PPI

Feasibility study of hide and leather identification systems M.668

1995

Prepared by:
Vision Abell Pty Ltd

ISBN:
Published: March 1995

MEAT & LIVESTOCK
AUSTRALIA

Vision Abell

CONTENTS

Vision Abell

CONTENTS (cont'd)

1. INTRODUCTION AND SUMMARY

Requirement For Hide And Leather Identification System

The hide identification system is a key part of the hide improvement program, operated by the Meat Research Corporation (MRC), designed to increase the quality of hide production in Australia. Hide quality can be improved by hide growing improvement and hide to leather process improvement. The implementation of a hide identification system will allow the traceability of hide quality information from finished leather back to the grower. Traceability of process information is also important in production process control at tanneries and abattoirs and is an essential requirement of quality assurance systems, in particular AS 3902.

The main benefit of a hide identification system is it will allow tanneries to implement payment systems where abattoirs are paid for hide quality as well as quantity. This has not been possible in the past, as hide quality can only be determined after wet blue processing. At this stage in the process hides from different abattoirs are mixed up. A payment system based on hide quality will in turn give more incentive for growers to produce better quality hides and reduce the number of butchering defects from abattoirs.

Results of Feasibility Study into Suitable Hide Identification Systems

A number of different potential hide identification systems were investigated, these systems included methods currently being used to identify hides and other technology not previously used in the industry. Three different groups of hide identification methods were investigated

1. Identification via modification of hide (Marking hide in some way). Typically these methods of identification were found to withstand the tanning process reasonably well, as the identification mark becomes an integral part of the hide. These methods however required more expensive marking and reading equipment.

2. Identification via attachment of identification device (Tagging). All tags had high readability rates although all systems had problems associated with tag attachment and tag survival through various tanning processes.

3. Identification via intrinsic property of hide. There were no suitable systems identified that use an intrinsic property of a hide for identification.

A number of trials were conducted at Michell Leather's Thebarton plant to test promising systems. These systems are detailed in the body of this report.

A trade off analysis was conducted on seven different identification systems. This analysis included a costing analysis and a comparison of the various systems against hide identification requirements as outlined by the MRC. The systems investigated in the trade off analysis included:

System 1 - Transponder Tags

System uses transponder tags to identify hides. Highest cost system to implement due to high cost of tags.

System 2 - Disposable Bar Code Tagging System

Disposable bar code tags used to identify hides. Reasonable high cost system as tags have to be removed and reattached during several processes.

System 3 - Recyclable Laser Marked Bar Code Tags and Punched Holes (punched after samming at wet blue tannery)

This system uses a combination of identification systems (ie bar code tags and punched holes) to reduce capital cost of equipment at abattoirs and labour cost at tanneries. The system operating cost is reasonably low.

System 4.1 - Recyclable Laser Marked Bar Code Tags and Punched Holes (punched after fleshing at wet blue tannery)

Similar to system 3 although requires less labour and is therefore cheaper to operate. This system is one of the recommended systems for implementation. The system operating cost is approximately 35 cents per hide.

System 4.2 - Disposable Bar Code Tags and Punched Holes (punched after fleshing at wet blue tannery)

This system is similar to system 4.1, except cheap, disposable bar code tags are used instead of high cost laser marked tags. Disposable bar code tags have the advantage that a unique number can be given to each hide, as tags are not reused. This system is dependant on identifying a bar code tag material with suitable properties that will survive the hide preserving processes used before wet blue processing. The system operating cost is similar to system 4.1, this system is also recommended.

System 5.1 - Tattoo Identification System

The system uses a pig striker style of tattooing device to tattoo an identification mark onto the hides. The tattooed marks are read automatically by a custom designed and built Optical Character Recognition System. The operating cost of this system is significantly greater than the operating cost for system 4.1 and 4.2.

System 5.2 - Tattoo Identification System

This system is similar to system 5.2, although a higher cost, high definition tattooing device is used. This allows a cheaper off the shelf OCR system to be used for reading the identification marks. This system also has an operating cost significantly greater than system 4.1 and 4.2.

The analysis identified systems 4.1 and 4.2, combined Bar Code Tagging and Hole Punching as optimal methods for hide identification.

The systems will use either recyclable laser marked bar code tags or disposable bar code tags to identify the hides from abattoirs to the fleshing process at tanneries. At this stage the tags will be removed, and the recyclable tags will be returned to the abattoirs for reuse. After the fleshing process, the hides will be punched with a hole pattern to identify them through to the finished leather stage. The estimated operating cost for these identification systems is $0.35 per hide.

The main benefits of the combined bar coding and hole punching identification systems include:

- Expensive marking or punching equipment is not required at each abattoir.
- The hole punching identification method used for most of the tanning processes has a lower labour requirement and is therefore cheaper to operate then tagging identification methods.

