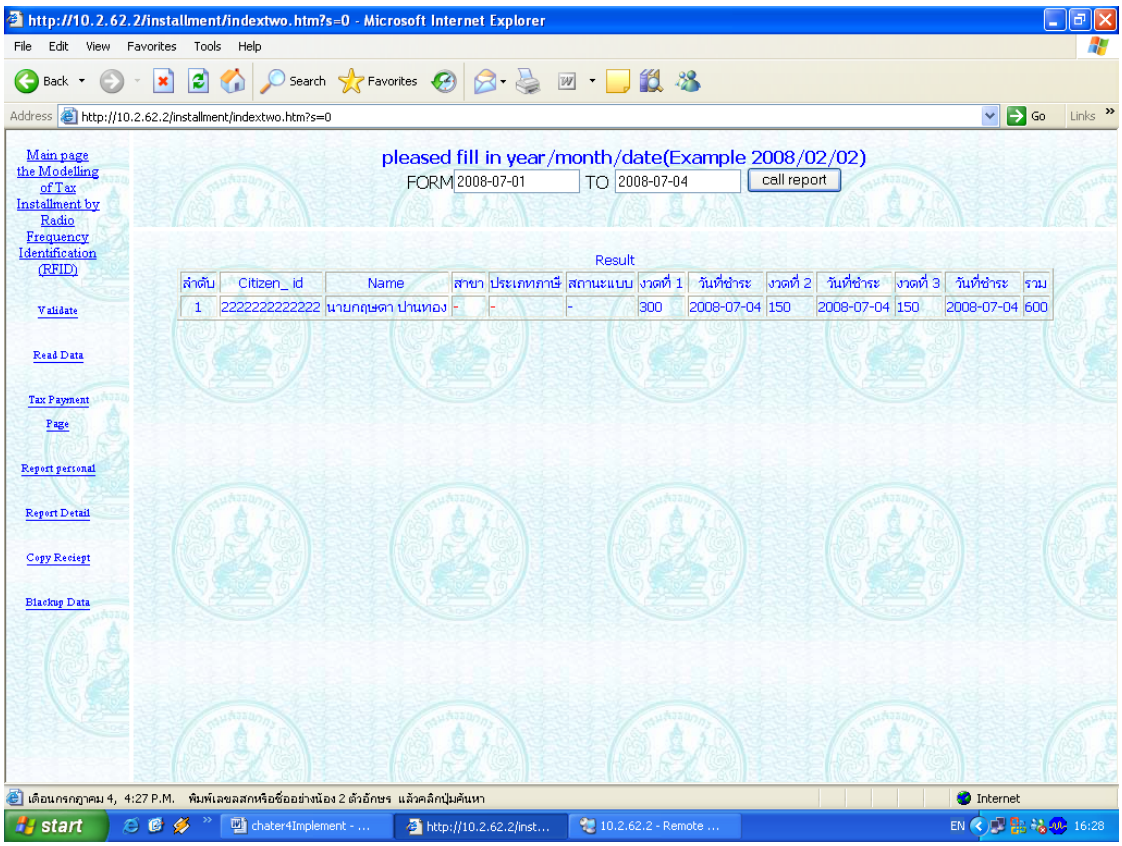


Figure 4.22 Period-Chosen Report Consequence

Figure 4.22 reveals an outcome of a period-chosen report, for example, beginning from 2008-03-03 to 2008-03-04. A report displayed indicates start time and end (due) time of tax installment payment. In addition the date/month/year of payment can be revealed as needed.

4.2.6 Register New User Page

The system will entitle a user to access it in case he is registered and the permission is defined for him. The person who may define this right has to be an admin only.

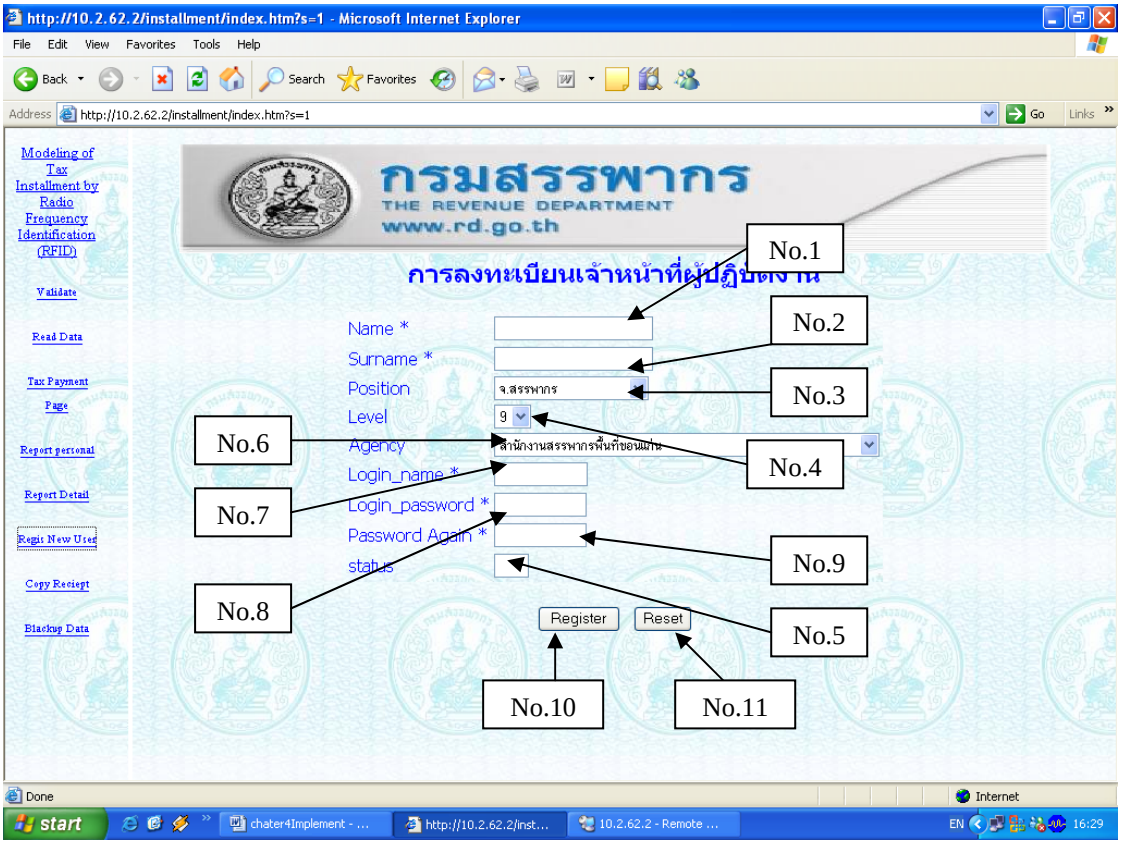


Figure 4.23 User Data Addition by Administrator

Figure 4.23 shows an interface for user data addition. Details are listed below.

- “No.1” is textbox for admin to fill in name.
- “No.2” is textbox for admin to fill in surname.
- “No.3” is textbox for admin to fill in position.
- “No.4” is textbox for admin to fill in level.
- “No.5” is textbox for admin to fill in agency.
- “No.6” is textbox for admin to fill in user name.

- “No.7” is textbox for admin to fill in password.
- “No.8” is textbox for admin to fill in admin to confirm use of system.
- “No.9” is textbox for admin to fill in use status. If 1, means an admin, who will oversee the entire system. If 0, it means a user, who is entitled to use the system as defined by an admin.
- “No.10” is a button to record data in system database for registration.
- “No.11” is a ‘Reset’ button for deleting all items.

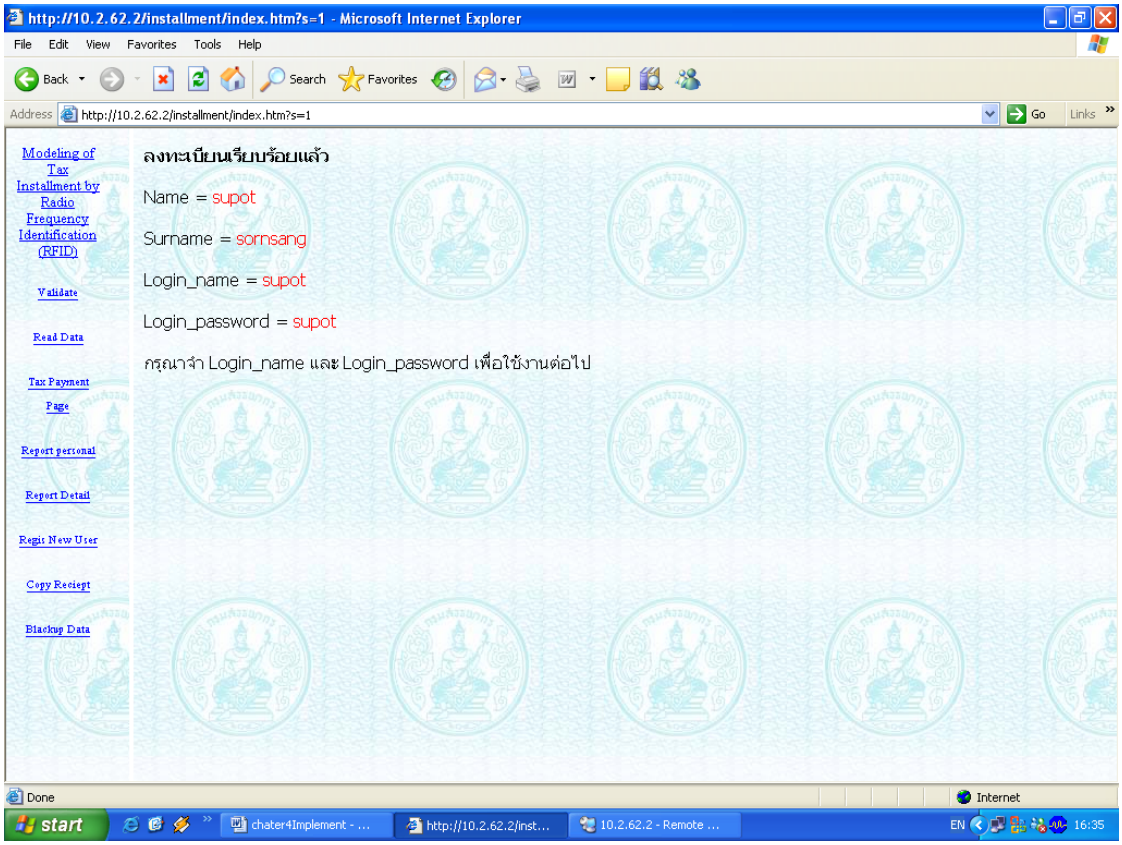


Figure 4.24 Consequence of User Data Addition

Based on figure 4.24, after on admin has already filled in data, he will click on ‘Register’ button. Details of registration are then displayed on screen. Login name and password should be kept for an access to the system.

CHAPTER V
EXPERIMENTAL AND RESULTS

5.1 The Objectives of the Experiments

The main objectives of the experiments are listed as follows:

- To study the feasibility of the RFID concept proposed in previous chapter.
- To demonstrate the capability of modeling of tax installment by RFID.
- To assess/evaluate the performance of modeling of tax installment by RFID.

5.2 Experimental Environment

The computer hardware and software used for the experiments have the following specifications:

Processor	:	Intel Pentium M 1.70 GHz.
Memory	:	512 MB.
Hard Disk Drive	:	60 GB.
Operating System	:	Windows XP.
Developing Tools	:	Edit plus, PHP
Database Tools	:	MySQL

We chose to develop the prototype on HTML, PHP, and VB Script languages because it is one of the best software's for application development environment for MS Windows.

The functionality test aims to check whether the system can properly perform in accordance with the major functions. The functionality test focuses on six main processes: Login, Validate, Read Data, Tax Payment, Print Receipt and Print Report.

5.3 Unit Test

It is a function-by-function test to make known that the system can perform as needed. If there is an error, it may be corrected, starting with the following.

5.3.1 Login Test

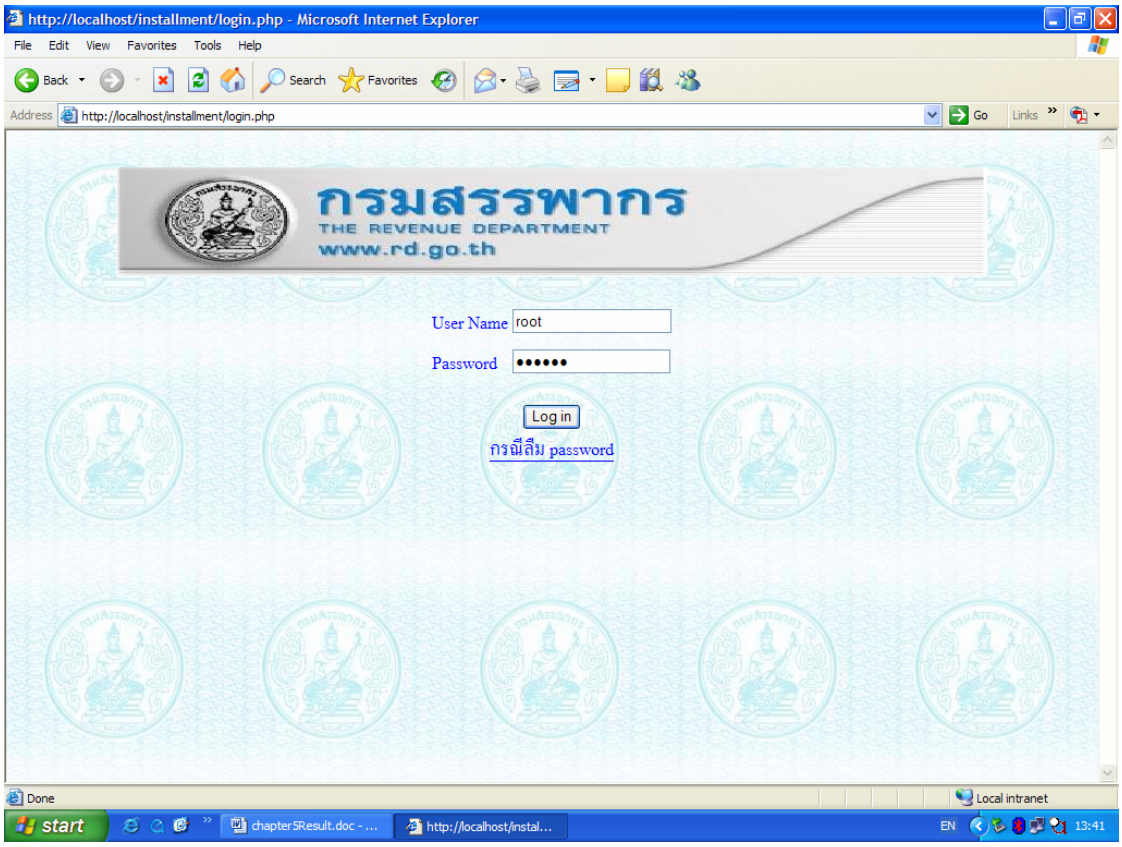


Figure 5.1 Test of Filling in User Name and Password of Administrator

Figure 5.1 reveals a test of filling in user name as root and password as root id. This name has already registered with the system and is defined as an Admin. When he login, he will be entitled to use the entire system, as revealed in figure 5.2.

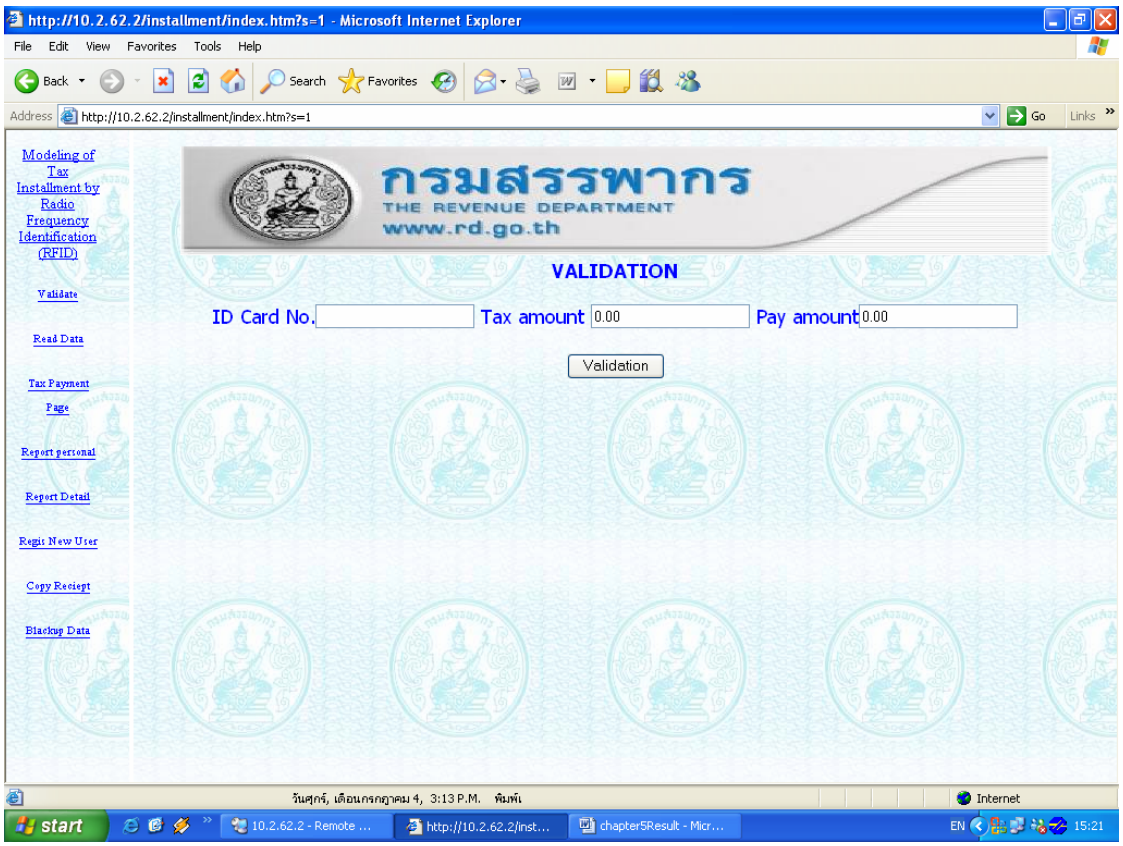


Figure 5.2 Login into the System Using Admin's Right

Based on figure 5.2, after an access to the system based on an Admin's right, the following menses can be used.

