THE LAWHILL MAILBOX™

A COMPREHENSIVE INFORMATION PACK

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Introduction

In recent years, Complete Paper Solutions Limited has investigated various devices which could be applied to the checking of printed output, this has included everything from simple OMR to magnetic character recognition, image processing, radio frequency tagging and laser scanning. The widespread adoption of such devices has generally been limited due to the balance between customer demand (which has been on the increase) and the cost of implementing the technology involved (which is on the decrease).

Research, much of which has been conducted in the United States, has found that manual keying errors typically occur once every 400 characters, whereas OCR equipment manages an error rate of around one in 10,000 characters scanned. In comparison to these results, even ‘good’ printing at up to 240 dots per inch will result in bar code scanning errors of only one every 3 million characters. ‘Excellent’ printing at up to 720 dots per inch has been found to increase this error rate to about one in 80 million characters scanned.

Bar code scanning has an important safety net to catch these misreads in the inherent and automatic self check function which the decoder runs after each scan. If a character is substituted, it will always be picked up, and when one considers the cross checking procedure run against the machine programme, the chances of an incorrect document escaping detection are practically zero.

The most appropriate integrity device for connection to the Lawhill Mailbox™ is therefore a system based on bar code scanning, and in combination with any standard or bespoke inserting equipment, provides the necessary additional intelligence for the relevant objectives required within today’s mailing processes.

Background

Since the introduction of laser printers in the 1970's, more sophistication has become possible in the post printer processing of computerised documents. Due to the advanced technology available in laser printing, it has become possible to identify documents in a more precise manner than using the older Optical Mark Recognition (OMR) devices which date back to the 1950's.

OMR has only a very limited variety of ways in which the identification of a group of documents can be identified (say 10 in a typical system), which means that in a typical day's production of say 30,000 letters for mailing out, there will be 3,000 sheets with identical coding. In the event that a sheet is missing or out of sequence due to an operator or printer error; one could be faced with a monumental task of sorting the problem if and when it was noticed. Obviously the commercial implications in sending the wrong information to the wrong client are many.

Laser printers are easily capable of producing a bar code, which is normally available as a standard font, at any desired position or orientation on the page. The code can be configured to possess the correct details required for the basic intelligent mailing processes which are :

- a three digit set number to separate identical mailings by up to a thousand
- a series of numbers to represent individual feeder stations (possibly 6 digits)
- a single digit (0 or 1) or a five digit code to indicate a change of Mailsort area

The use of a conventional industrial code such as Interleaved 2 of 5, or Code 3 of 9, allows all of these features together with the advantages of possessing a self check function and a narrow form which when printed within the sheet margin or even near to the address for reading through an envelope window, does not become too detracting.

Introduction

The requirement is for a bar code reading system to provide selective inserting, document matching and Mailsort separation within the operational processes of any existing inserting equipment. The basic MAILBOX™ package is concerned not only with the reading of inserted documents and the control of the various inserter functions but also includes for all standard mechanical and electrical modifications required by the machine for these functions to operate successfully.

Basic inserting equipment can be configured to output the finished envelope as either 'face up' or 'face down' and in this respect the implementation of coding the documents must be considered before the introduction of any added intelligence within the process. Details regarding all aspects of implementation are discussed at length in Section 5, but for the purposes of describing the basic equipment and its functions, this section will deal only with those inserting systems, such as the Bell & Howell 'Phillipsburg', which insert documents 'face down' into envelopes, and where the station furthest from the insertion process will always carry the prime or address document.

The three most frequently needed functions of the Lawhill MAILBOX™, for Direct Mail processes, are detailed below and are followed by a brief description of the basic hardware and its operation.

Selective Inserting

To control this process, a laser bar code scanner will be attached beneath the first feeder station mounted along the infeed track of the inserter system. This will read a bar code which is pre-printed on each prime document delivered onto the infeed track and since each document set must always have an address carrier, control of the other feeder stations is straightforward. The code will contain the information required to activate those other stations which will feed the correct inserts onto the prime document as it reaches those particular feeder stations. The bar code can be written in a number of ways depending on the number of feeder stations. For a small number of additional stations, say three, then a three digit code could represent the on or off status in binary format. '1' would represent document feed and '0' no feed and obviously one or all of the stations can operate in response to the prime document depending on the number of '0's and '1's in the bar code. If there are say up to five additional feeder stations, then this system may create longer bar codes than required and in this case a two digit number representing any particular feeder station combination could be used as an alternative.

