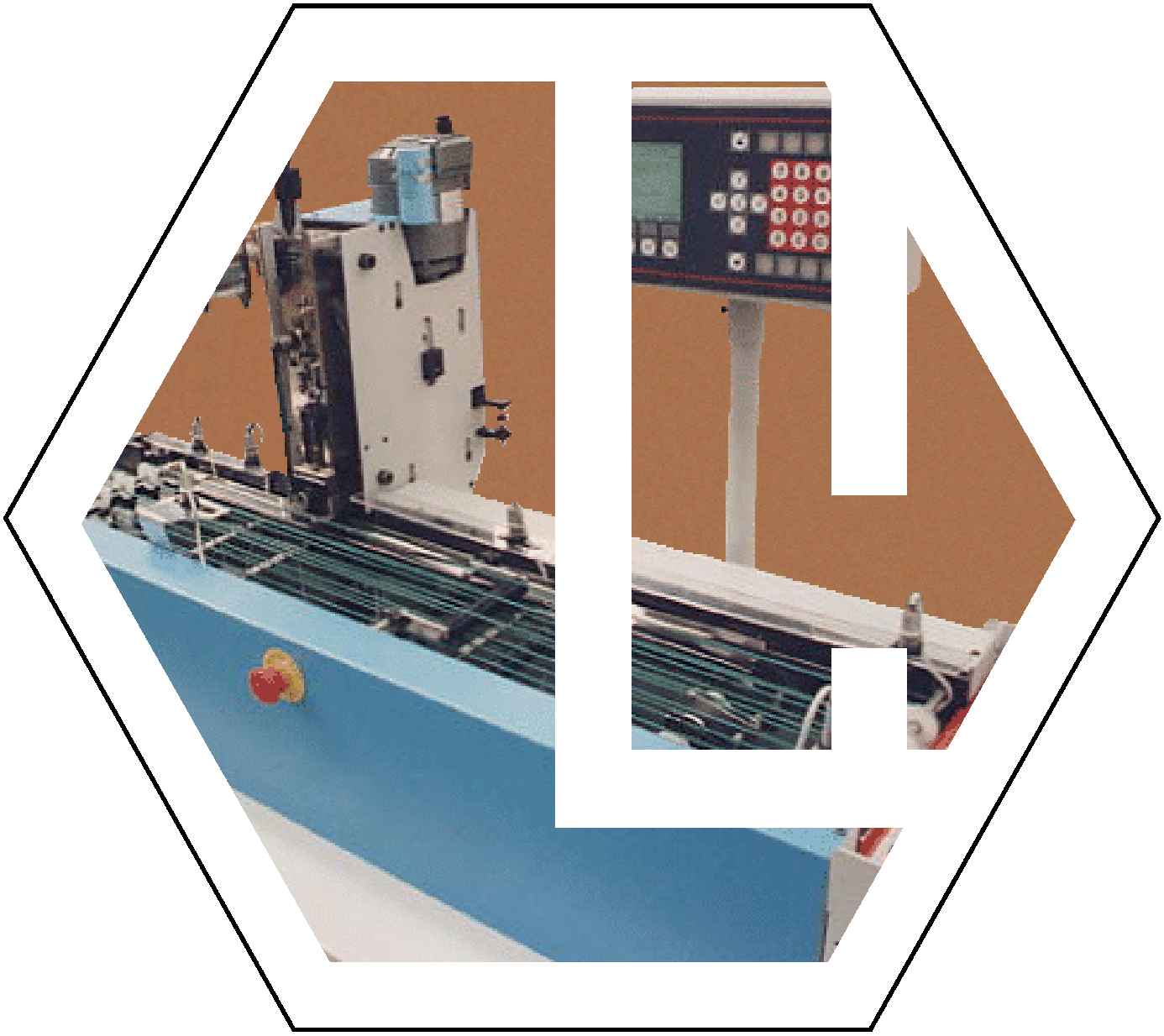
LAWHILL



LARGE FORMAT BOOKMAKER

A COMPLETE SYSTEM FOR COLLATING AND FINISHING

A COMPREHENSIVE INFORMATION PACK

Index

Introduction

Lawhill is a relatively small company designing and manufacturing special purpose systems, mainly as solutions for paper handling and finishing problems in the security and electronic printing environment. The broad range of projects with which we are occupied has involved us with many technologies not normally connected with the data processing industry, in which we have concentrated over recent years. This diversity and the lack of any conventional production line, allows Lawhill to be very flexible in its response to customer demand. It is our aim to become experts in any necessary field and to apply that knowledge to each project, thereby maintaining a lead which others must follow.