- Validate: Tax amount calculation before data are recorded on RFID tags.
- Read Data: Retrieve data in order to view or verity them.
- Tax payment Page: Record each tax installment payment.
- Personal Report: display individual taxpayer report.
- Detail Report: display a payment period report based on conditions defined.
- Regis New User: Add new user data and define his right.

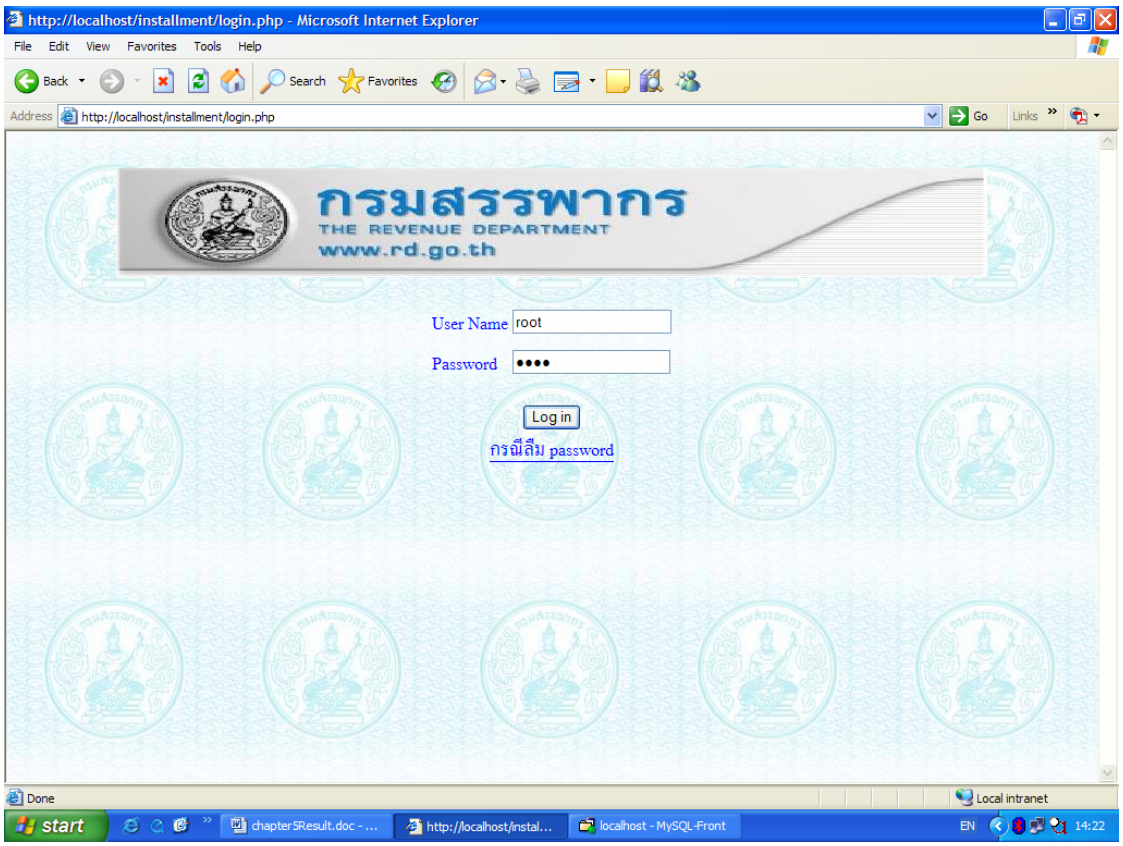


Figure 5.3 Test of Filling in User Name and Password of User

Figure 5.3 illustrates a test of filling in user name as root, and password as root id. This name has already registered with the system and is defined as a user. When he login, he will be entitled to use only part of the system, as defined by the Admin, as demonstrated in figure 5.4.

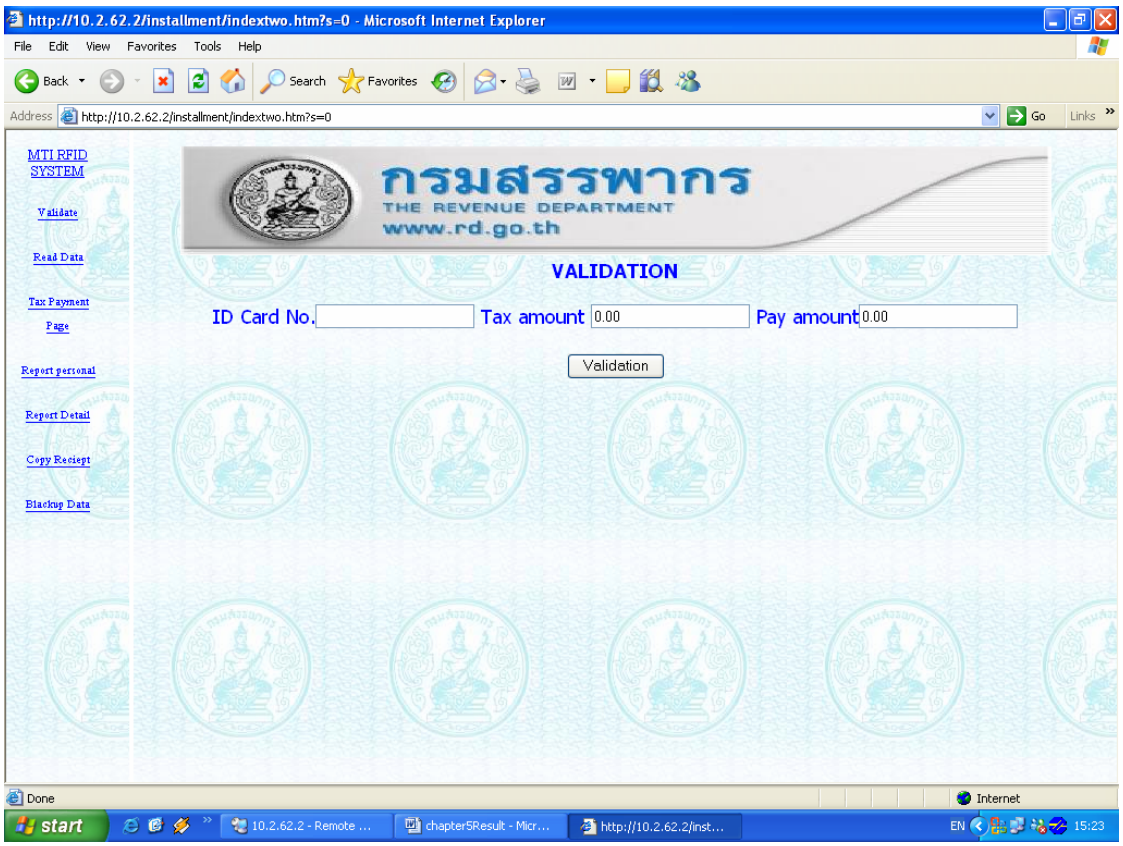


Figure 5.4 Login into the System Using User's Right

Based on figure 5.4, after an access to the system based on user's right, the following menus may be utilized.

- Validate: Tax amount calculation before data are recorded on RFID tags.
- Read Data: Retrieve data in order to view or verity them.
- Tax payment Page: Record each tax installment payment.
- Personal Report: display individual taxpayer report.
- Detail Report: display a payment period report based on conditions defined.

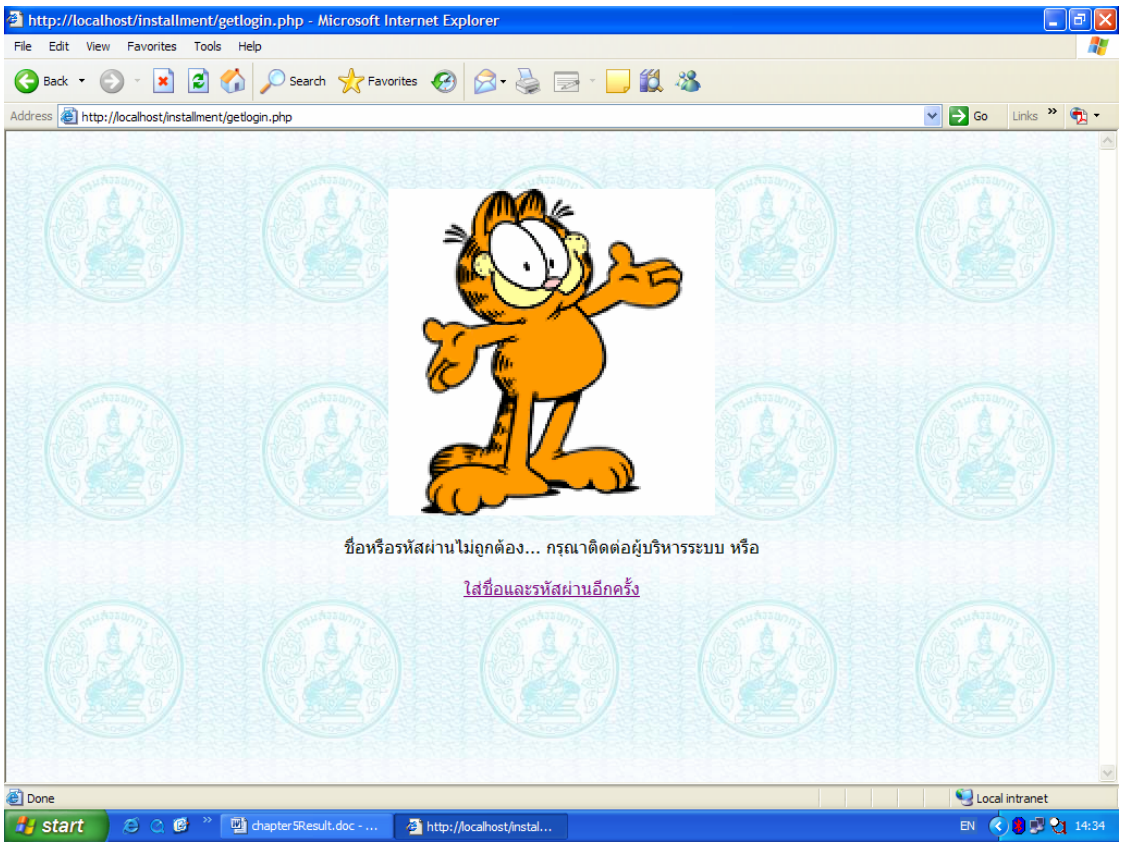


Figure 5.5 Case of No Registration for System Access

Figure 5.5 illustrates a test of filling in user name as root and password as root id. This system has not yet registered with the system. The system will suggest him to contact the admin and fill in user name and password once again.

5.3.2 Validate Test

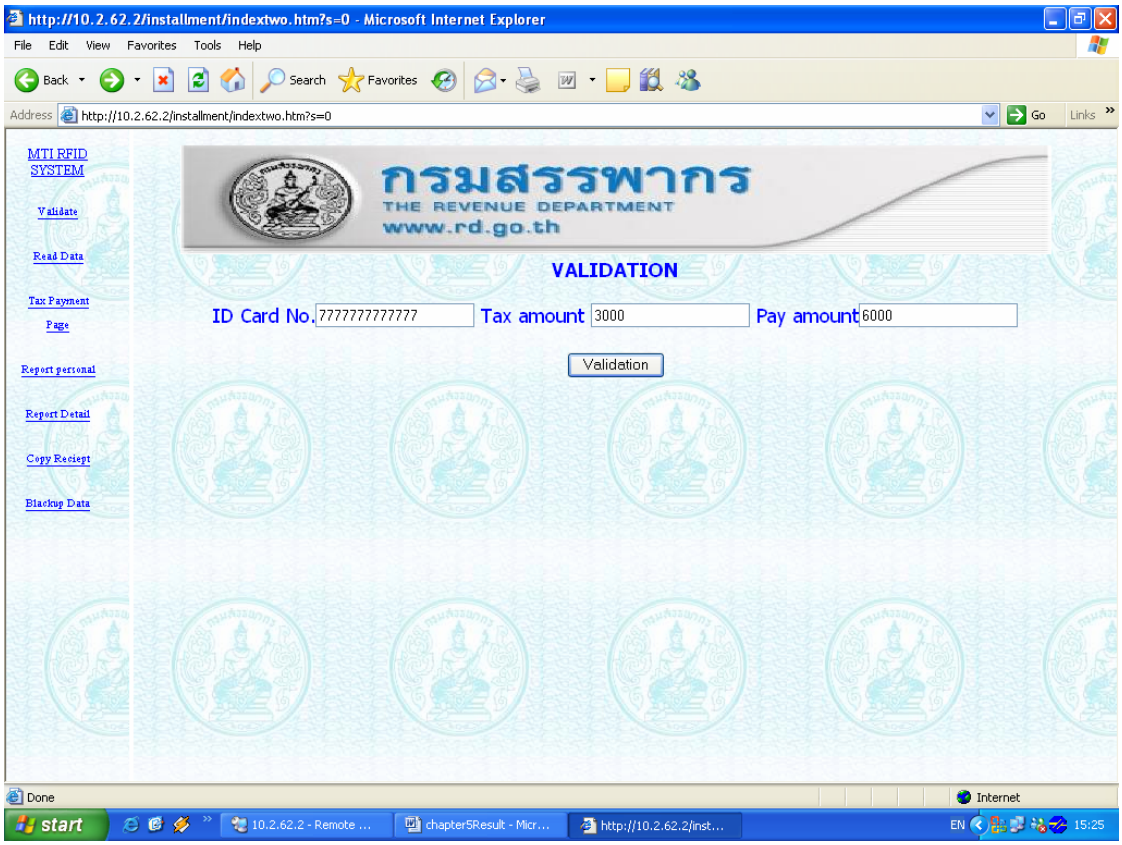


Figure 5.6 Test of Validation

Figure 5.6 reveals a validation test, with the following detail.

- Test of filing in a taxpayer's ID card no. In the ID textbox to verify whether it is in the system.
- Test of filling in all tax amounts that has to be paid (in the tax textbox).
- Test of filling in tax amount to be paid for the first installment, including a tax form.
- Test of clicking on 'Validate' button.

After testing based on the above stages, the consequence will appear as seen in figure 5.7.

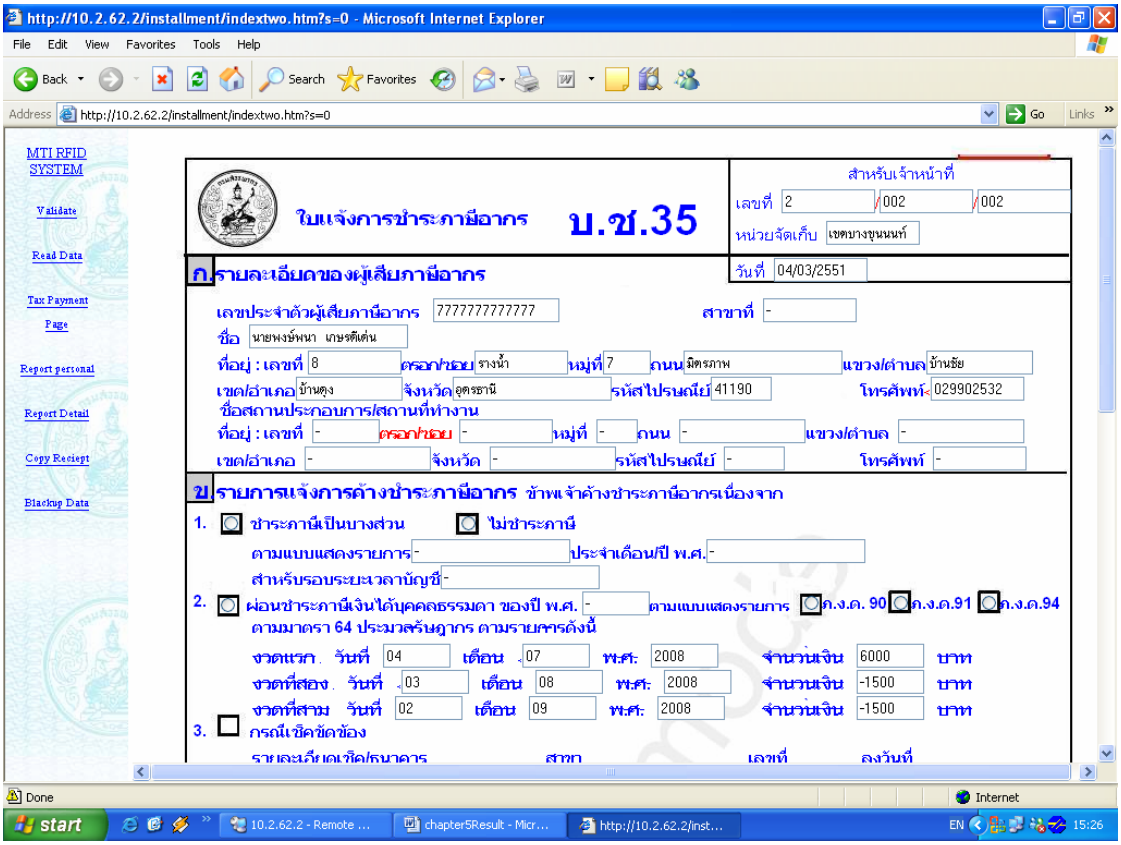


Figure 5.7 Result of Tax Validation

Figure 5.7 reveals the result of tax validation. The system will verify a taxpayer based on his ID card no. if it is in database, the system will display the taxpayer data while recording the data in database. Afterwards, there is a test of writing displayed data on RFID tags, as illustrated in figure 5.8.