2. HIDE PROCESSING IN AUSTRALIA

The hide processing in Australia is a large industry due to the large number of cattle grown. Approximately 7,000,000 cattle are slaughtered every year, resulting in more hides than are required for the domestic market. Large numbers of hides are exported every year to countries through out the world, with the large proportion of hides exported being green or processed to wet blue stage. Approximately 45% of hides (3,150,000 hides/yr) are processed to wet blue stage in Australia, and approximately 20% of hides (1,400,000 hides/yr) are processed through to finished leather in Australia.

Hide processing is undertaken by two different industries, abattoirs and tanneries.

Abattoir Processing

There are approximately 240 abattoirs currently operating in Australia with a large variation in production capacities. The largest abattoirs process around 200,000 head of cattle per year. Abattoirs are responsible for removing the hides from the animals. It can be assumed that 20% of the abattoirs process approximately 80% of the cattle slaughtered per year, with the other 80% of abattoirs processing 20% of the cattle.

Each animal that is processed has an unique identification number that is attached to the carcass as it passes along the production line. This identification number is associated with the carcass grower and can be used to store other information that is relevant to the carcass being processed (ie quality information such as meat quality, fat content etc). Once the hides are removed from the animals they are either delivered directly to a tannery or preserved for tanning in the future. Preserving methods include salting, where large amounts of salt are placed on each hide, and refrigeration.

Tannery Processing

There are approximately 12 tanneries currently operating in Australia. Most tanneries are located in the Eastern States.

Hide processing involves two main stages:

1. Green to wet blue processing.
2. Hide tanning or Finishing.

Tanneries can perform one or both of these processes, although wet blue and finished leather tanning plants normally physically separated. As a large number of hides are exported after wet blue tanning, there are more wet blue tanneries than finishing tanneries.

For more details of the tanning process refer to 3.1 Hide Process Flow Chart.

3. IDENTIFICATION SYSTEM REQUIREMENTS

The identification system is required to track hides through all tanning processes from the green state at the abattoir to finished leather. The system must place a unique identification mark or tag on each hide to allow traceability of hides back to the grower at any stage in the production process.

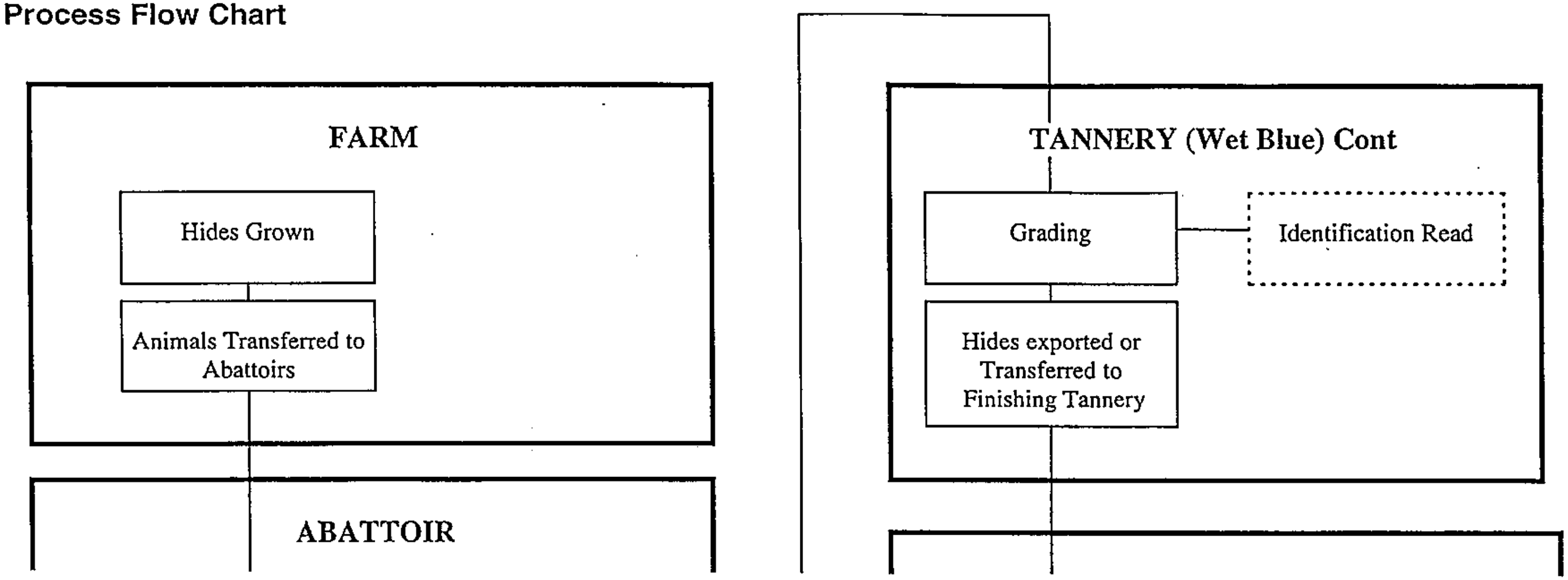
3.1 MRC Hide Identification Requirement Matrix

The main hide identification system requirements as identified by the Meat Research Corporation are listed in the following matrix.