In recent years, Lawhill 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 the Large Format Bookmaker is therefore a system based on bar code scanning, and in combination with standard finishing equipment, enables the verifiable production of A4 booklets from pre-printed laser stock.

Background Information

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 sheets 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 8,000 sets, there will be 800 finished documents with identical coding. In the event that a page (or complete document) 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 minimal detail such as :

- the set number
- the number of pages in the set
- the number of any particular page in the set

But printed along the hidden or spine edge of the booklet, the code can be relatively long and can therefore include other important information such as :

- the account or reference number
- the details of any particular page
- the type of stock required for that page

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 to allow hiding of the code under the tape on the spine edge of the booklet. With this facility, each and every page can possess an individual identification which can be used for complete integrity, ensuring operation is trouble free.

Integrity

For the purpose of verifying a book is ‘correct’, a check procedure has to be conducted on each and every page. This can be performed within the printer itself, or with a dedicated off-line device; but in both cases there is the potential for problems caused during transferral of the documents from one machine to another by accidental or careless handling. We believe that the best chance of guaranteeing integrity is to perform these checks on the finishing system, immediately before the separate pages of the booklet become packaged as a single document.

The criteria for such a system are :

- a bulk feeder for the continual delivery of the pre-printed stock
- a sheet feeder which will decollate the stock fed from the bulk feeder
- a reading system to check each individual decollated sheet
- an integrated intelligent programme which will process the information acquired
- a flexible and accessible operator interface
- a device which will re-collate the checked sheets into the designated set while maintaining the correct sequence
- a mechanical connection to move the completed set into a finishing system
- a finishing system which packages the set into a single booklet form by stitching and taping, perfect binding, Velo-binding or Wire-O binding.

These points are all addressed in what we generally describe as the LARGE FORMAT BOOKMAKER which became an addition to our modular range at the end of 1992.

Every sheet has a bar code along the stub edge which is applied by the laser printer and normally the bar code type resides as a standard text font in the printer’s software configuration. As each sheet is passed over the scanning head, the information contained in the bar code is decoded, memorised and verified against what the expected data should be. By comparing this information with each subsequent sheet in the set, the following errors can be recognised :

- all pages have been printed
- all pages are in the correct order
- all pages belong to the same set
- no pages have been printed twice
- no blank sheets exist in the set
- the information is in the correct orientation

When an error is recognised, the system will stop within one sheet of the offending page and will display a suitable message on the display screen of the control panel. It is at this point that the part set can be removed by the operator for checking; what procedure is followed thereafter is for the user to choose, but a hand held reading device can be incorporated which together with the Lawhill Management Information System (MIS), will provide detailed reporting to ensure errors are kept at a minimum and quality or operation is maintained. If the integrity checking forms part of a user's marketing drive towards a 'Quality' service to its customers, this management information would be necessary to ensure a complete Audit Trail.

The version of the Large Format Bookmaker described in this document allows for the feeding of pre-collated output from a laser or other cut sheet printing device where the various input bins may have a range of paper stocks varying from 80 gsm to 200 gsm. Should a requirement exist for a booklet to contain more sheet stocks that the printer has input bins, then an optional tower feeder (shown in figure iii) can be mounted above the collating area to add extra documents to the collation. These can be personalised or non-personalised since they will also pass over the bar code reading device before they enter the set make-up.

The bar code which is printed by the laser printer onto those sheets with personalised data is discrete in the sense that it is specified to that particular set and therefore has no (or minimal) chance of becoming mixed with another set using the same identity code.