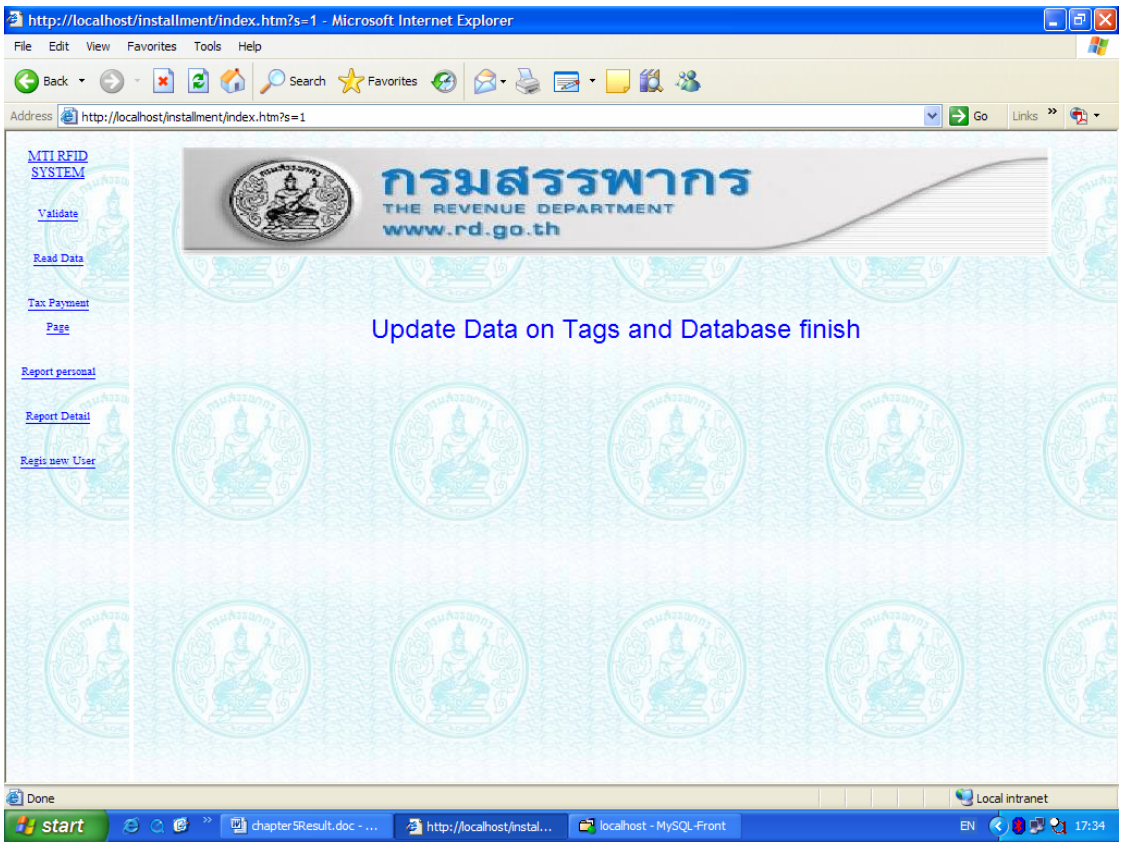


Figure 5.8 Consequence of Test of Write Data on RFID Tags and in Database

Figure 5.8 display a consequence of test of writing data on RFID tags and in database. The system will delete original data on RFID tags and write update data instead. The RFID tags is given to a taxpayer so that he will use it for tax installment payment corresponding with he has informed RD.

5.3.3 Test of Read Data

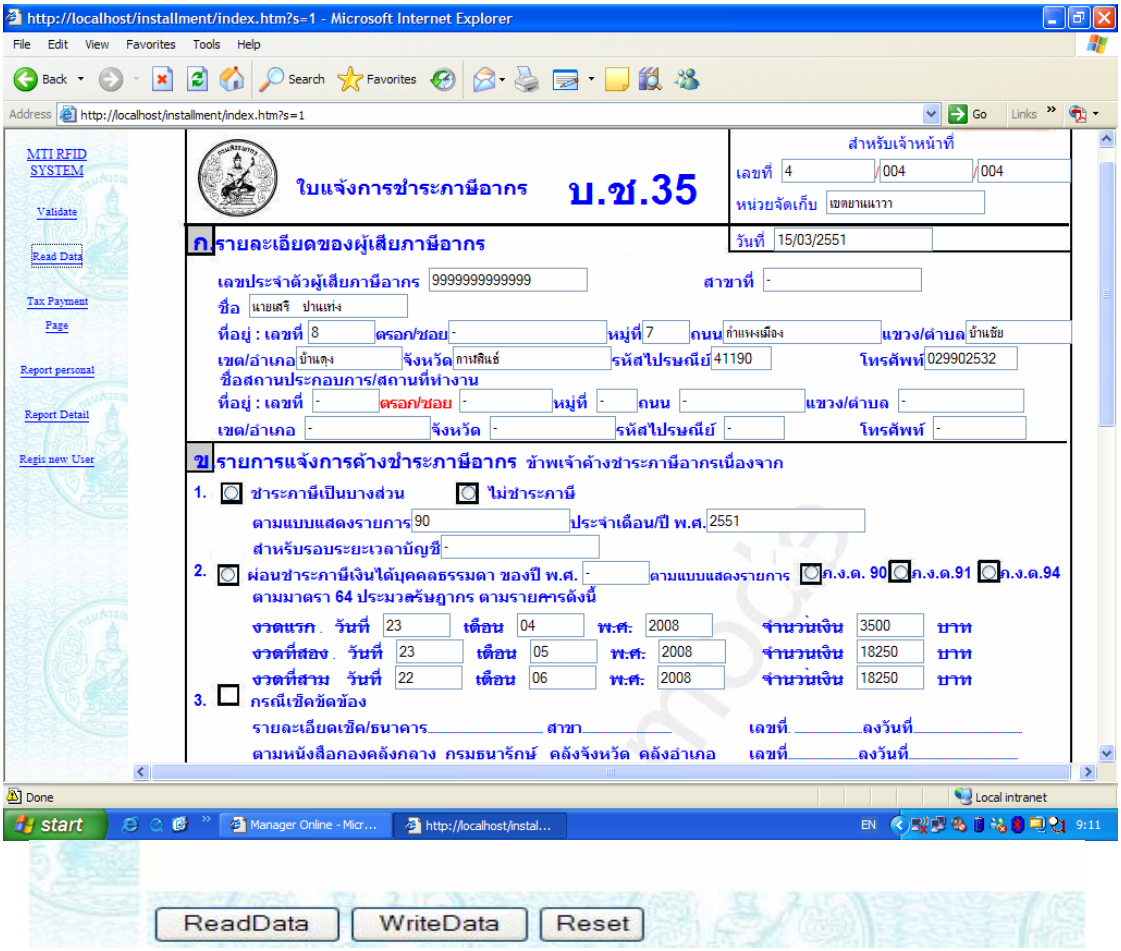


Figure 5.9 Result of Reading Data on RFID Tags

Based on figure 5.9, an RFID tags is placed on a reader so that data on it may be read. The result is seen as the figure. Apparently, tax items that were recorded earlier will appear. An RD official can update and read the data when he wants to be clicking on button at the button of the screen.

5.3.4 Test of Tax Payment

It is a test of the tax payment function by paying in 3 installments. The RFID tags that have gone through a validation stage are used. Details are in figure 5.10.

Figure 5.10 Test without RFID Tags

Based on figure 5.10, when there are no RFID tags coming near a reader, the system will spin around and wait for RFID tags to come within its reading range. If there are no RFID tags, the system will go on spinning around until RFID tags come in.

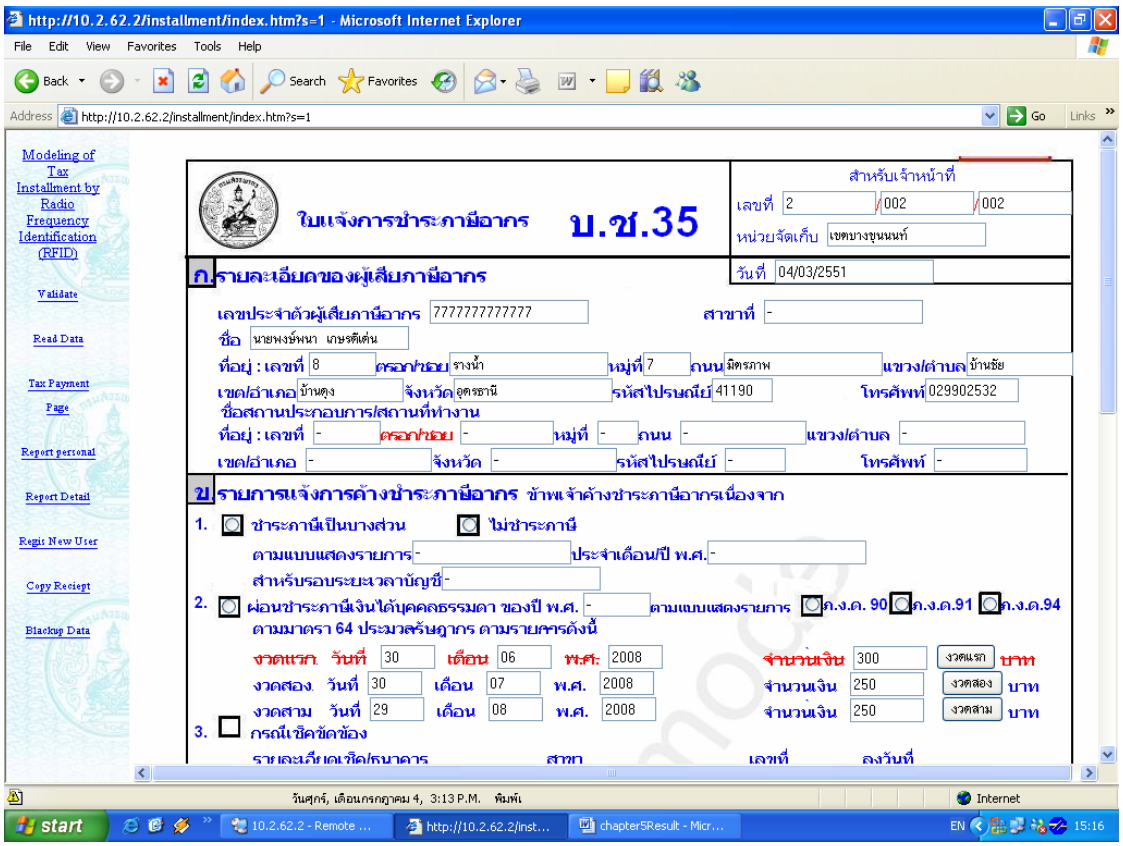


Figure 5.11 Test of Bringing RFID Tags within a Reader's Reading Range

Figure 5.11 reveals a test of bringing RFID tags within a reader's reading range. The system will verify by comparing RFID tags' ID with the one in database. If both are identical, it indicates that the taxpayer has reported on his desire to pay tax in installments to RD. The system will display the taxpayer data on screen. For the first installment, it appears in red since it has already been paid. The first installment is paid along with tax form submission.

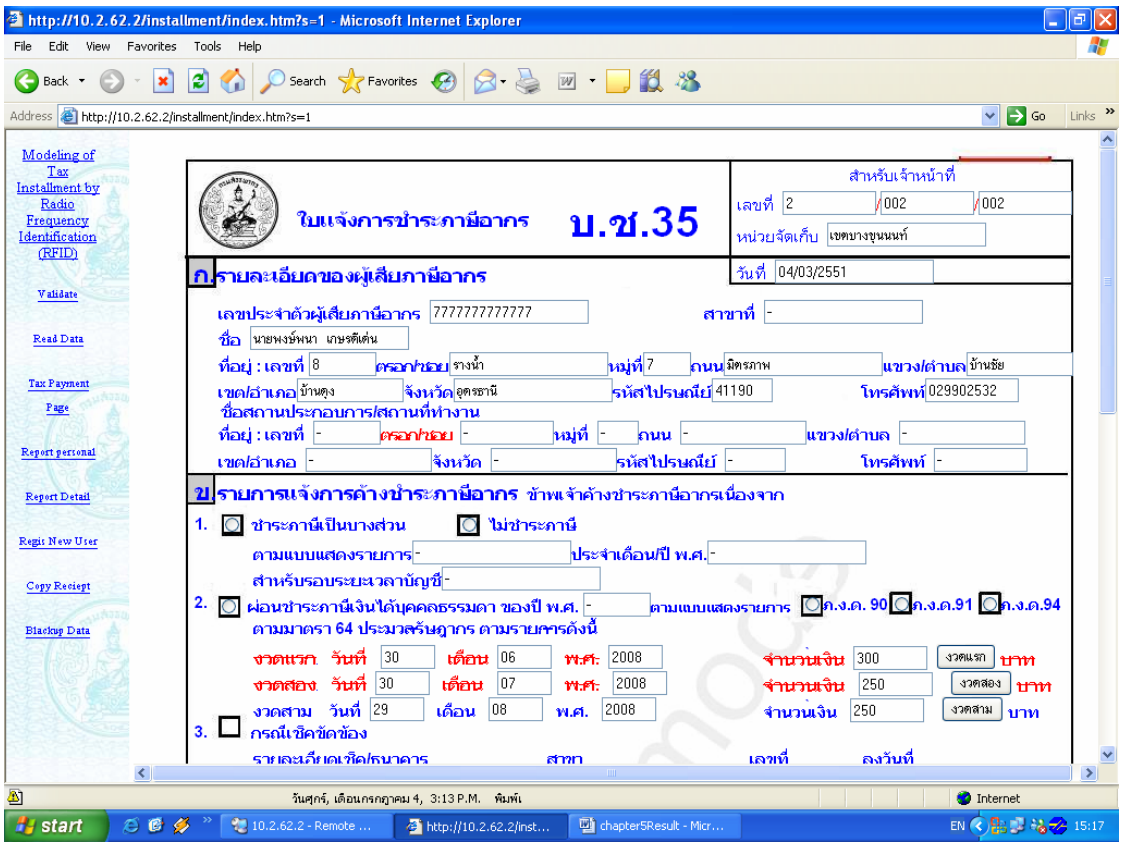


Figure 5.12 Tests of Tax Second Installment

Figure 5.12 reveals a test of tax second installment by placing RFID tags, used for installment 1 payment, on a reader. The system will verify RFID tags' ID by comparing it with the one in database. If the data is found there, the system will display installment 1 payment data. Then test by clicking on installment 2 buttons, the system will record data on RFID tags and in database.

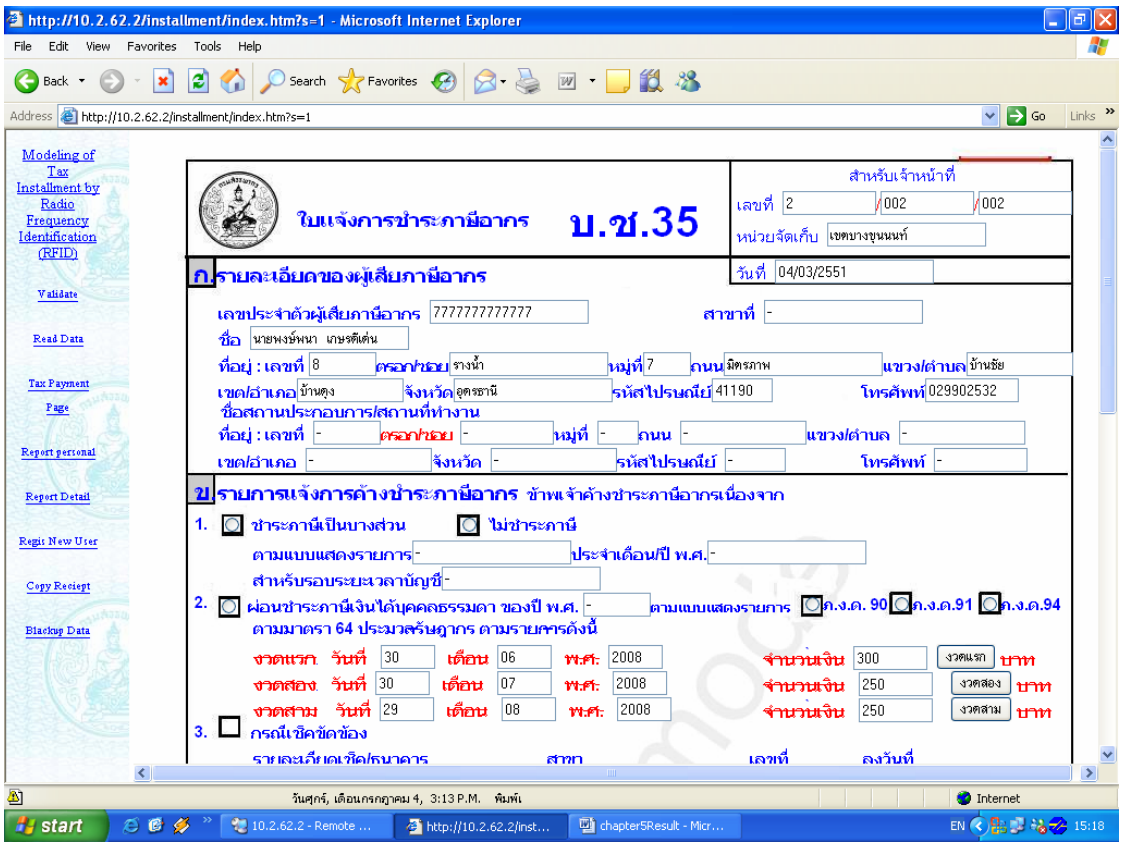


Figure 5.13 Test of Tax Third Installment

Figure 5.13 reveals a test of tax third installment payments using RFID tags that was used for installment 2 payments. The system will similarly record data on RFID tags and in database. Subsequently, test by having the RFID tags read data once again. The system will report that the tax installment has been paid.