Document Matching

This system will initially provide for the matching of documents in four feeder stations, and would always include the first feeder station for utilisation during selective inserting and probably the last feeder station with two others between. For matching to operate, an additional laser scanner is provided at each feeder station where matching is required. The bar codes which are pre-printed on each prime document are in a fixed sequence and obviously the matching codes on documents from other stations must be in the same pre-arranged sequence, but do not necessarily have to be identical. For example, all matching stations could have a single digit which matches say the last digit on the prime document. This would not be very secure as the sequence is repeated every ten documents, but would be easier to camouflage if visual impact is important. Increasing the number of digits to two gives a tenfold increase in document integrity, but would marginally lengthen the bar code. During normal processing, the correct matching of documents enables the inserter to operate continuously until a miss-match stops the complete machine. The control software will be designed to provide matching through an unlimited number of feeder stations and thus provide an expandable system which can be added to at any time in the future. A feeder station kit will provide all the necessary hardware, plus the laser scanner, and would also include installation and commissioning.

Mailsort Separation

Mailsort separation can be triggered in a number of different ways, but the required information is always stored within the pre-printed bar code on the prime document. For full audit control and total integrity, the Mailsort bar code can be positioned so that it can be scanned through the envelope window after completion of the inserting process, but could be placed anywhere on the prime document if customer preference is for a less obvious appearance.

In its simplest form the code can be represented by a single digit which changes from say ‘0’ to ‘1’ with the Mailsort district and then changes back to ‘0’ with the next district. In this type of application, the bar code is placed into a simple shift register within the PC control system effectively ‘tagging’ the information to the particular document. If the ‘tag’ on any document is different from the previous one, signifying a change of Mailsort district, then the envelope containing this document will be processed differently when it arrives at the station where separation occurs. The separating device might be a simple mechanism for deflecting the envelope as the Mailsort district changes, such that the operator can see where the separations occur, or might temporarily speed up a shingle stack output conveyor to create gaps between the envelopes in consecutive Mailsort districts. More information can be obtained by showing the five digit code which represents the Mailsort district number and this is discussed in more detail in Section 6.

Brief Description of the System

The Lawhill MAILBOX™ bar code reading system consists of an enclosed Inserter Interface Box, a Windows '98 based PC with keyboard etc. and up to six Erwin Sick CLV-412 laser scanners for mounting at each of the designated feeder stations. The system arrangement is as illustrated in Appendix 1 with standard items shown in pink and optional upgrades shown in blue. One of the PC's serial ports is connected to the Inserter Interface Box to which are connected the two or more bar code readers to form an internal scanning network. The other serial port is left available for a suitable label printer for Mailsort Tags if required (see Section 6 for more details). With the exception of the laser scanners, the complete system is housed either within the boundaries of the existing inserter framework or in a separate floor mounted cabinet with a single conduit leading to the inserting machine providing a dedicated station from which to monitor and control the system functions. The conduit between cabinet and machine carries the scanner cables and all cabling to the additional control devices mounted at each station. These provide, depending on inserter type, either suction or clutch control at each feeder station as well as additional circuitry for handling 'no feed' and 'mis-feed' signals.

As the system operates, signals pass between the control box and the inserter which control the individual feeder stations and the stop, reset and start features of the machine. All the existing fault conditions within the inserter are unaffected and additional errors in mis-matching or selective inserting are indicated on the PC's colour monitor and these in turn control the inserter through the interfacing software.

The PC's colour monitor provides a complete operator interface and is designed at Lawhill in Microsoft Visual Basic to specifically meet the requirements of a particular project. This enables the customer to provide an input at the design stage in order that screen customisation and specific jargon etc. are correctly represented and identify with those parameters and working practices already in existence.

Implementation

It is necessary at this point to elaborate on the performance of bar coding against other forms of integrity checking. As indicated in the Introduction, bar code reading is significantly more secure, reliable and economical than any other form of code reading, and this is hardly a disputable fact since **every** item we purchase today in a supermarket or shop is marked with some form of bar code. However, it is not the bar code's performance or implementation which prevents customers using it, it is normally the relatively ugly appearance of the bar code or the fact that, to many people, the very word 'code' signifies something sinister. Fortunately, both of these common perceptions can now be answered with some degree of appeasement and the details below demonstrate why bar coded documents are on the increase. Although modern bar coding does not create as personal a document as one with no additional markings, it does provide the Direct Mail Industry with simpler and more cost effective solutions to their customer's requirements for added value.

The improvement of bar code reading laser scanners over the last five years has led to a new generation of hardware which is compact, economical, extremely fast and can read extremely small codes securely and safely. The demands are such that all mass produced, personalised documents can be more effectively processed utilising bar code technology and the example shown in Appendix 2 provides adequate proof that any organisation can allay their customers' fears with the right informative approach.