A typical format is :

Digits 1-4 inclusive. : Set identifier, numbered sequentially by the laser. The number of variations possible in this sequence directly correlates to the inherent security in the process; OMR has typically 10 options. The ideal is for this set identifier to appear as rarely as possible, so that the possibility of an address page numbered as belonging to set 0001 cannot become accidentally mixed by careless handling with another set starting 0001. Four digits allows this to occur once in every 9999 booklets, but could be increased to 5 or 6 to separate identically numbered sets by up to a month or more.

Digits 5 & 6 : Total number of sheets in the booklet identifier which will appear as the same printed code on all sheets within that particular set, but can be any random number within the size range of the system. For example 09 would represent a nine page booklet set.

Digits 7 & 8 : Sheet sequence identifier, numbered sequentially by the laser printer according to the order of that sheet in the booklet set. For example 01 would represent the front cover of the set, whereas 09 would represent the back cover of a nine page set.

Procedure of Operation

The Lawhill Large Format Bookmaker is configured from a number of standard Lawhill Series 5 Modules as shown in the photographs and figures i, ii, & iii in the Appendices Section at the end of this information leaflet.

- The 'AUTOMATE' automatic sheet feeder which accepts the printed output, reads, sorts and collates the pages using bar codes printed on each sheet.

- The optional Tower Feeder which is an add-on modular unit for the inclusion of personalised or non-personalised documents which cannot pass through the normal printing cycle.

- The Stitching Module which uses continuous wire to form three staples along the spine edge of the booklet.

- The Taping Module which applies self adhesive tape along the spine edge of the booklet to cover the staples formed at the Stitching Module.

- The conveyor to collect and stack the finished booklets.

There are basically two types of system, the choice being dependent upon the manner of printing employed, the type of printer and how the company wishes to present itself. When used with a Xerox 4135, the opportunities for flexibility are numerous due to the facility of four separate trays from which various stocks can be selected dynamically. Covers can be personalised, allowing the complete booklet to be made in A4 format, fully collated before leaving the printer. Such a system is shown in Figures i and ii and the photographs in the Appendices at the end of this booklet. If the covers or other documents are not to be personalised, or there is a restriction on the number of stocks which can be handled by the printer, then these can be added into the collection separately from the Tower Feeder as shown in Figure iii. This allows the number of stocks available to be considerably more than the four bins available in the Xerox.

A typical production sequence is described on the following page.

Operation

- The printed A4 sheets are taken from the laser printer and placed face down, head first, onto the infeed tray of the Bulk Feeder section of the Lawhill ‘Automate’. Upon starting up the system, this device shingle feeds the pages into a conventional suction feeding device which can separate and deliver individual sheets. The bulk feeder will only fill the suction feeder to a pre-determined level and will then stop.

- The bar coded sheets are fed one at a time from the Suction Feeder into a collating area.

- As each sheet exits the suction feeder its bar code is read by a laser scanner so that each set is progressively assembled in the collating area from individually checked and verified sheets.

- As the number of sheets within the suction feeder decreases, the bulk feeder automatically re-starts to maintain the required level and will continue this ‘topping up’ through automatic operation. To maintain the volume of sheets within the bulk feeder, additional pre-printed stock can be added at any time to the infeed tray.

- If additional non-printed sheets are required, the appropriate type is selected from the Tower Feeder above. This can be preset through the control panel or determined by an extension to the bar code for that particular set. If the first page of the document set is required from the Tower Feeder, the information must be contained within the bar code of the previous set.

- When the full collation of the document set has been completed, with all the individual pages verified as ‘correct’, stops at the front of the collating area withdraw so that the finishing process may proceed.

- The set moves forward out of the collating area and stops at three discrete positions beneath the stitching unit for application of the three wire stitches. As the set reaches the first stitch position the collating stops automatically reset so that the next collation can begin.

- The set finally enters the Taping Module where the self adhesive tape is applied along the spine edge of the stitched booklet. The finished product is then passed onto the conveyor for stacking prior to loading into an inserting machine for ultimate mailing.