5.3.5 Test of Receipts

It is a test of issuance of receipts for taxpayers.

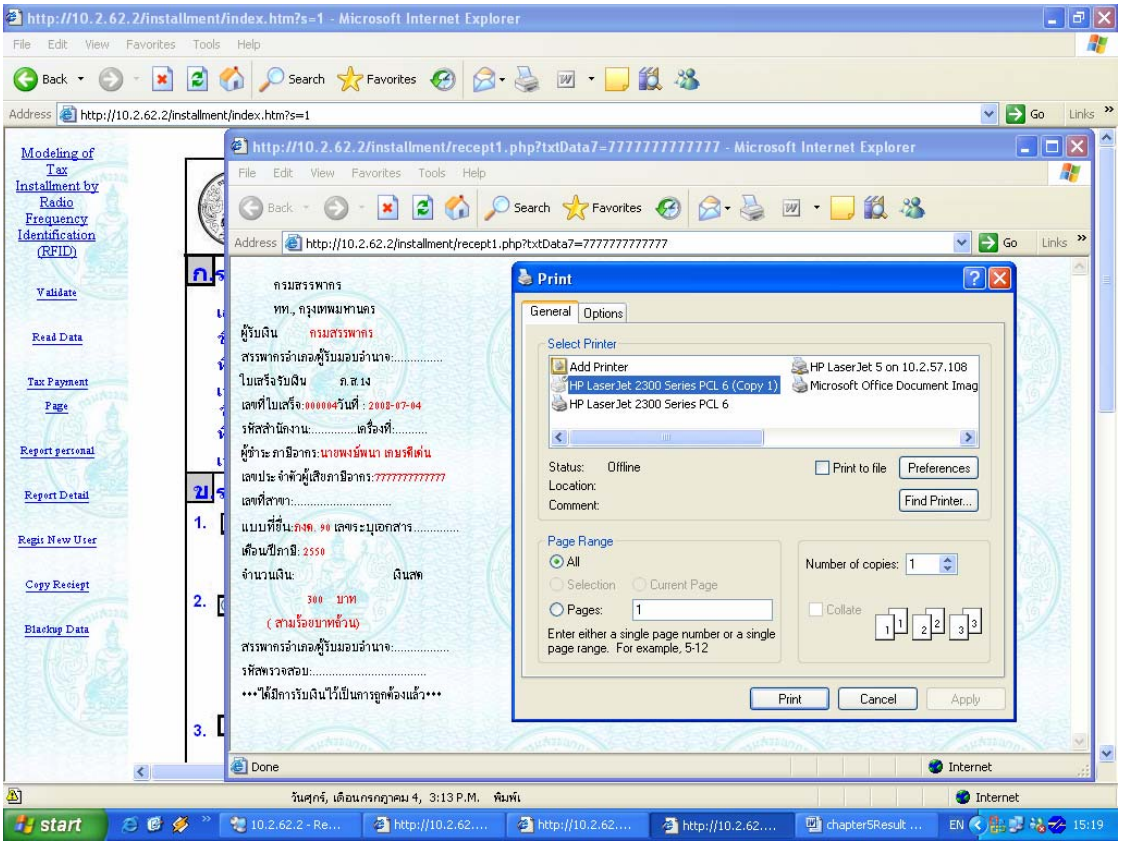


Figure 5.14 Receipt Issuance for First Installment

Figure 5.14 illustrates a test of receipt issuance for installment 1 by placing RFID tags that have gone through a validation stage on a reader. Then click on “Tax Payment” menu and data on RFID tags will be displayed. Click on the “Installment 1” button and the interface for receipts appears while a receipt is printed out by a printer set.

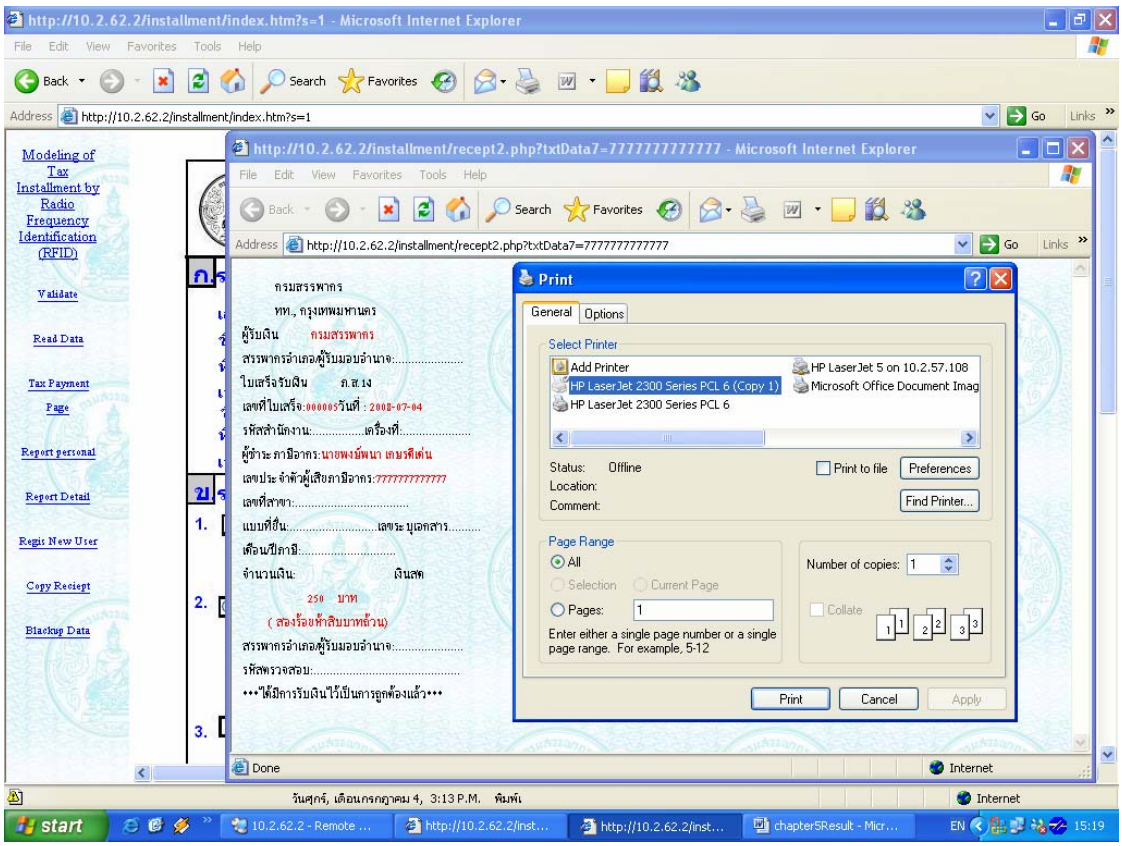


Figure 5.15 Receipt Issuance for second Installment

Figure 5.15 reveals a test of receipt issuance for second installment by placing RFID tags, which have gone through tax installment 1 payment, on a reader. Then click on “Tax Payment” menu and data on RFID tags will be displayed. Click on the “Installment 2” button and the interface for receipts appears while a receipt is printed out by a printer set.

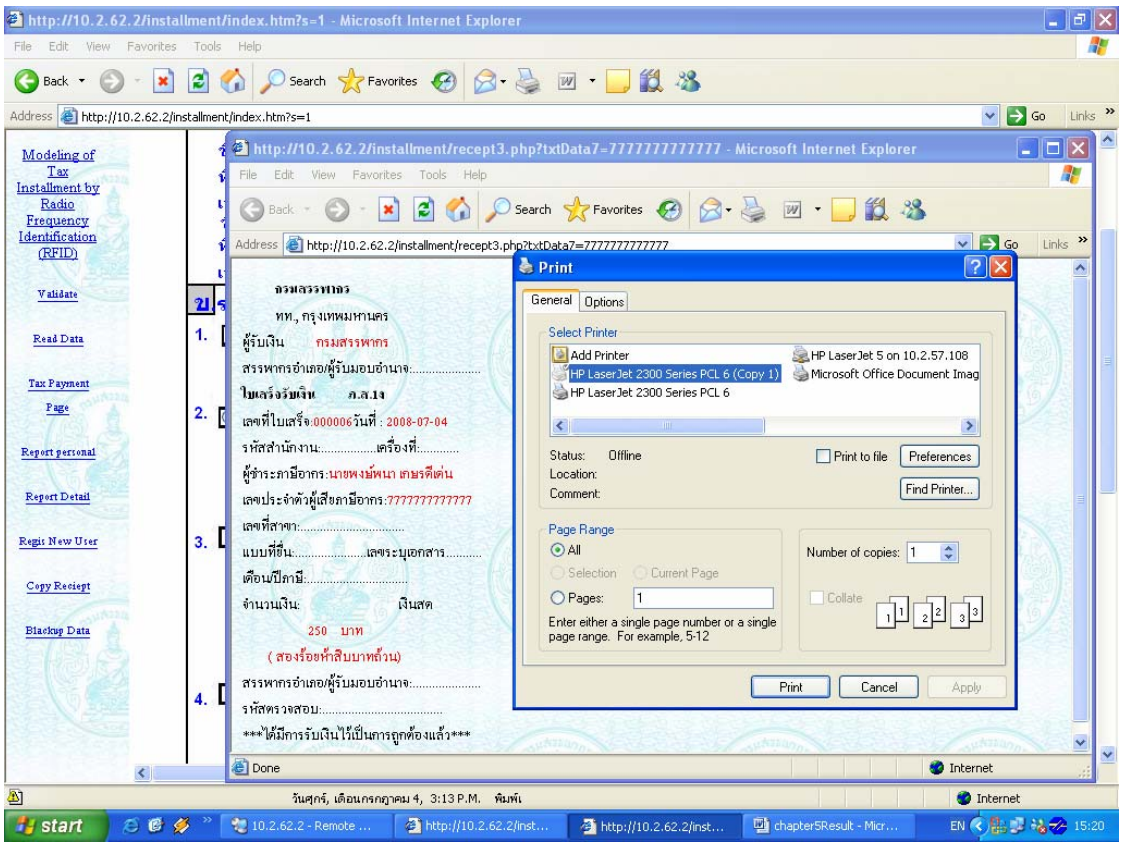


Figure 5.16 Receipt Issuance for Third Installment

Figure 5.16 illustrates a test of receipt issuance for installment 3 by placing RFID tags, which have gone through tax installment 2 payments, on a reader. Then click on “Tax Payment” menu and data on RFID tags will be displayed. Click on the “Installment 3” button and the interface for receipts appears while a receipt is printed out by a printer set.

5.3.6 Test of Report

5.3.6.1 Personal Report

It is a test of an individual taxpayer report by filling in his ID card number.

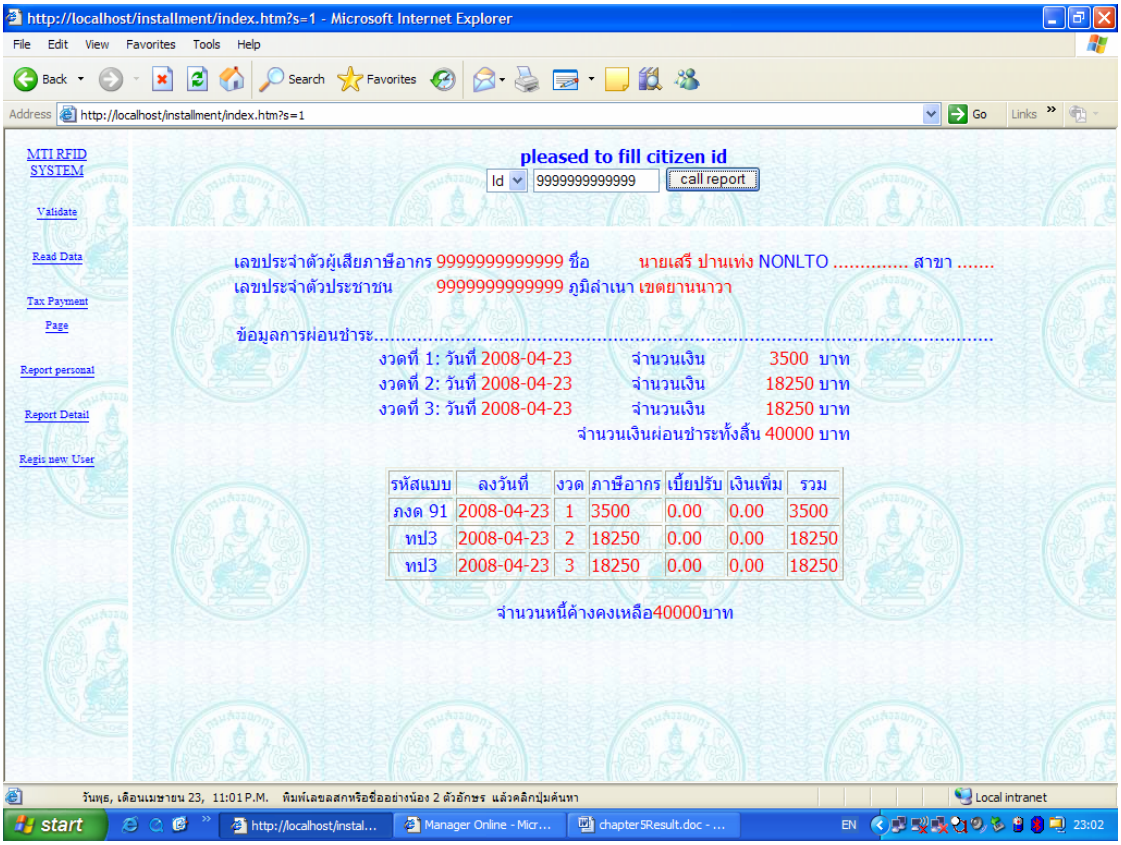


Figure 5.17 Test of Individual Taxpayer Report

Based on figure 5.17, for each time of tax installment payment, the system payment, the system will store data in database. Thus, a report can always be viewed. For instance, if an RD official wants to view Mr. Seri Pantheng, a taxpayer, he has to fill in Mr. Seri's ID card number. The system will report each of Mr. Seri's tax installments.

5.3.6.2 Detail Report

Figure 5.18 Test of Detail Report (with Defined Conditions)

Figure 5.18 reveals a test of retrieving data based on the transaction period defined. The test is conducted by filling in 2008-03-03 to 2008-04-23 and the system will show data of the period defined.

A Table of Unit Test Summary

Table 5.1 Test Functionality

Functionality Test Name	Description	Input	Output
1. Login	Test of check user authorization	Data of user and password	Showing menu list by user authorization
2. Validate Data			
2.1 Calculate	Test of calculate tax money from tax	- Citizen id - Tax form taxpayer	Showing from tax "บช 35"
2.2 Write data on RFID Tags	Test of write data on RFID tags	- Citizen id - Tax form taxpayer	Data on RFID tags
2.3 To pay by installment 1	Test of installment payment by clicking on Installment 1 payment' button.	- Tax data	- Print a receipt first installment - Record payment data on RFID tags

Table 5.1 Functionality Test (Cont.)

Functionality Test Name	Description	Input	Output
3. Tax payment			
3.1 Showing Data of Taxpayer	Test of view all attributes	-	- Attributes - Target attribute
3.2 Read Data from RFID Tags	Test of retrieve data from RFID Tags ad Test of retrieve data from the database	- Data on RFID Tags	- Data from RFID tags
3.3 Write data on RFID Tags	Test write data on RFID Tags	- Test to pay by installment 1 - Test to pay by installment 2 - Test to pay by installment 3	- Receipt - Record Data on RFID tags and Database
3.4 To pay by installment 2	Test of installment payment by clicking on a “Payment” button	- tax data	- Print a receipt second installment - Record payment data on RFID tags
3.5 To pay by installment 3	Test of installment payment by clicking on a “Payment” button	- tax data	- Print a receipt third installment - Record payment data on RFID tags
4. Read Data	Read data from RFID Tags	- RFID Tags	- Data from RFID tags
5. Utility			
5.1 Receipt	Test of print Receipt	- Tax Payer data	Receipt
5.2 Print Report	Test of print report	- Tax-Year - Tax-Month	Report of the verification result

5.4 Reliability Test

A test was conducted for about 1 month, from 15 March to April 17, 2008.

Table 5.2 Reliability Test

Function Test	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Login	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Validate	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Read Data	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Tax Payment	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Tax Payment	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Tax Payment	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

Function Test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Login	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Validate	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Read Data	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Tax Payment	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Tax Payment	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok
Tax Payment	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok	ok

5.5 Performance Test

A test was conducted by using each function, and then the time taken was measured on windows me, Windows xp and Windows vista.