Prior to using the Lawhill MAILBOX™ with a 'face down' inserting machine, the prime documents in the first and matching documents in the selected matching stations must be pre-printed with the correct bar codes. The recommended type is code 3 of 9 which is a standard font available on all later laser and other non-impact printers. The bar code length will depend on the required level of integrity, but for example could be eight digits with an additional start and stop '*' symbol either end of the number string and should be no greater than 10mm in width. The minimum bar width will be 0.2 mm and the ratio of large bar to small bar should be 2.5:1 giving each digit a length of 4.2 mm and each code a total length of approximately 42 mm.

When the MAILBOX™ system is switched on it immediately initialises the Inserter Interface Box informing the inserter that connection is made. The monitor display now prompts the operator to enter specific job information from the keyboard. In addition to customer related specifics this information will set the system for selective inserting, document matching, Mailsort separation or any combination of these three to initialise the system for the next correct job specification. This job selection can be done automatically from the in-house network if the system is connected in this way.

Following this initial programme selection process, the inserting Machine is now started in the normal way and will continue to operate automatically until a fault occurs. If the fault is in the inserting machine, any fault message or signal will appear as normally displayed on a panel or by indicator lights. When the problem has been rectified and the machine restarted, the MAILBOX™ system will retain all the necessary data to continue operating without resetting the various feeder stations so that normal production can continue without delay. If the problem is bar code related, The PC's monitor will display the relevant correction information and record any missing job data resulting from the stoppage. After rectification of the fault the correct restart procedure will ensure that the system can resume production with the minimum of delay.

The integrity available within the bar code parameters can again be specifically designed to meet customer requirements and various options are available to give additional security to each job which is processed. The basic system will obviously detect match errors and prime document sequence errors, but will also identify blank documents, poorly printed bar codes (and therefore probably poorly printed documents) and incorrect orientation of documents. Other options (see Section 6) will guarantee that all insert stations are pre-loaded with the correct inserts for a particular job (if bar coded), Mailsort district Tags can be printed on-line as the last envelope in any area passes the print station, prevention of job completion until all documents are accounted for with hand scanning of all damaged document sets and many more which are commonly utilised in the Direct Mail environment.

Should the Lawhill MAILBOX™ be required for a 'face up' style of inserting machine such as a CMC Paper Mail-300 an additional 'Dummy' document must be inserted from the first inserter station to control the inserting process. With selective inserting, a laser bar code scanner will be attached to the first feeder station and this will read pre-printed bar codes on the 'dummy' prime documents. The code, in the same format as described earlier, will contain the information required to activate the correct inserts to be fed onto the 'dummy' sheet as it reaches those particular feeder stations. With document matching, the 'dummy' document will carry information duplicated on the prime document which in the 'face up' format must be added at the last inserter station so that the address is visible through the envelope window. Mailsort separation however, can still be effected by the relevant bar code only applied to the prime document in the last inserter station as this operation only occurs after the envelope is complete and finally sealed.

The result of an extra 'dummy' document may not seem cost effective at the outset, but this additional insert can have many useful functions such as customer advice and promotional advertising. This is certainly easier to implement than the only other viable alternative which allows for the feeding of the prime document at the first station and after inserting the complete document set into a plain envelope, adds an on-line printed address label to the outside.

System Upgrades

The MAILBOX™ System can be readily upgraded to include additional control software to enable the existing inserting system to perform other bar code related tasks. The options shown below are those which may be added at a future time and are all customer specific.

1) Additional Matching

The basic MAILBOX™ system provides for the matching of two documents on a six station inserting machine, but as detailed earlier, the software will cater for additional laser scanners which can be added at any time the need arises, with the minimum of cost, effort and delay.

With this option additional bar code readers (up to eight in total) could be added to other feeder stations to provide the system with a more versatile matching facility where many personalised documents are required correctly collated within the same package.

2) Network Audit Trail Capability

This option allows more detailed Mailsort information to be read and compared on-line to your in-house computer communications network so that all documents entering and registered by your main frame can be stored and cross checked with each and every document package as it leaves the conveyor of the inserting system, having completed every step in the production process.

To successfully install this system, additional Mailsort information, in the correct format, is required within the pre-printed bar code and this must be supplied initially from the specific job data already existing within your network when a particular Mailsort job is active and laid down during the printing process. This data, taken at the last production stage, and passed via a terminal server connected to the MAILBOX™, can now be easily compared to that already on the in-house network, and will effectively close the audit 'loop'.