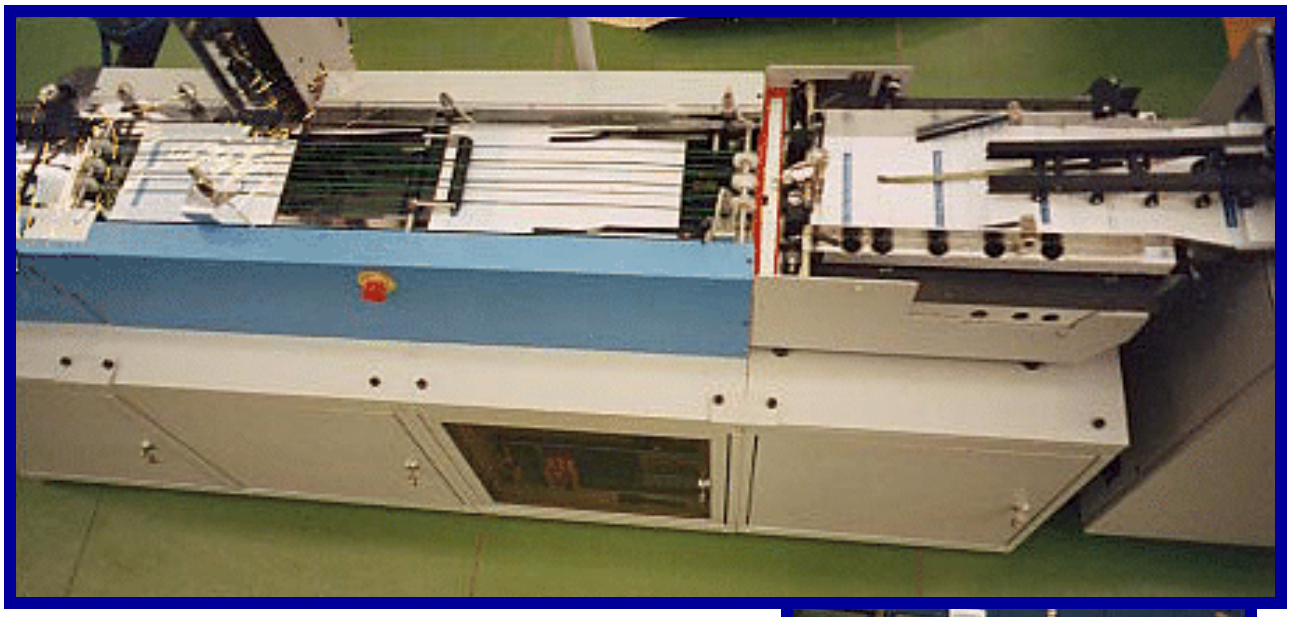
Appendix 5.1 Figure 1 - Photographs of Typical Large Format Bookmaker

Appendix 5.2 Figure 2 - Simple System using Pre-collated Stock

Appendix 5.3 Figure 3 - 'Automate' System with Tower Feeder

Appendix 5.4 Figure 4 - Typical Arrangement of Pages for A4 Booklet

Figure 1 - Photographs of Typical Large Format Bookmaker



This system utilises an AUTOMATE™ Module for collating insurance policy booklets or similar documents where absolute integrity is required. In this example, each completed book is finished with three wire stitches and edging tape to cover the stitched area. The pages are produced on a Rank Xerox laser unit from variable data and with suitable bar codes printed in the edge area which is ultimately hidden. The pages are then passed in bulk to the Bookmaker where each page is decollated, individually verified by a bar code reading device and then re-collated in a set prior to finishing.