Table 5.3 Performance Test

Item	Function Test	Windows me (IE6) (sec)	Windows xp (IE6) (sec)	Windows vita (IE7) (sec)
1	Login	0.02	0.02	0.01
2	Validate	0.04	0.04	0.02
3	Read Data	0.06	0.08	0.02
4	Write Data	0.21	0.20	0.19
5	Tax Payment			
	First installment	0.02	0.12	0.08
	Second installment	0.02	0.12	0.08
	Third installment	0.02	0.12	0.07
6	Receipt	0.23	0.23	0.30
7	Personal Report	0.01	0.02	0.00.81
8	Detail Report	0.01	0.02	0.01

5.6 Test Case

5.6.1 Normal Case

Based on RD regulations, a taxpayer who wants to pay tax in installments must have a tax amount of over 3,000 baht, both for mid-year and year-end tax. A payment will be made in 3 installments, each equal in the amount, while no additional money is required. A taxpayer has to ask for an installment payment at an RD regional office concerned. The payment requirements are that he has to pay one-third of the total tax amount for the first installment, along with the submission of tax form, within September 30 or March 31 of each year. Similarly, he has to pay another one-third for the second installment within one month after the first one, and pay the remaining one-third within one month after the second payment. If the taxpayer fails to pay any one installment within a time limit, he will be longer eligible to pay in installments and has to pay additional money of 1.5 % per month or fractional month of the remainder of tax amount.

5.6.2 Abnormal Case

In case a taxpayer fails to pay installment 2 or 3 within the due time, he is no longer eligible to pay in installments. Of course, he is liable to pay all overdue tax and additional money of 1.5 % per month or fractional month of the tax remainder, in accordance with article 27 of the revenue code. Additional money is counted from the first day of overdue date to a payment date, for instance,

Mr. A submits a form for an ordinary person’s income tax (PIT.91) OF 1999, with a tax amount of 6,000 baht. He is entitled to pay the first installment, based on article 64(1) of the revenue code, totaling 2,000 baht on, March 31, 2000, along with a submission of a tax form. For the installments 2 and 3, he will have to pay 2,000 baht each within April and May 2000, respectively. Nevertheless, April, 30, 2000 was Sunday, which was a holiday. Thus, Mr. A was allowed to pay the second installment on May 1, 2000, without of his privilege to pay in installment subsequently. Moreover, he does not have to pay additional money according to article 27 of the revenue code.

5.6.3. RFID Tags Loss Case

- In case RFID tags are lost, an RD official will fine the taxpayer 100 bath.
- For installment payment, it a taxpayer is able to pay continuously, the system will store his data. Just fill in his ID card number and the next installment payment can be made.

5.6.4. In case a password is forgotten

An RD official may search for it by filling in his name and sure and then search, as revealed in figure 5.19.

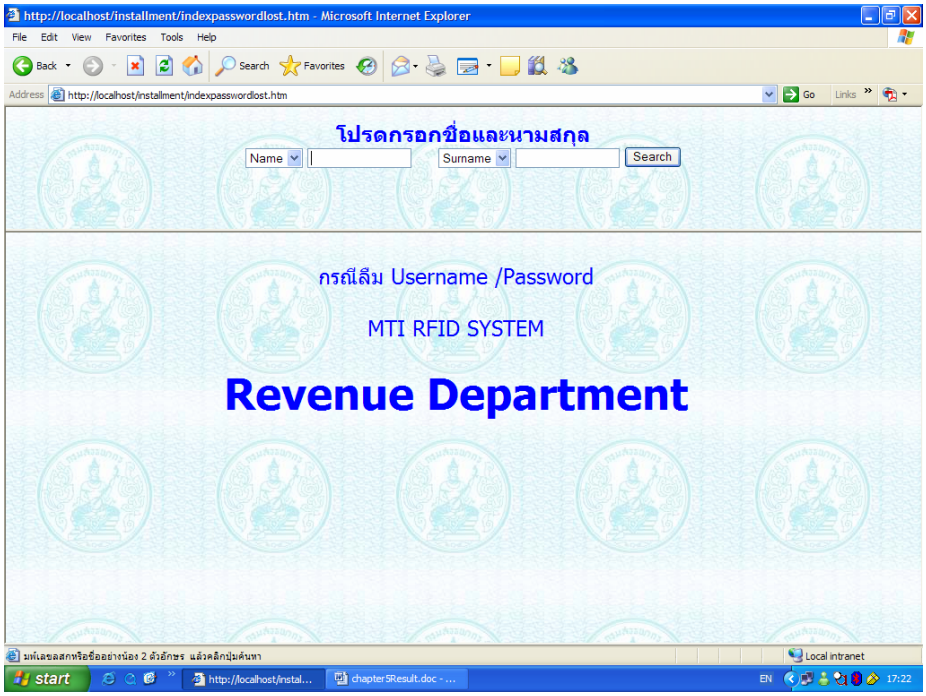


Figure 5.19 Interface for searching for User Name and Password

Based on figure 5.19, in case an RD official forgets username and password, this menu can only be accessed by an Admin, who will fill in name and surname of the official who wants to know them.

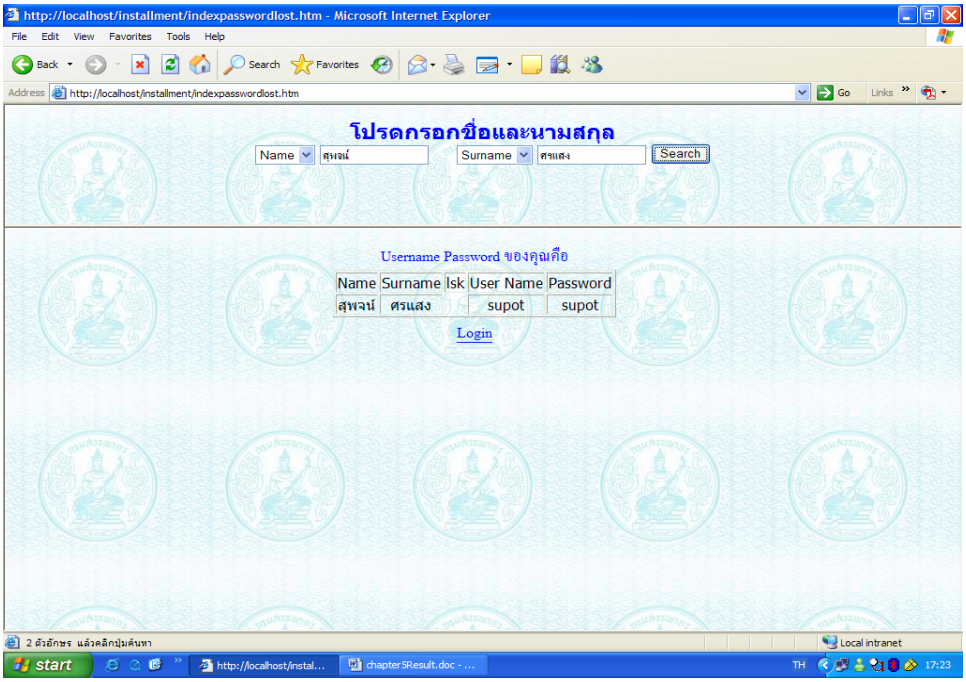


Figure 5.20 Consequences of User Name and Password

Based on figure 5.20, when an Admin fills in name and surname of an official who needs to know user name and password, and clicks on “Search” button, the system will display the official’s name along with user name and password that the official has registered with the system.

5.6.5 In case a taxpayer loses a receipt or needs a new one.

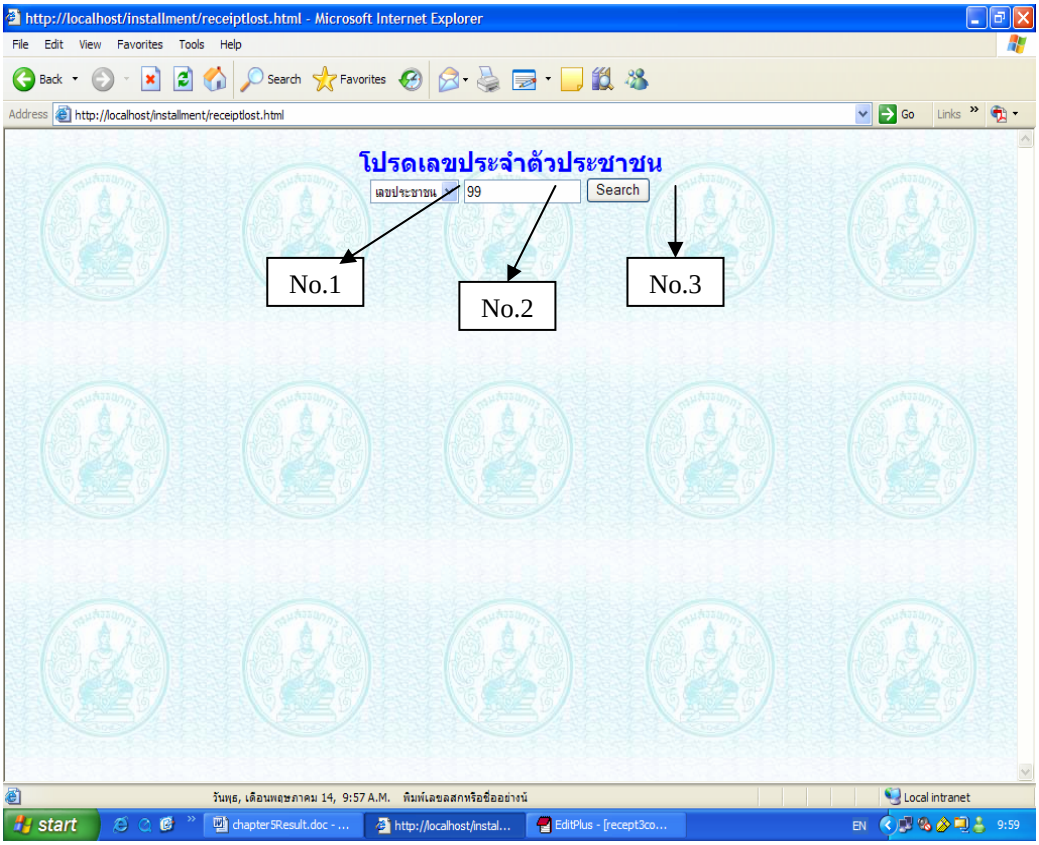


Figure 5.21 Interfaces for Filling in ID card Number

Figure 5.21 reveals a detail of an interface for filling in a taxpayer's ID card number to search for a receipt. The menus include the following.

- "No.1" is textbox for an admin to select an ID card number to search for a receipt.
- "No.2" is textbox for an admin to fill in the ID card number in order to search for a receipt.
- "No.3" is a button for an admin to click so as to send what is filled, to search for a receipt.

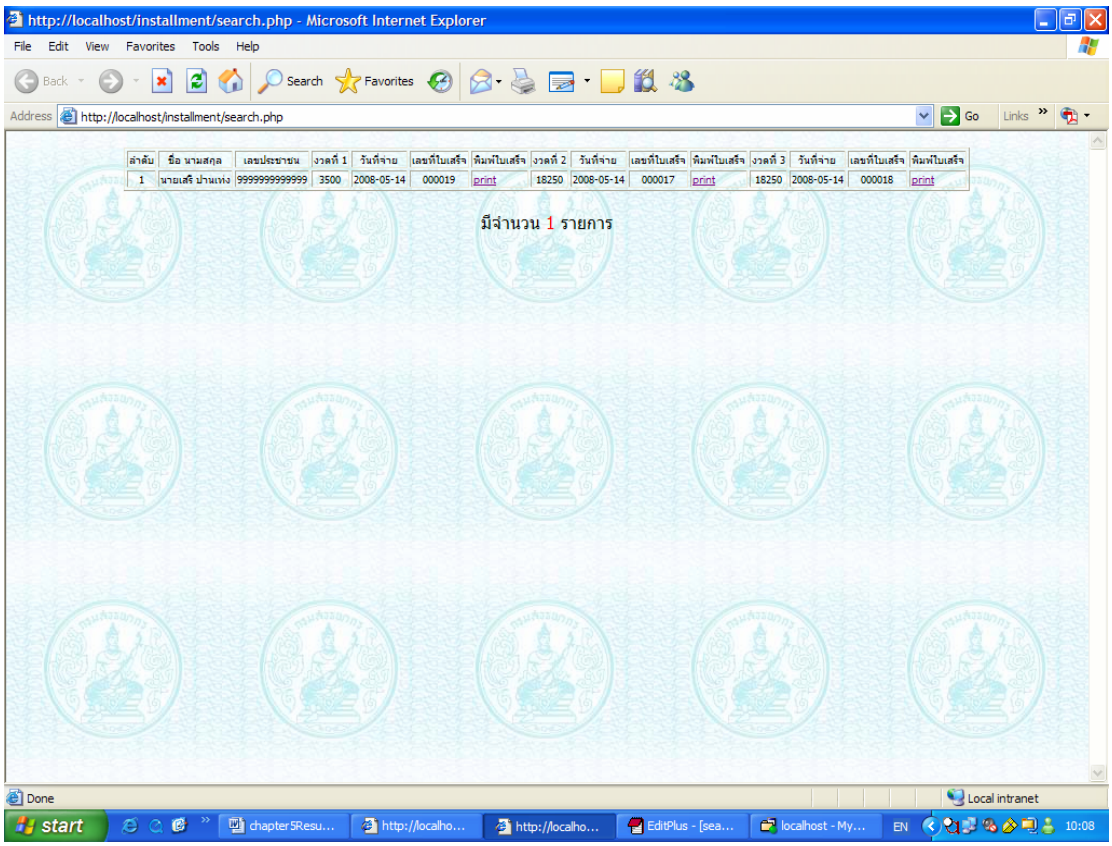


Figure 5.22 Consequence of Receipt Search

Figure 5.22 demonstrates an outcome of a search for particular receipt. The system will display items of a taxpayer searched for. An RD official may click to select a receipt for each installment payment as needed, all form the menu “Print Receipt”.

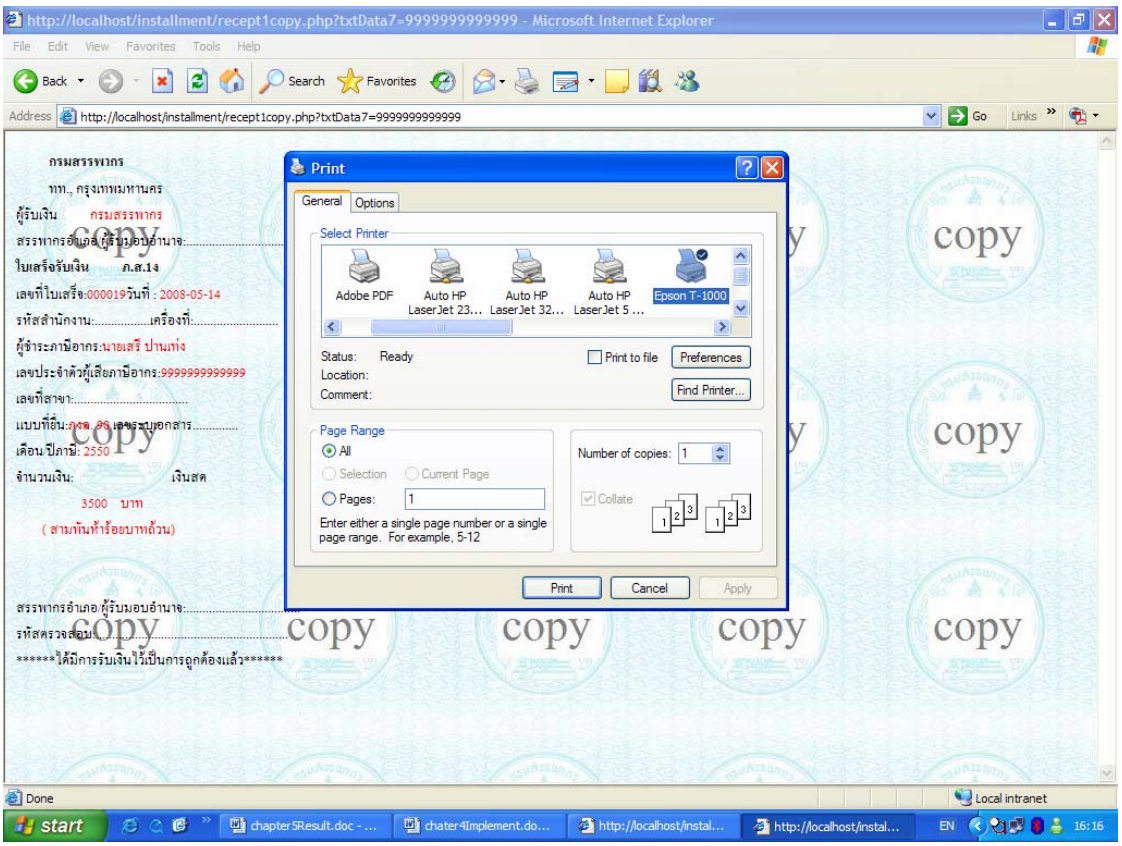


Figure 5.23 Consequence of Receipt Printing

Based on figure 5.23, after an RD official search for a receipt needed and finds it, he then clicks to select a receipt for installment payment required. The system will display a receipt for that particular installment while ordering a print through a printer. At the back of the receipt, there is a word “Copy” to show that there has been an issuance of a receipt when a tax installment is paid.

CHAPTER VI
CONCLUSION AND SUGGESTION

6.1 Conclusion

The objective of this research project is to study the performance of RFID technology. It begins with writing a program communicating between a reader and RFID tags, using HTML, PHP, VB Script, and JAVA Script for communicating between each other through port RS232. In addition, the RFID technology is applied to an existing working system of the Revenue Department (RD), which is tax payment in 3 installments. Web technology is also utilized for an operation of this research project. A user can use the system wherever there is an RD branch office (regional office) since there is a network throughout the country. Apparently, an application of RFID technology helps facilitates the RD services and replaces existing tax forms RD has. Above all, taxpayers are provided with convenience and don't have to waste their time on tax payment. The system processes include the following functions.

- **Login:** Verify an RD official's right to access the system.
- **Validate:** Calculate tax amount to be paid to RD and store data on RFID tags.
- **Read data:** Read data on RFID tags to verify taxpayer data. Updating or modification of data is also possible.
- **Tax payment:** Receive data from RFID tags and serves to make payment in installments.
- **Personal report:** Report on individual taxpayer data for an RD official to view and update them.
- **Detail report:** Report on taxpayer data based on tax payment period defined.
- **Regis new user:** It is a function to add RD official data in order to access the system. An RD official's right to access the system is defined by an Admin.