Taking this a stage further, the situation often arises that a number of inserting machines are required to work from an already overloaded in-house network system giving data traffic problems and slow response times. A special Lawhill MAILBOX™ system has been designed to cope with this situation and a schematic is shown in Appendix 3 with two inserter systems attached. The intermittent communications problems can probably be put down to one or a combination of the following :-

- Requests for action from the inserter software has to 'fight' its way amongst mainframe network traffic in order to reach the Host Server that is running the applicable Job Program.

- The Host will 'get around' to processing the requests, amongst all the others entering the network.
- The response to the original request has to 'fight' its way back to the inserting machine.

Any time delays due to such problems will not be consistent, and depending on the amount of other traffic using the network, intermittent failures will be inevitable.

The Lawhill MAILBOX™ consists of three main component systems which interact to provide the control and communications required to provide a solution which can work independently of the mainframe network, but can access information held on it, on a regularised daily, shift-by shift, or hourly basis. This means that an independent 'Inserters Network' can operate without external and unknown influences affecting its performance, but can still relate continuously to live job information.

The first main component of the MAILBOX ™ system is the 'Communications Platform' which consists of suitable (fast with large memory and storage capacity) PC running Windows NT Server software. This becomes the 'Local' Server and has two Network Interface Cards (NICS). One card is connected to the existing Mainframe's Network, and the other forms the 'Local' Network to which the 'Inserter Sub-systems' are connected. This enables the Mainframe to send operational job data to the 'Local' Server at pre-determined 'quiet' times, between shifts say, which can then be accessed by the 'Inserter Sub-systems' on the 'Local' Network, whilst the Routing function of the Local Server isolates the two Networks from each other. This means that unnecessary traffic on the Mainframe Network will not be transmitted on the 'Local' Network, (and vice-versa), ensuring fast and consistent 'Local' communication.

The PC, complete with enclosure, monitor and keyboard, is housed in a separate portable cubicle in the area of the inserting machines. Cabling to the sub-systems is contained within permanent trunking attached to the frameworks of each inserting machine, and flexible conduit connections are made between these and the cubicle. To enable full back-up facilities within the 'Local' Server environment, a SCSI card and Tape Streamer are provided, which will run from pre-loaded scheduling software, to ensure that file copying is automatically activated at regular intervals. Also included in the 'Communications Platform' is an Ethernet Hub which allows up to four 'Inserter Sub-systems' to be connected to, and interact with, the 'Local' Server to form the new 'Inserter Network'. Each 'Inserter Sub-system' consists of a suitable PC which has a 'Local' Network card so it is able to access data held on the 'Local' Server to perform the required actions within the particular sub-system. Connected to the two serial ports of this PC are a Bar Code Laser Scanner and a Mailsort Tag printer. The diagram in Appendix 3 shows only bar code reader which is for Mailsort separation only, but as with all MAILBOX™, multiple readers can be utilised for the various inserter functions. The Label Printers are mounted at a convenient station on the output conveyor as are the PCs, complete with desktop enclosure, monitor and keyboard. All cabling will be effected through the conduit trunking leading back to the 'Local' Server PC in the portable cubicle.

3) Bar Code Reader Replacement System

The photographs in Appendix 4 demonstrate another feature of the Lawhill MAILBOX™ which in this modified form can be programmed to mimic any other manufacturer's bar code reading device. The set up shown is at the site of a third party processor in Basildon where the requirement was to replace Microscan MS3000 read heads plus separate decoder cards and MS4000 read heads plus integral decoders with compatible Erwin Sick devices. The original Microscan units were attached to Pitney Bowes 8300 machines running Formscan integrity software and the replacements were to be 100% interchangeable without the requirement for any changes in this existing software. The requirements for this particular customer were a need to replace older, unreliable equipment, but the scale of economy with installing the Lawhill MAILBOX™ alternative bar code reading system is such, that even on newer installations the advantages to the customer of having an alternative supplier can only lead to added value within existing inserting equipment.