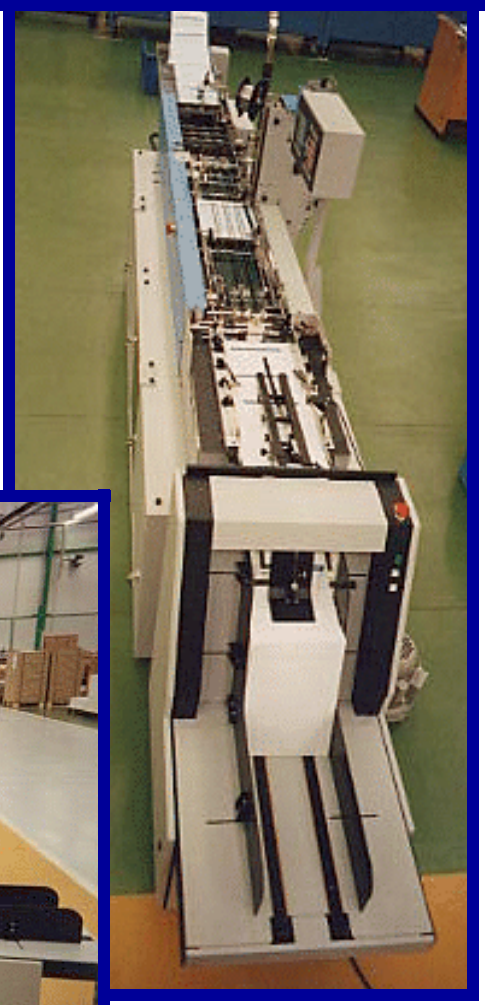


Figure 2 - Simple System Using Pre-collated Stock

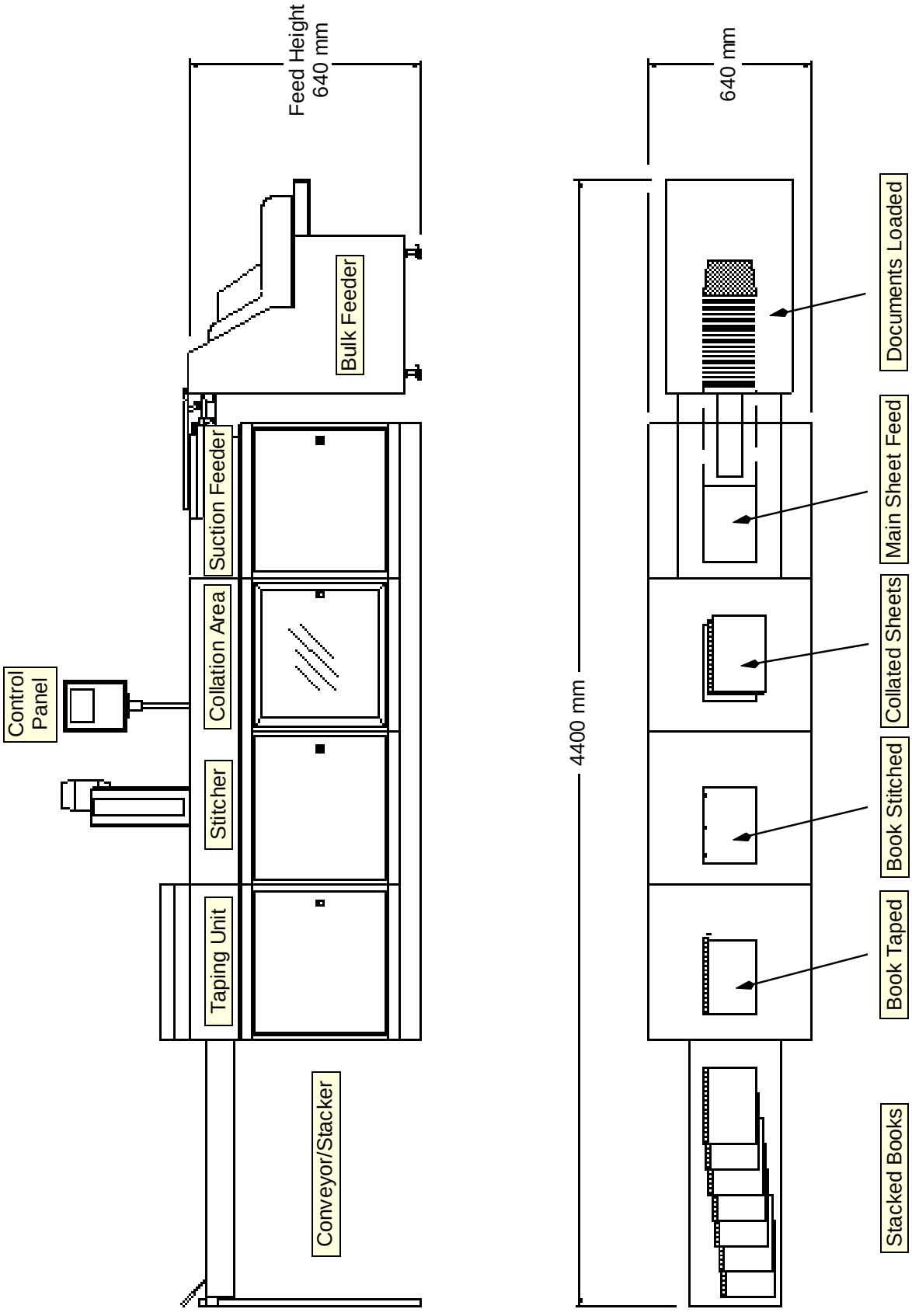