It can be seen that RFID technology can be effectively applied to the work we are doing' using web technology, which is currently popular and yields the highest benefits to our agency.

6.2 Suggestion for Future Works

It is hoped that in the future when RFID technology has higher memory and data can be transmitted more rapidly and farther, while the cost per unit decreases and data are securely protected, the Revenue Department may consider using it to store various types of data or replace existing taxpayers' cards which are currently used. And In the future, when RFID is used in the RD of Thailand. The expected benefit are listed below:

1. To reduce the officers who responsibility about receive taxpayers from 5 to 1 person.
2. To reduce cost of time for service taxpayers from 30 minute to 3 minute for 1 person.
3. To support paperless's policy because of 1 RFID can replacing 3 forms of ทป.3 and 1 pnd 90,91 forms.

REFERENCES

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[4] Giesecke & Derient GmbH , John Wiley & Sons Ltd , Klaus Finkenzeller "RFID Handbook Fundamental and Application in Contactless Smart Cards and Identification" Munich 2003.

[5] National Electronics and Computer Technology Center, National Science and Technology Development Agency, Ministry of Science and Technology, "RFID Technology" RFID_booklet.pdf

APPENDIX

A.1 An example of RD tax installment payment report.

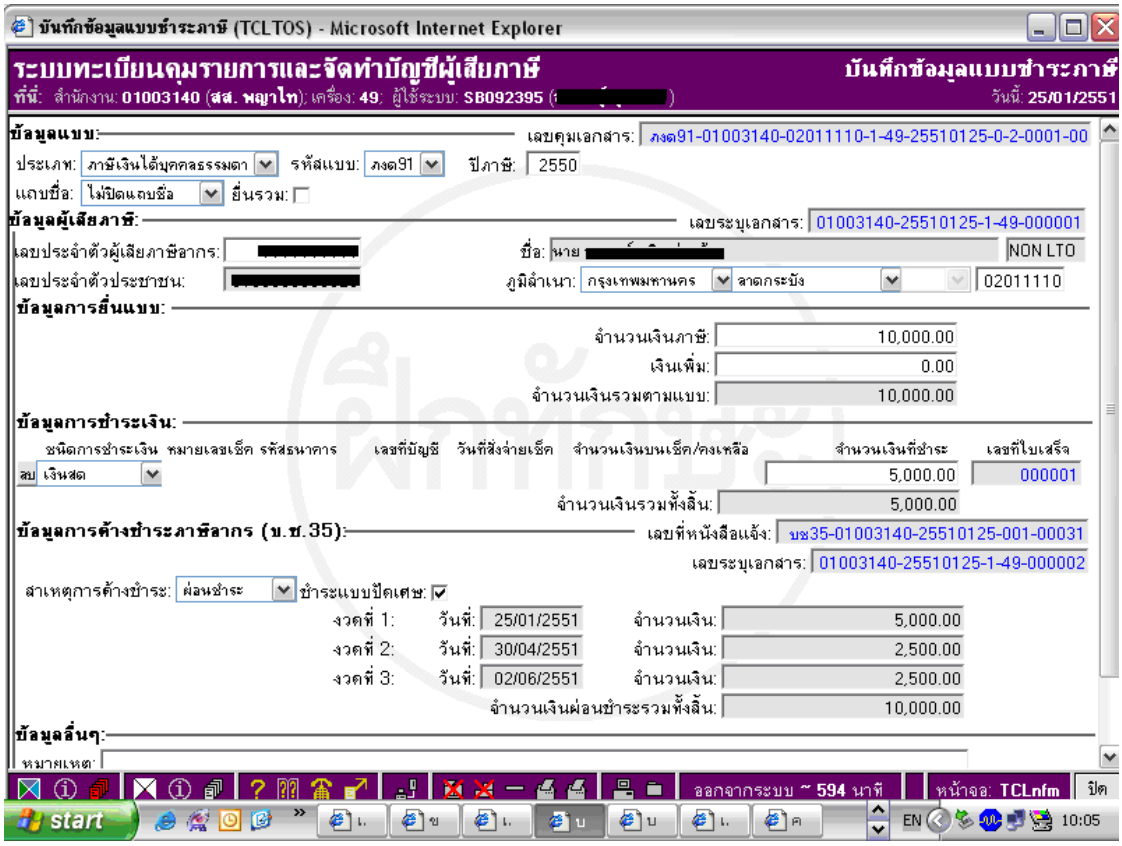


Figure A-1 Example of Personal Report

Figure A-1 reveals a report on tax payment sample, which is RD working system. The report displays the number controlling document, tax category, form code and year of tax payment. Besides, the report also shows items of paid installments such as installments 1, 2 and 3, when individual taxpayer data are searched, the system will reveal the installments paid.

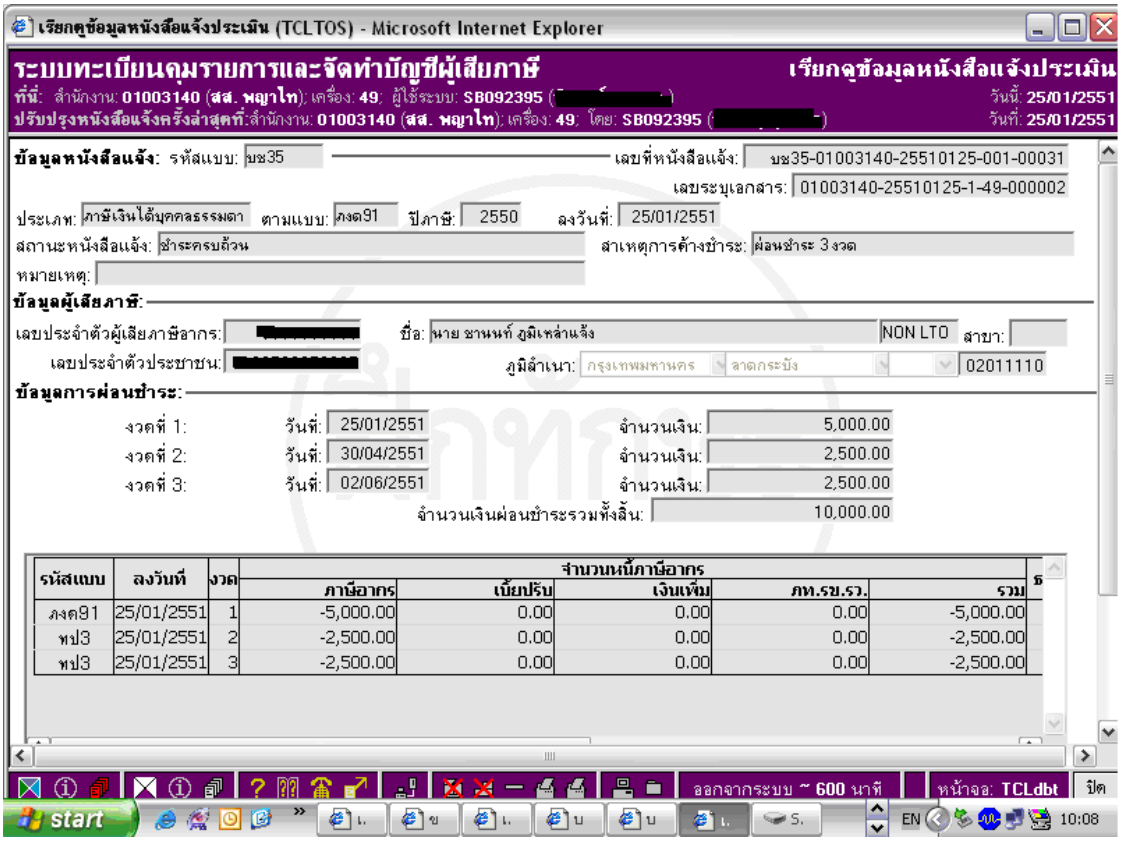


Figure A-2 Example of Personal Report

Figure A-2 displays a report on individual taxpayer data. A taxpayer who desires to pay tax in installments contacts RD officials. When all installments are paid, an RD official may retrieve to view individual taxpayer data.

A.2 An example of a receipt used by RD

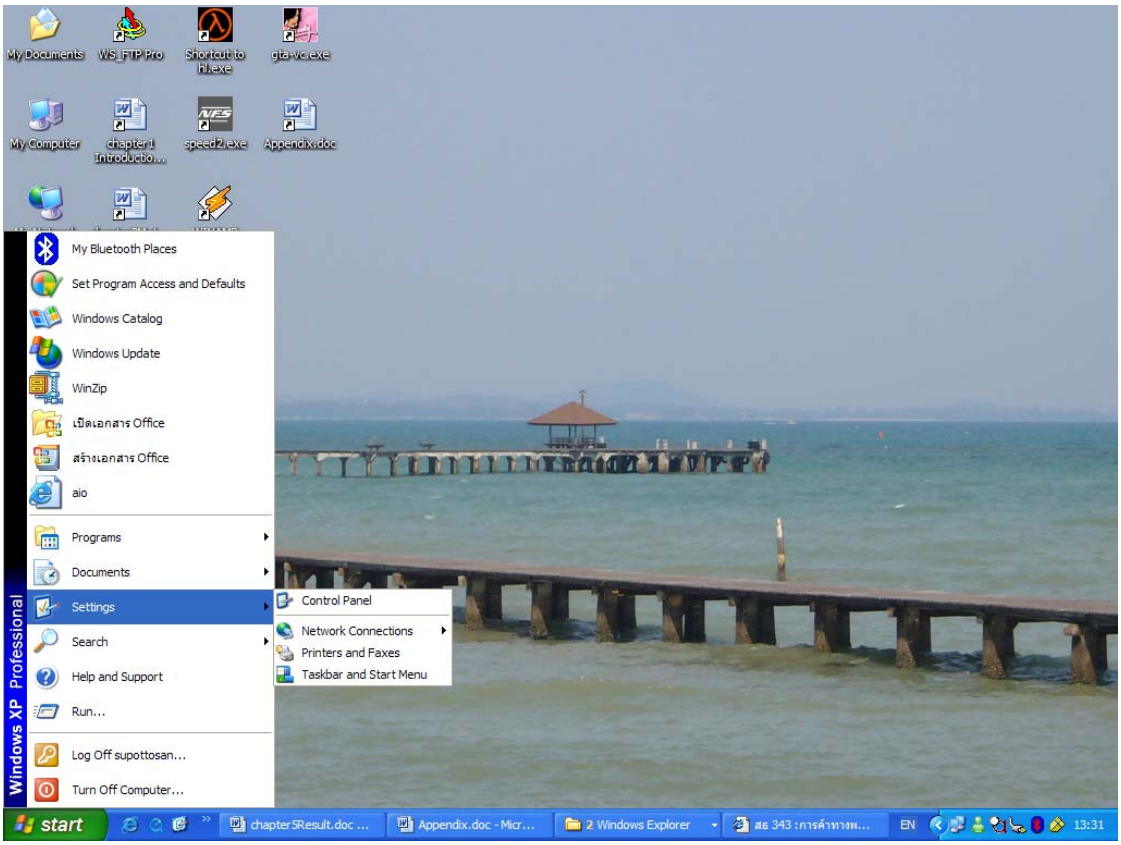
กรมสรรพากร
กท., กรุงเทพมหานคร
ผู้รับเงิน: .....
สรรพากรอำเภอ/ผู้รับมอบอำนาจ: .....
ใบเสร็จรับเงิน ภ.ส.1ง
เลขที่ใบเสร็จ: 000030 วันที่: 17/08/2550
รหัสสำนักงาน: 00000722 เครื่องที่: 50
ผู้ชำระภาษีอากร: บริษัท [redacted] จำกัด
เลขประจำตัวผู้เสียภาษีอากร: [redacted]
เลขที่สาขา: สนญ.
แบบที่ยื่น: ภ.ธ.40 เลขระบุเอกสาร:
00000722-25500817-1-50-000035
เดือน/ปีภาษี: 07/2550
จำนวนเงิน: เช็ค
*600.00
(หกร้อยบาทถ้วน)
รหัสธนาคาร: 020111 เลขที่บัญชี: 3256142102
หมายเลขเช็ค: 0211011 วันที่สั่งจ่าย: 17/08/2550
จำนวนเงินบนเช็ค: *600.00*
รหัสตรวจสอบ: 86951929
***** ได้มีการรับเงินไว้เป็นการถูกต้องแล้ว *****

Figure A-3 A Receipt Used by RD

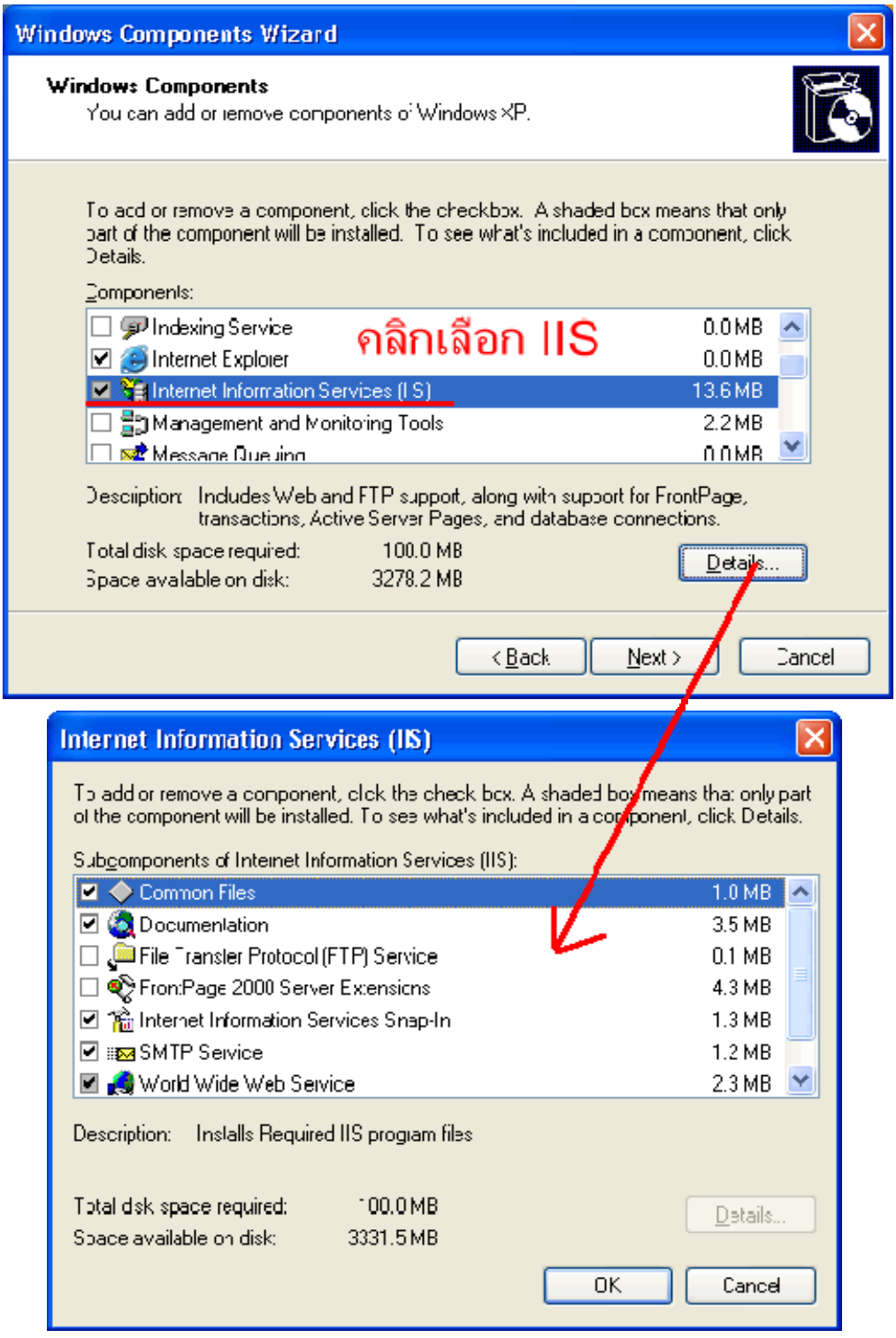
Figure A-3 illustrates an example of a receipt a taxpayer obtains from RD after his tax payment. It can be seen that for each tax installment, a taxpayer will get a receipt as an evidence. A receipt tells such details as receipt number, date/month/year of payment, tax amount paid, etc.