Appendices 6

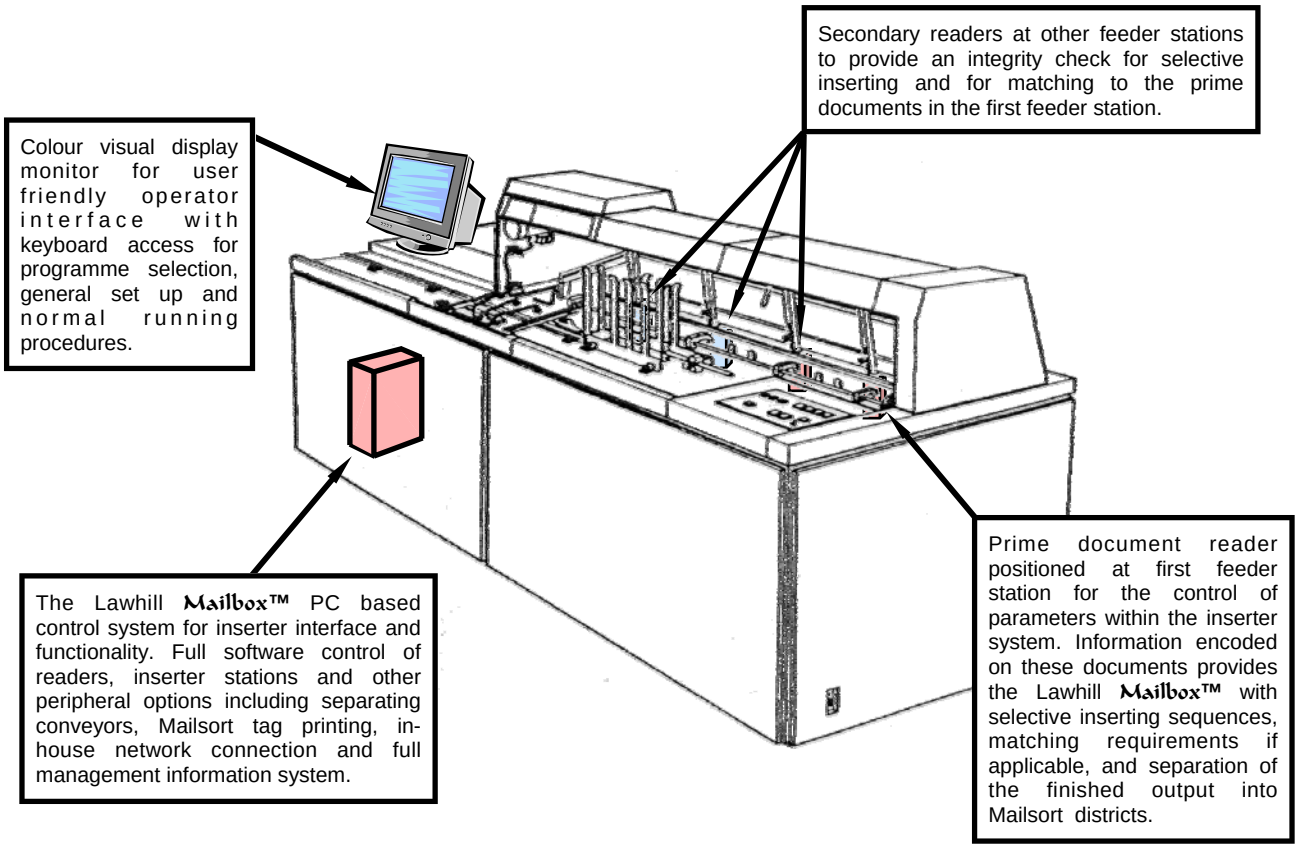
Appendix 1 — Typical Application and Schematic of Basic System Components

Appendix 2 — Typical Bar Code Application - The Counterpart Driving Licence

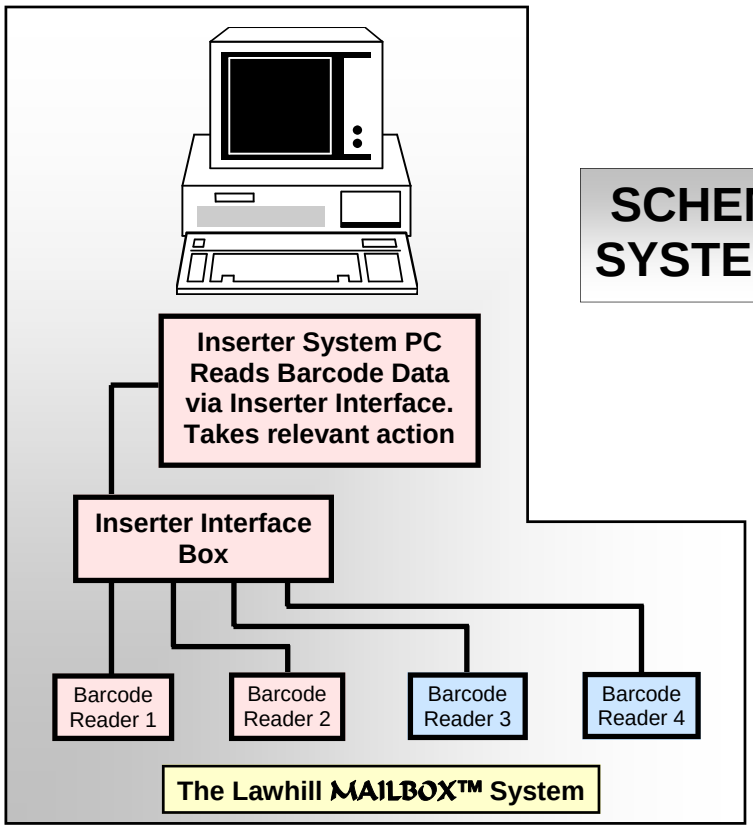
Appendix 3 — Schematic of the Basic Modules Within a Dedicated Networked System