Figure 3 - AUTOMATE™ System with Tower Feeder

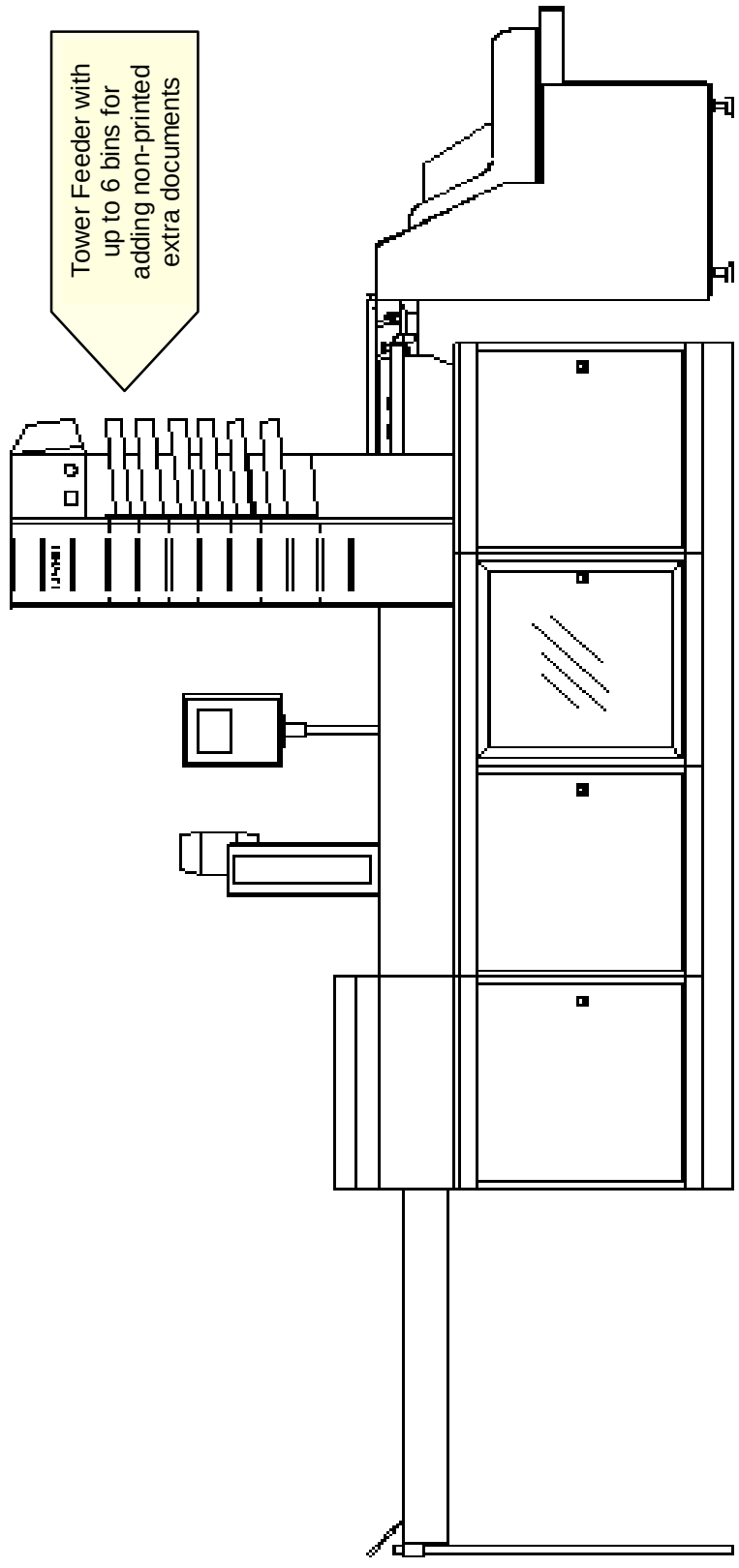