A.3 Installation of IIS

1. Click on Start > Settings > Control Panel
2. Double click on Add or Remove Programs

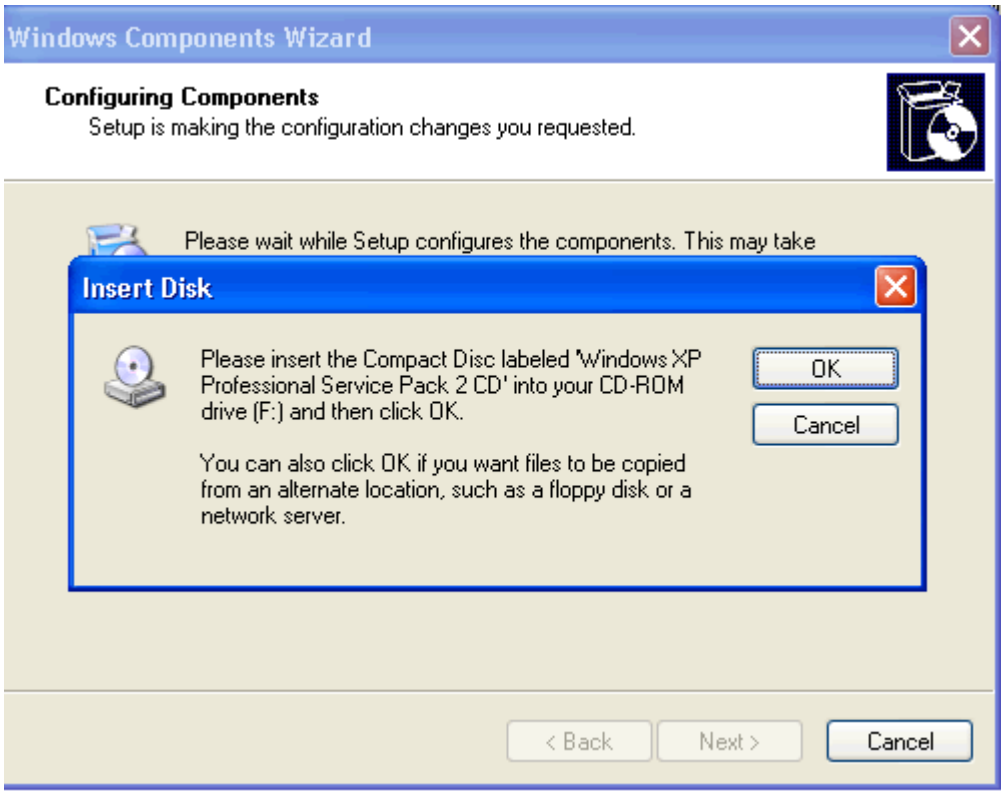


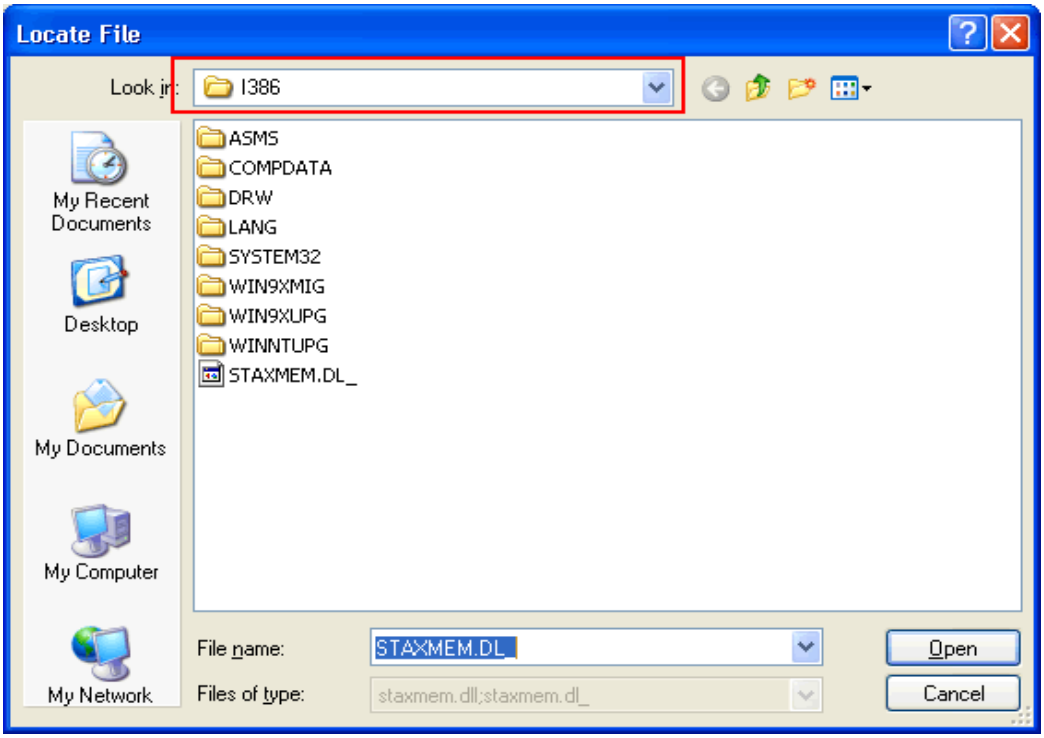
3. Click on Add/Remove Windows Components



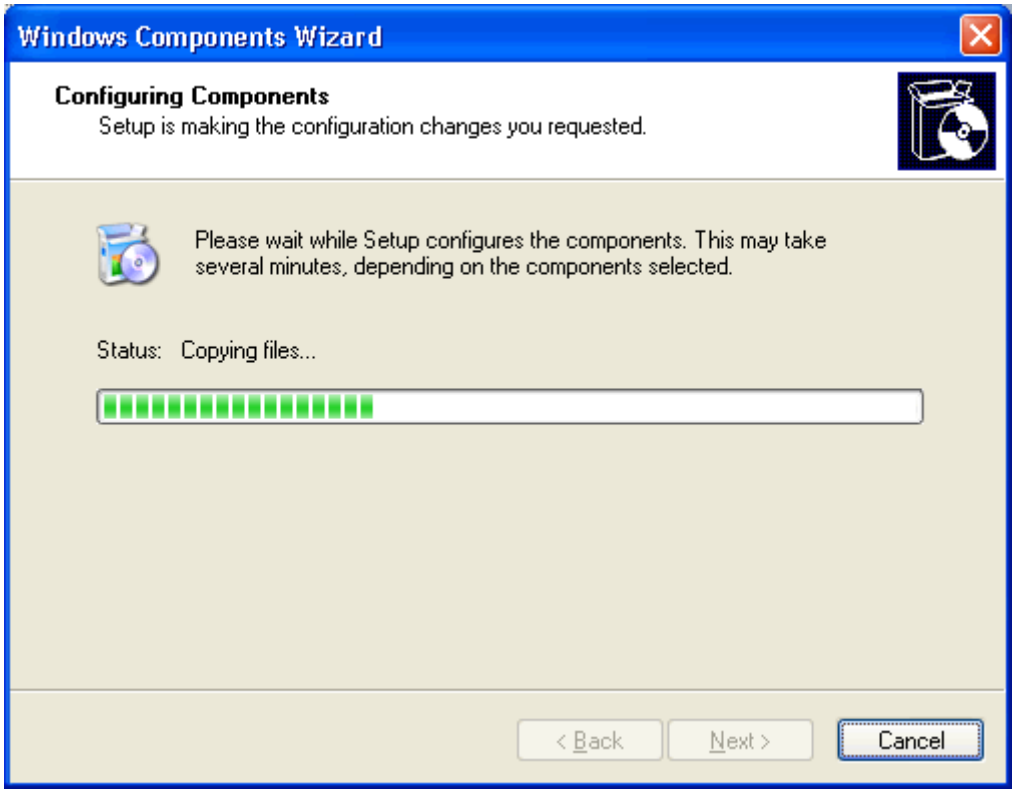
4. Click on 'Next' button to start installation 5.in case the system asks for windows XP installer, Click on OK button and then browse to find a CD to install windows XP, folder i386 or insert windows XP at CD ROM.

5. In case the system asks for windows XP installer, click on OK button and browse to find a CD to install windows XP in folder i386.





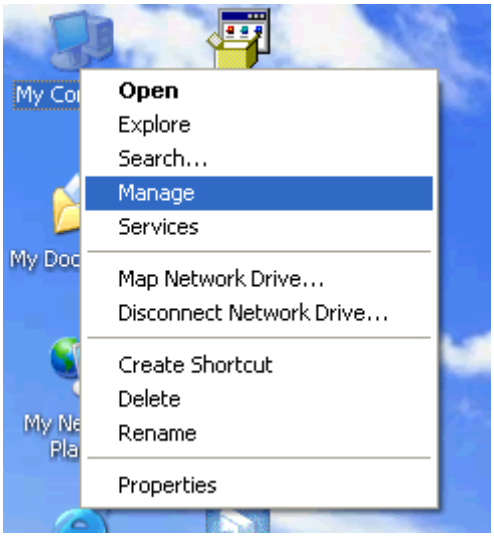
6. Click on open, OK buttons.
7. The system will install IIS as shown in the figure.



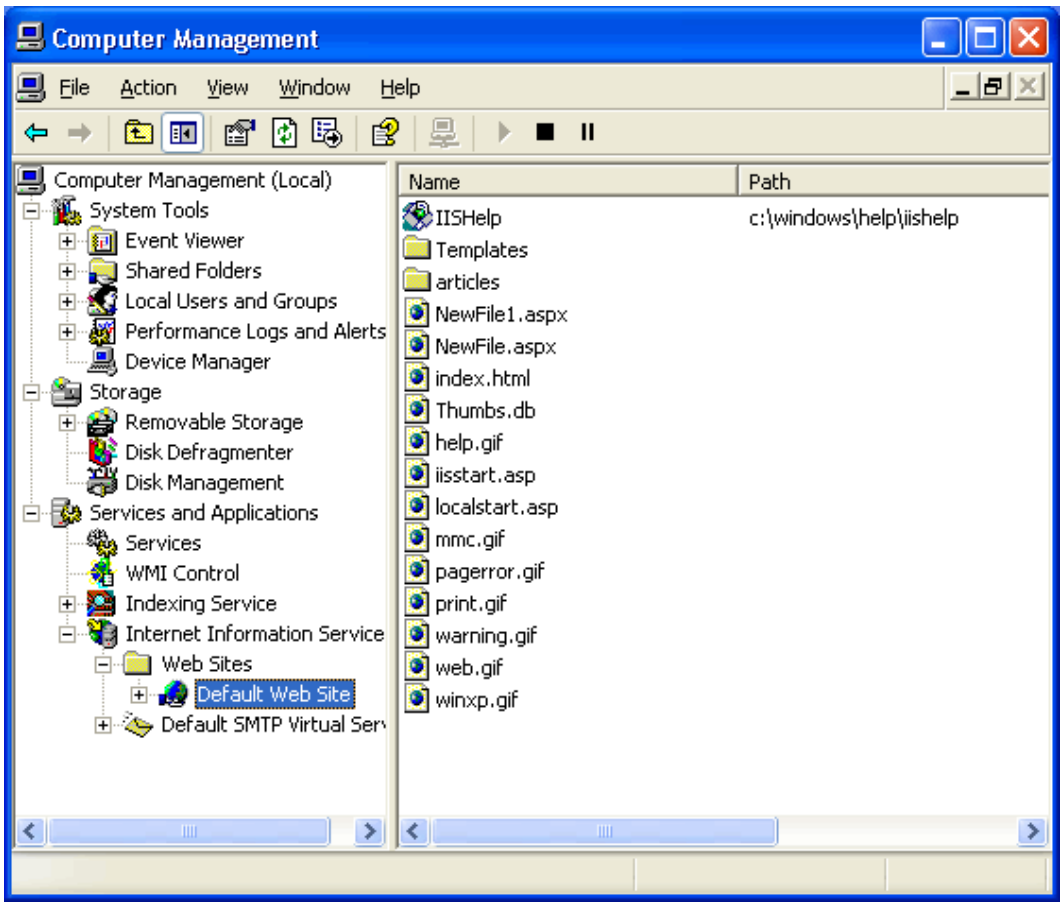
8. Click on Finish button.

A.4 IIS Management

1. Click right on icon ‘My computer>Manage.



2. Click on Services and Applications > Internet Information Services > Web Sites > Default Web Site



3. Start management (adjustment) by clicking right on Default Web Site > Properties

   - Tab Web Site

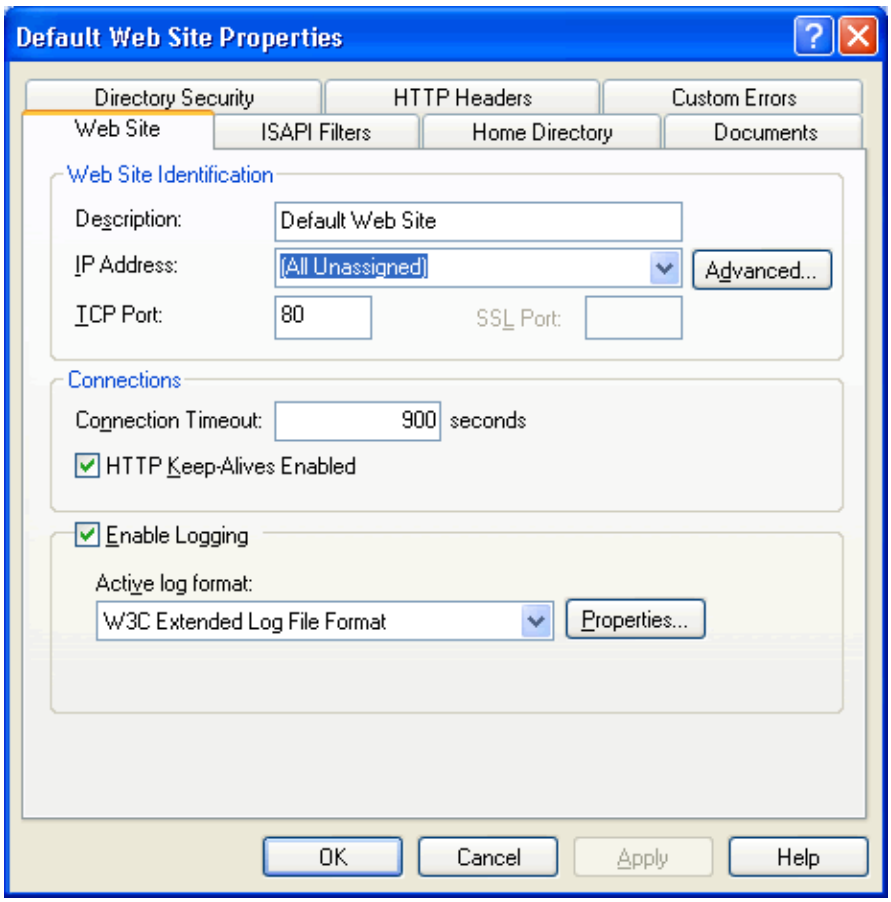
     3.1 Description : Identify the name of website needed such as www.rd.go.th

     3.2 IP Address : Choose IP address needed to retrieve a website (if retrieval of all IPs is required, select as all Unassigned)

     3.3 TCP Port : Port for retrieving a website, select 80.

     3.4 In case port 80 is used to retrieve a website, reference to port is not necessary, such as http://10.2.57.5 (background is http://10.2.57.5:80)

     3.5 In case there is a need to change port, for example, change to port 81, when retrieve web, use http://10.2.57.5:81.



- Home Directory Tab.

Local Path : Path needed to store website is generally <drive:\>Inetpub\wwwroot

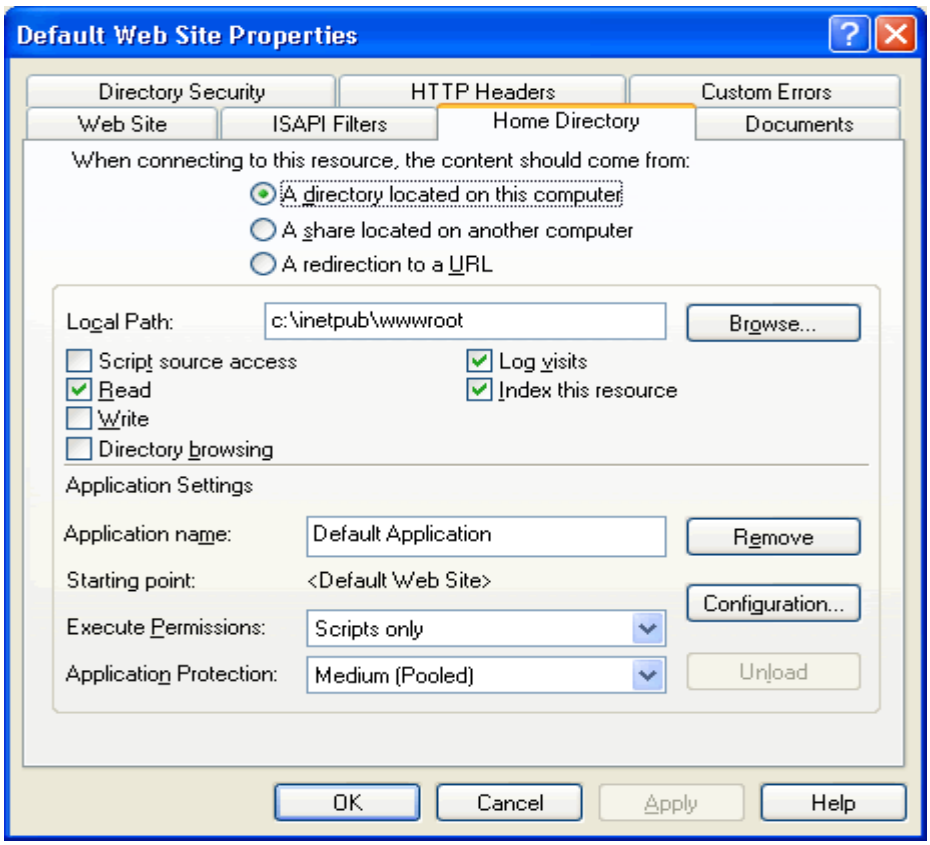
[ ] Script source access : visibility of script file is needed.

[/] Read : Can read file [ ] Write : Can write protect file.

[ ] Directory browsing : Visibility of data in directory is needed.

[/] Log visits : Storage of log file.

[/] Index this resource : Retrieval of index file.



In case usable language checking is needed, click on configuration button.