Appendix 4 — Photographs of Typical Bar Code Reader Replacement System

TYPICAL APPLICATION



SCHEMATIC OF BASIC SYSTEM COMPONENTS



Keep this safe

Counterpart Driving Licence

3805148 D740

DVLA Driver and Vehicle Licensing Agency

Important Document - The photocard and paper counterpart together make up the complete driving licence and should be kept together. Both must be produced when required.

What should I do if I want to change the photograph on my licence before you ask me to or I change my name or address?

To change your name or photograph you will need to ask for form D750 from the post office.

To notify a change of address, complete the changes section on the bottom of the counterpart driving licence.

In all cases, send both the counterpart and photocard licences to DVLA.

What about "old style" paper driving licences?

Photocard licences have now replaced paper ones. However, paper driving licences already in circulation will remain valid for the forseeable future.

What should I do if I declared my old licence lost/stolen when I applied for a photocard and it has now been found?

You must return your old licence to DVLA with a covering letter since it is no longer valid and it would be illegal to use it.

What is the barcode used for?

The numeric barcode on both the photocard and the counterpart licence are solely for DVLA production purposes. They do not contain any coded information about the holder of the driving licence.

Important Note – Your identity documents

- Your identity document/s have been returned to you by separate post
- These should be returned to you within the next 4 or 5 days

If they have not arrived within 10 working days, you should contact DVLA Customer Enquiries on **01792 772151** or fax **01792 783071** or Email on: drivers.dvla@gtnet.gov.uk or write to: Customer Enquiries, DVLA, Swansea SA6 7JL

You will need to give your driver number or your full name and date of birth.

Ring between: 8.15am and 4.30pm Monday to Friday.

Unless you contact us within three months of the date of your licence application we shall not be able to conduct the necessary follow up investigation both at DVLA and with Royal Mail. DVLA would not be liable to any claim after the three month period.

6500130300

000131626106

Driver number: SANDE 801063 0J9FT

Issue number: 06A

tegory details)

Category	From	Until	Codes

leaflet INS 57P for offence codes

Year	Fine £	Disqual. period	Other	Penalty points

Entitlement History (see Section 3 overleaf)

Category	From	Codes

NOTE: < means "earlier than"

You may only drive the above if you hold current entitlement for a higher category.

Official Use

Changes *to your permanent address, please write clearly in the boxes using CAPITAL LETTERS IN BLACK INK. (See Section 5 overleaf)*

New house No.