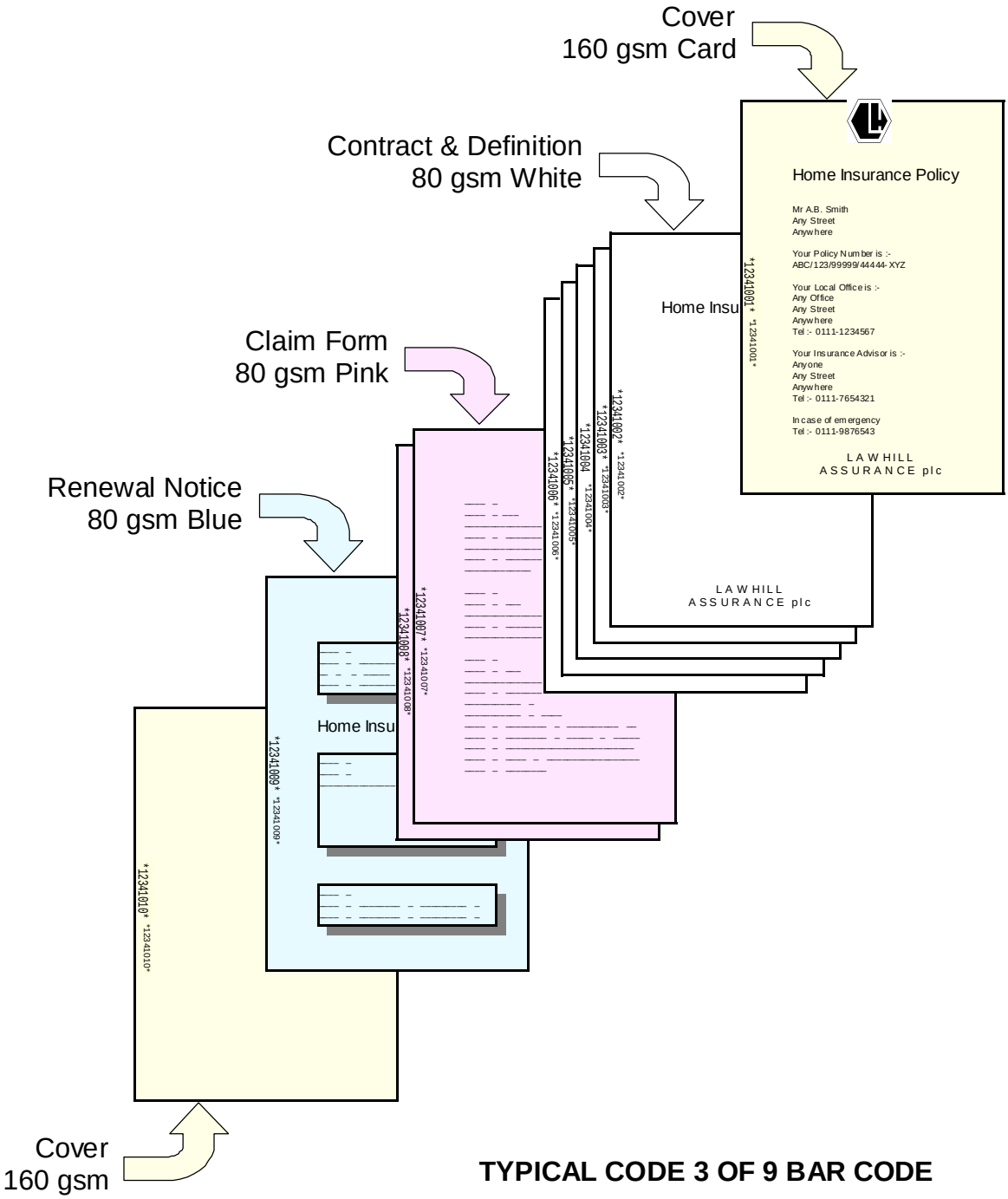


Figure 4 - Typical Arrangement of Pages for A4 Policy Booklet



TYPICAL CODE 3 OF 9 BAR CODE