4. Tab document to add Home Page file or first-page file that needs to be retrieved, by clacking on the button.

Add index.html > language HTML

index.shtml > language SHTML

index.asp > language ASP

index.aspx > language ASP.NET

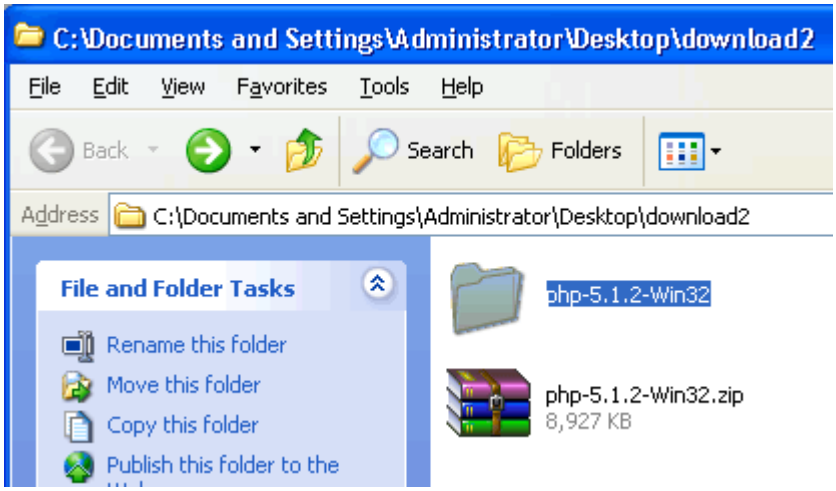
5. When managed (adjusted) all parts, then click on OK button.

6. Stop and Start IIS for 1 round.

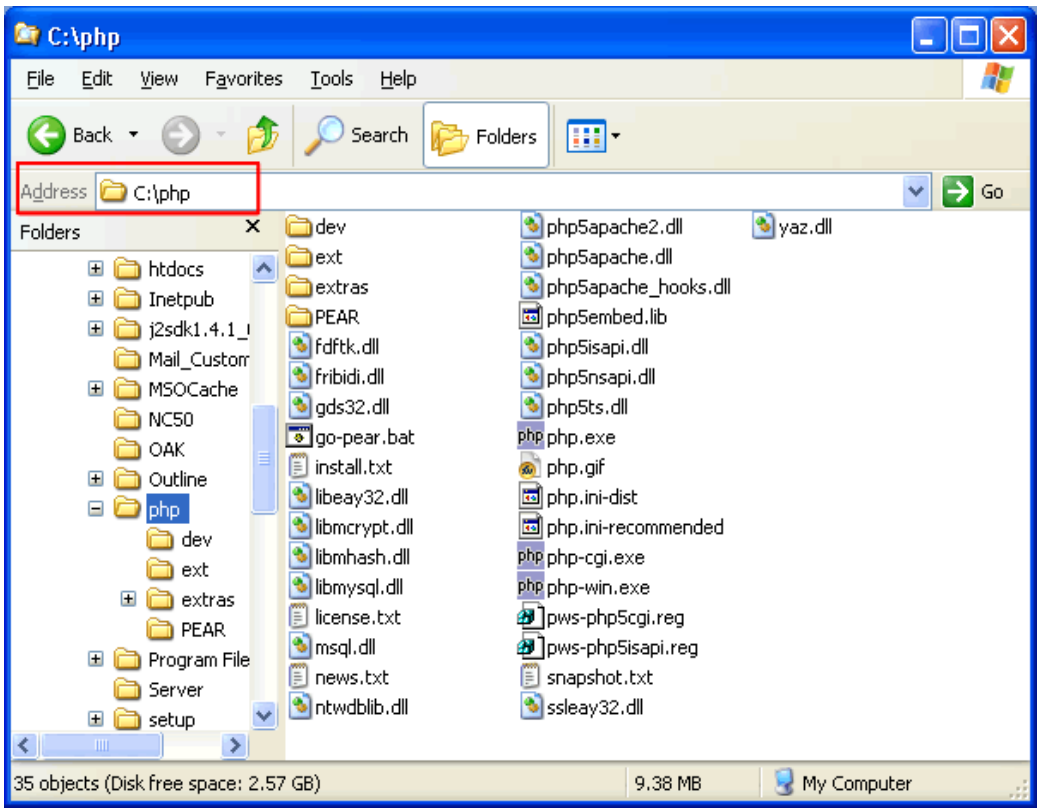
7. Finish IIS management.

A-5 Installation of PHP

1. First, download php installer at http://www.php.net/downloads.php
2. Click to choose to download zip package installer. Here php php-5-1-2-win32.zip.
3. Break down file with winRAR or Winzip and php-5.1.2-Win32



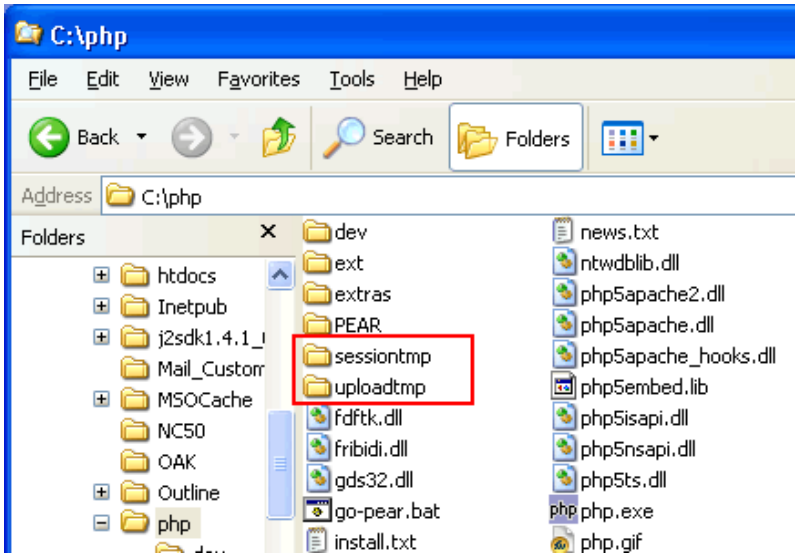
4. change folder name' php-5.1.2-Win32 to php**.**
5. Copy php folder into drive **C:** or other drives needed.



6. Create 2 folder: sessiontmp and uploadtmp.

   • sessiontmp is for storing temporary session in the case we write using session variable like Login system.

   • uploadtmp: is for temporary file shelter in the case we write code and send or attach file too.



7. Change file name ‘ php.ini-dist’ to php.ini and copy it into C:\Windows

Note.

Download php.inis-sdist file.

Download php.inis-sdist file that has been modified.

(click right > save Target As)

8. Use Edit Plus or Notepad to correct C:\Windows\php.ini file.

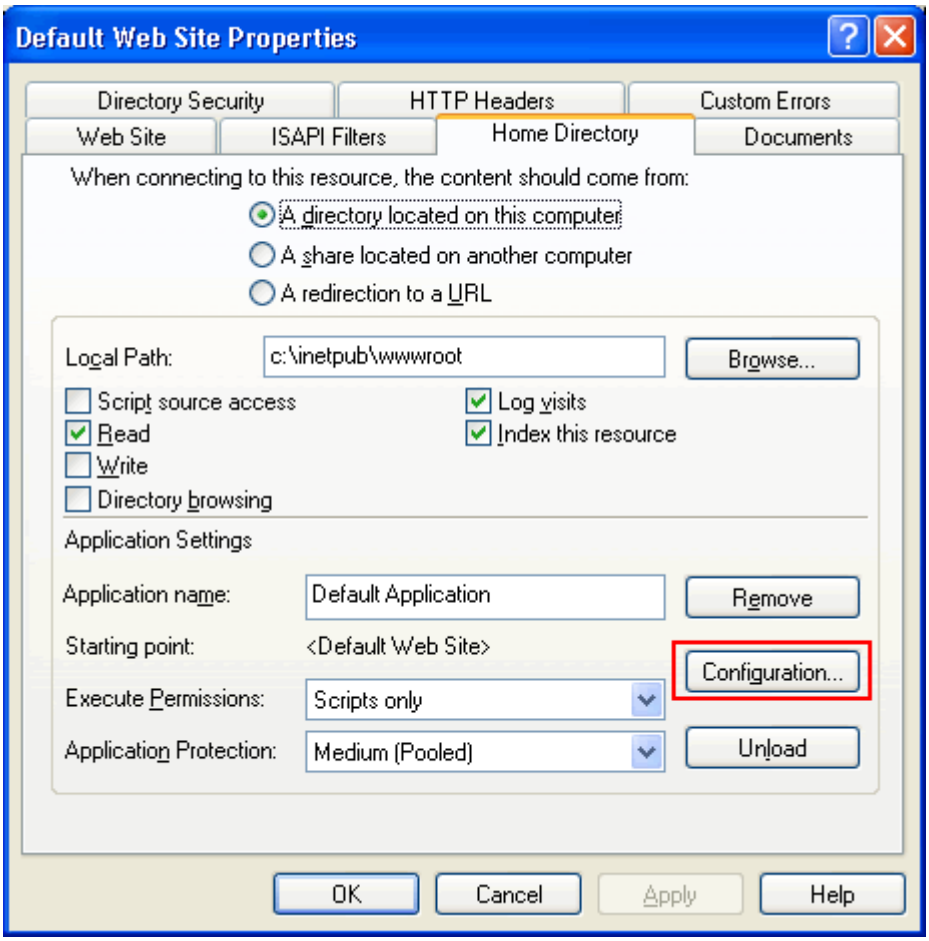
Details to be corrected are as follows:

Before correction	After correction	Explanation
output_buffering = Off	output_buffering = 4096	Output buffering.
register_globals = Off	register_globals = on	Adjust value to on .
magic_quotes_gpc = On	magic_quotes_gpc = On	Magic quotes for incoming GET/POST/Cookie data.
doc_root =	doc_root = C:\Inetpub\wwwroot	Room for script file storage.
extension_dir = "./"	extension_dir = "C:\php\ext"	Room for extended .
; cgi.force_redirect = 1	cgi.force_redirect = 0	Adjust value to 0
;upload_tmp_dir =	upload_tmp_dir = C:\php\uploadtmp	Temporary room for uploading
upload_max_filesize = 2M	upload_max_filesize = 10M	Maximum file size that user can upload (may be adjusted as appropriate)
;extension=php_gd2.dll ;extension=php_mysql.dll ;extension=php_mssql.dll	extension=php_gd2.dll extension=php_mysql.dll extension=php_mssql.dll	Increase extension as needed, by deleting the sign ‘;’.php_gd2.dll (GD Library) php_mysql.dll (MYSQL)php_mssql.dll (MS SQL Server)
SMTP = localhost smtp_port = 25	SMTP = localhost smtp_port = 25	Detail of SMTP Server

; For Win32 only. sendmail_from = me@example.com	; For Win32 only. sendmail_from = me@localhost or SMTP = mail.yourname.com smtp_port = 25 ; For Win32 only. sendmail_from = name@yourname.com	
;session.save_path = "/tmp"	session.save_path = "C:\php\sessiontmp"	Room for session file storage.

9 . More management (adjustment) of IIS by clicking on Home Directory tab.

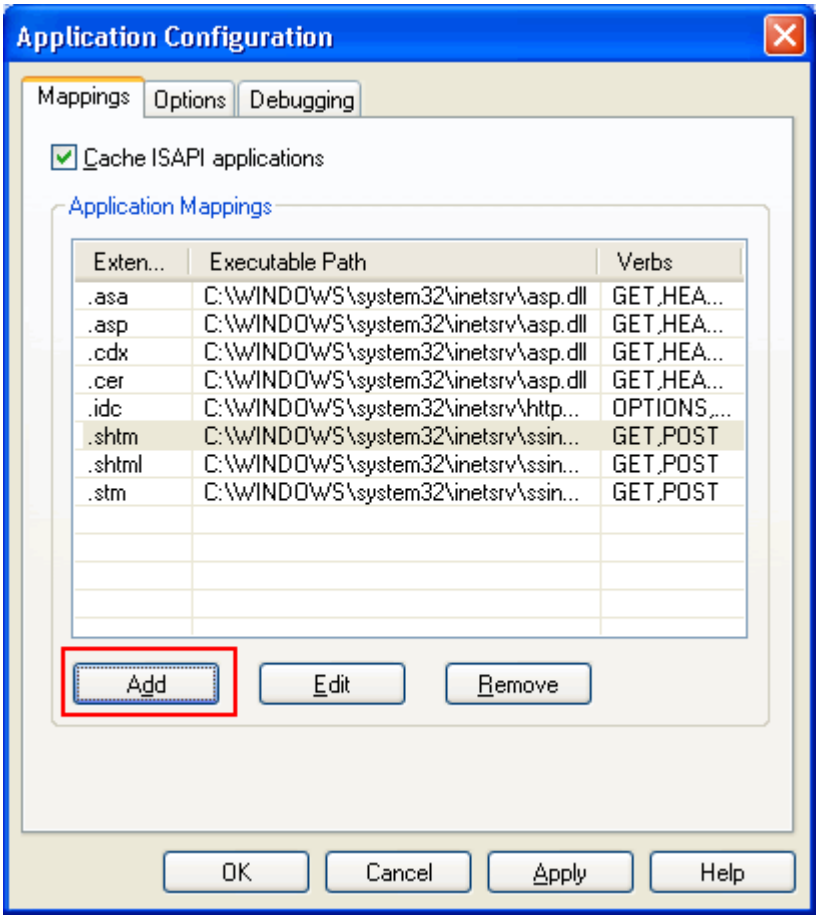
10 . Click on Configuration button.

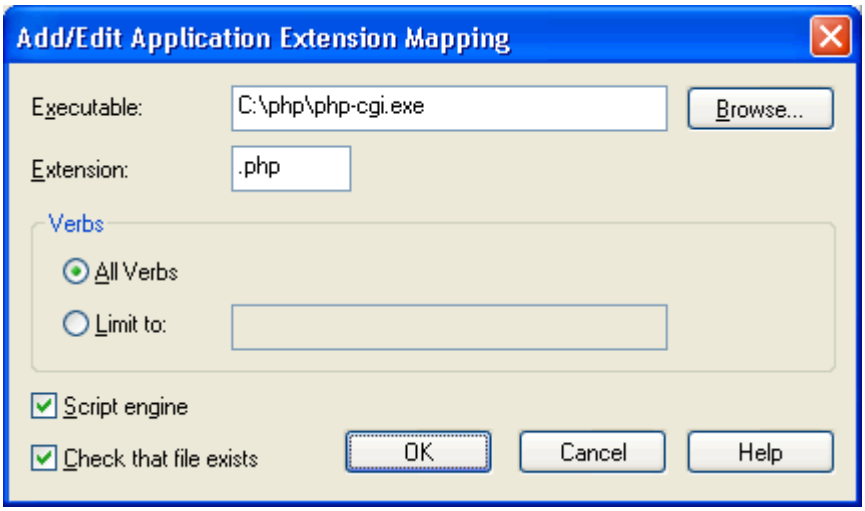


11 . Click on Add button and then adjust value as follow:

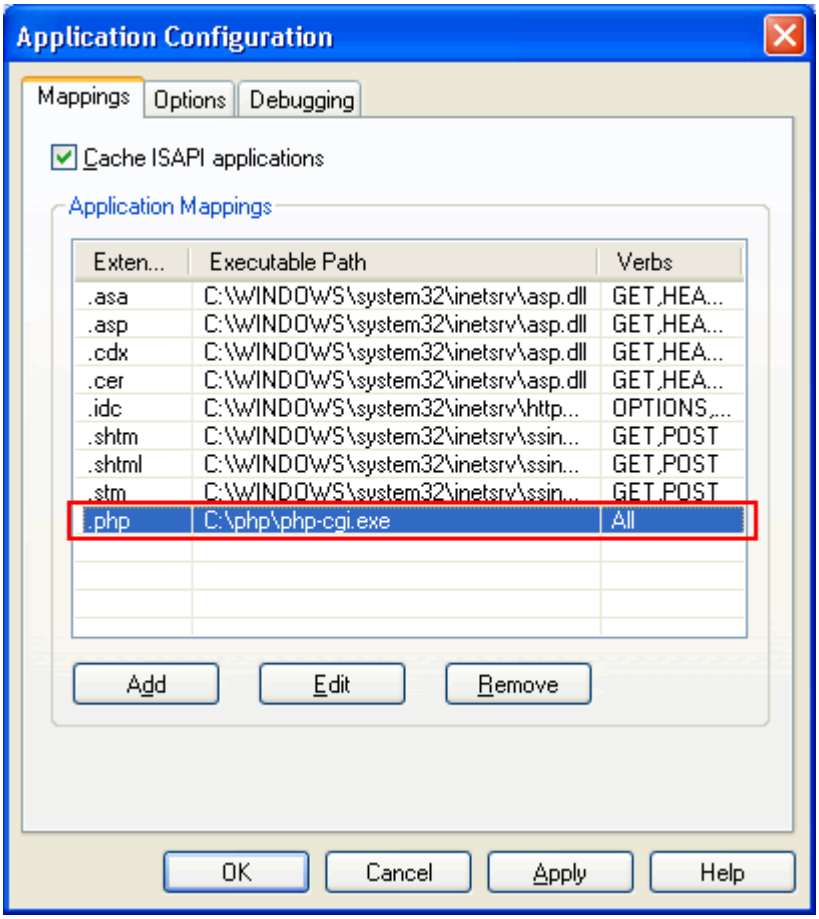
Executable : Browse to select php-cgi.exe file in C:\php folder.

Extension : Choose .PHP surname





12 . Click on **OK** button.



Path of PHP language compiler that is added.

13. Click on OK button 2 item

14. Click on Stop and Start buttons for 1 round.

BIOGRAPHY

NAME	Mr. Supot Sornsang
DATE OF BIRTH	August 27, 1968
PLACE OF BIRTH	Nakhonratchasima, Thailand
INSTITUTIONS ATTENDED	Rajabhat Institute Petchburiwittayalongkorn , 2001: Bachelor of Science (Industrial Technology) Mahidol University, 2008: Master of Science (Computer Science)
POSITION & OFFICE	2003 – Present, Revenue Department, Bangkok, Thailand Position: Computer Technical Officer