New address

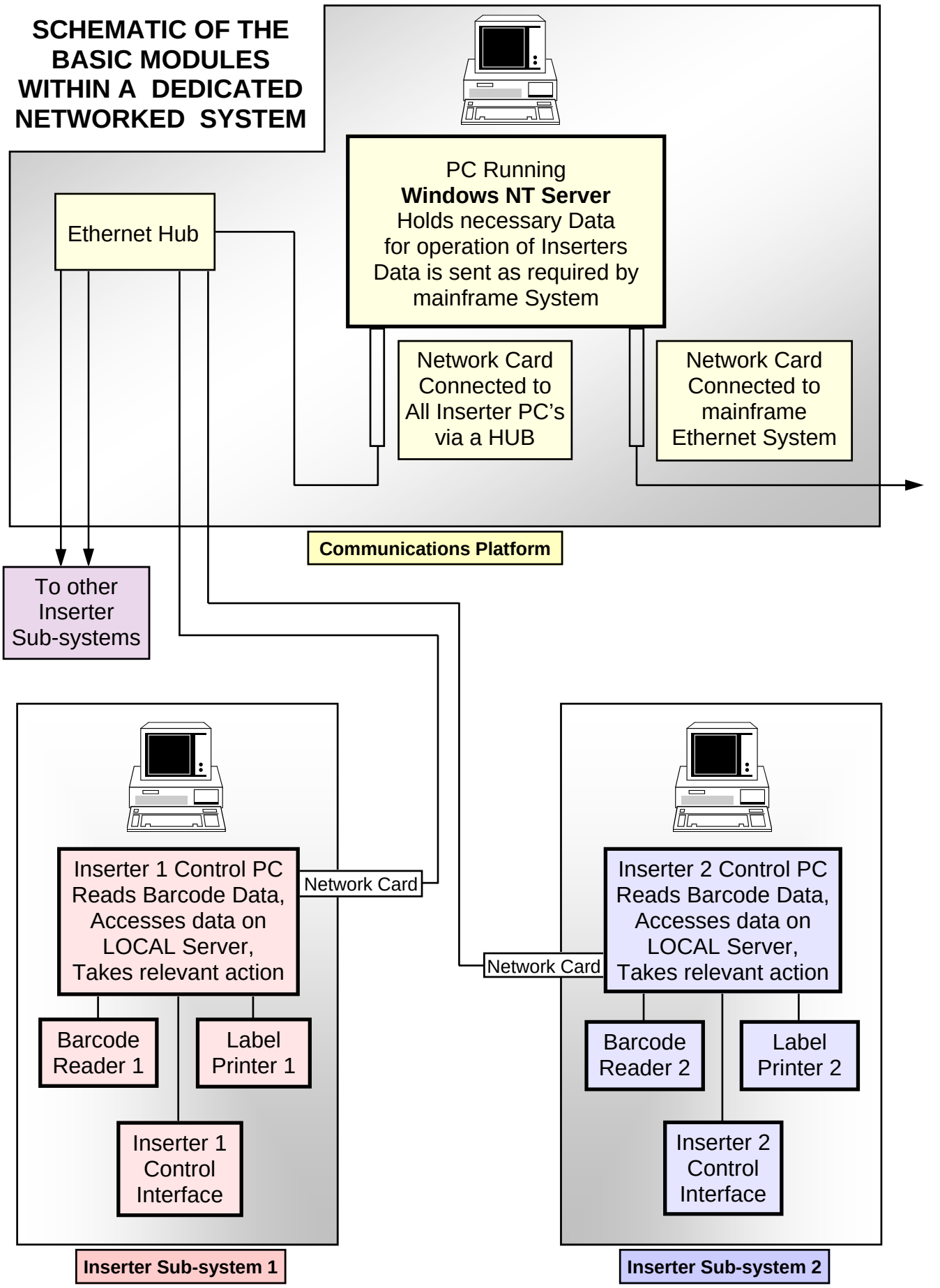
This document mus… …ined from most post offices.

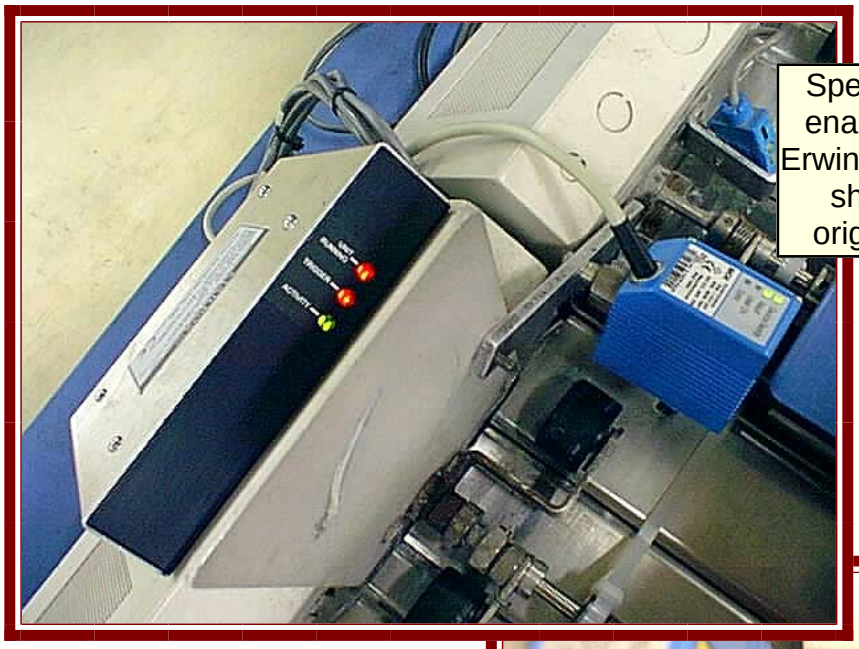
to confirm changes

Date

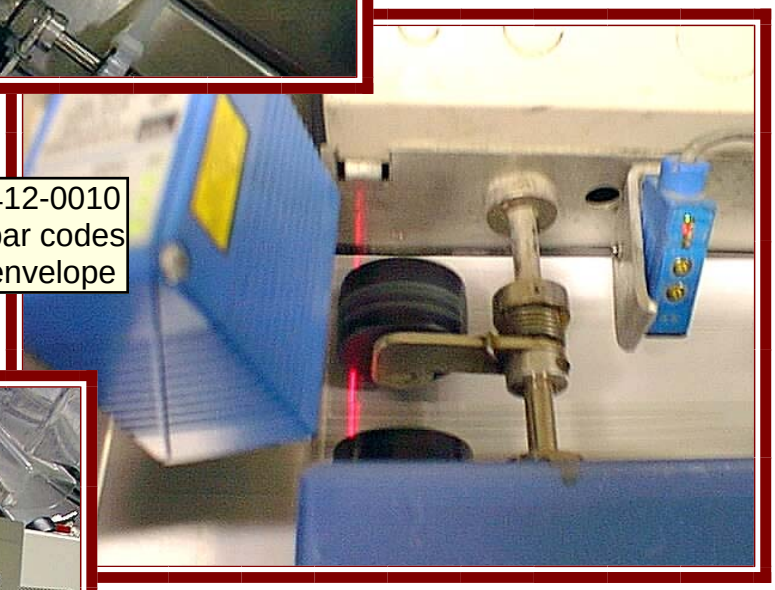
3805148 Send the completed form with your photocard licence to DVLA, Swansea, SA99 1BN July/99

The new Counterpart Driving Licence now issued by DVLA. The bar code at the top of the sheet allows for the correct inserts to be added depending on the type of licence (Provisional in this case) and also contains the Mailsort district information for economy of distribution. The inset to the left is the explanation leaflet sent out with all new licences and includes a suitable note (circled) regarding the content of the bar code.


SCHEMATIC OF THE BASIC MODULES WITHIN A DEDICATED NETWORKED SYSTEM
PC Running
Windows NT Server
Holds necessary Data for operation of Inserters
Data is sent as required by mainframe System
Ethernet Hub
Network Card Connected to All Inserter PC's via a HUB
Network Card Connected to mainframe Ethernet System
Communications Platform
To other Inserter Sub-systems
Inserter 1 Control PC Reads Barcode Data, Accesses data on LOCAL Server, Takes relevant action
Network Card
Barcode Reader 1
Label Printer 1
Inserter 1 Control Interface
Inserter Sub-system 1
Network Card
Inserter 2 Control PC Reads Barcode Data, Accesses data on LOCAL Server, Takes relevant action
Barcode Reader 2
Label Printer 2
Inserter 2 Control Interface
Inserter Sub-system 2



Special MAILBOX™ to enable the replacement Erwin Sick bar code reader shown, to mimic the original Microscan unit



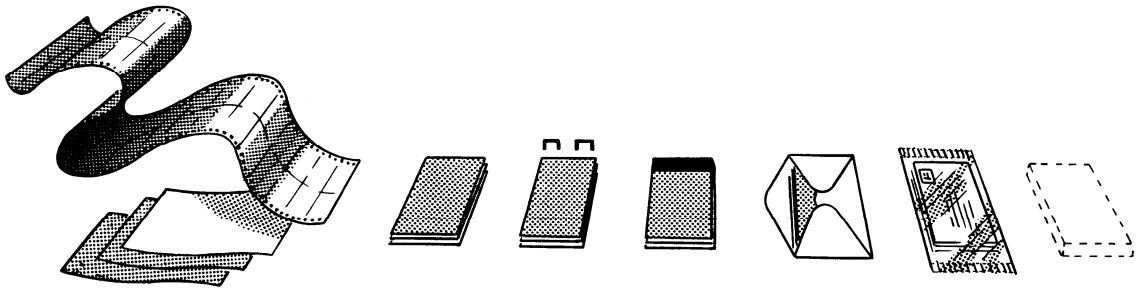
The Erwin Sick CLV412-0010 line scanner reading bar codes through the passing envelope

The MAILBOX™ mimic unit

The MAILBOX™ mimic unit internally

COMPLETE PAPER SOLUTIONS LIMITED

Unit 2 . Ladycross Business Park
Hollow Lane . Dormansland
Surrey . RH7 6PB . UK



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