		Priority
1	Machine Readable	5
2	Unique Code on each Hide	5
3	Human Decodable	5
4	Able to be applied to Green Hides	5
5	Better than 99% Retrieval/Recognition	5
6	Eight character code minimum	5
7	Hygienic and Safe	5
8	Human Readable	4
9	Survival to Finished Leather	4
10	Apply while hide on animal	4
11	Read with hair still on Hide	4
12	Automatic Application	3
13	Software Driven Code	3
14	Sixteen Character Code Maximum	2
15	Readable on Grain and Drop Split	1

For a more detailed system requirements specification refer to the **Requirements Specification for a Hide and Leather Identification System** document number 94117 PPMS000RS produced by Vision Abell.

3.1 Hide Process Flow Chart



4 IDENTIFICATION VIA MODIFICATION OF HIDE

Several methods of hide identification were investigated which involve some form of hide modification.

4.1 Hole Punching

4.1.1 System Overview

A hole punching system can be used to place a unique identification mark on each hide. It is envisaged a purpose built device would punch a series of holes in a sequence or pattern, through each hide. The hole patterns would be computer generated, with identification information coded into the pattern. The hole patterns would be read automatically by an electronic vision system, consisting of a video camera and image analysis system. A video image of the pattern would be captured and analysed to decode the identification information. The hole patterns would be human decodable, although not readily human readable.

The hole punching method of identifying hides has the major advantage of being able to survive most hide tanning processes including fleshing. The process requires no consumables to produce the identification marks. The method has the associated disadvantages of high equipment costs, high development risks and lower rates of identification code recognition than other forms of hide identification.

An approximate equipment cost is

Hole Punching Equipment - $30,000 to $40,000
Reading Equipment - $60,000 to $80,000 (for three reading stations)

4.1.2 Trials

A number of trials were conducted to test the hole punching identification method, in which a series of holes were punched into different parts of sample hides. The trials were conducted to determine the following:

- Optimum region of hide for hole punching.
- Hole size and shape required.
- Amount of deformation and stretching of hide in hole punching regions.

- Suitable hole patterns that could be used for coding identification details and size of patterns.

Trial results indicated that a hole punching system could be developed that would be suitable to place an identification code on to hides.

Several regions of the hide were trialed as potential sites where hole patterns could be punched. These regions included the front leg, rear leg and tail. The tail region was found to be the best area for punching, as it has the densest fibre structure. Both the front and rear leg regions had problems associated with the fleshing process, where the hole patterns could be damaged or ripped off. Greater deformation and stretching was expected in these regions due to the less dense fibre structure.

During processing, any holes punched through the hides tended to close up due to fibre swelling. From trials it was found that typical fibre swelling would cause holes to close by 1.5 to 2 mm on all sides. The minimum hole minimum hole diameter that can be used, that remains open after drumming is 5 mm. Both square and round holes were trialed with both holes being easily differentiable after processing (ie hide swelling did not cause hole shapes to become non differentiable). Several different sized round holes were trialed (∅5 mm, ∅6 mm, ∅8 mm). The 5 mm and 8 mm hole sizes were easily differentiable.

Due to the nature of the hides, a certain amount of stretching occurs, resulting in deformation of any hole patterns. The degree of stretching varies in different regions of the hide, with the most stable region being the tail area. Deformation of hole patterns increases the difficulty of automatic decoding the patterns using a vision system. The Allen Bradley CVIM2 vision system uses special processing techniques to rectify distorted images. The slippery nature of the hides before tanning can increase pattern deformation problems when punching holes. This will have to be considered in the design of hole punching equipment to minimise these problems.

For more details on hole punching trials see Appendix A.

4.1.3 Coding Patterns

A range of different hole patterns were investigated during the trials to determine an optimum pattern design. The following criteria were considered when investigating different hole patterns:

- Pattern has to be suitable for coding all hide identification information as outlined in the Requirement Specification for a Hide and Leather Identification System (Doc No. 94117 PPMS000RS).
- Hole punching area is to be minimised (area should be less then 150mm x 30 mm).
- Pattern should be designed for easy recognition by electronic vision system.
- Pattern should be easily produced, and the complexity of punching equipment should be minimised.

The hole patterns investigated are detailed below.

1. **Binary Pattern - Holes and Spaces**

A binary pattern can be produced were a hole represents a 1, and the absence of a hole, or space represents a 0.

Advantage - Easy to produce - simpler punching mechanism required than other methods.

Disadvantage - Pattern has a greater susceptibility to leather distortion effects, as decoding system requires information about each hole position.

This pattern style was recommended by Allen Bradley as the most suitable coding system for use with their vision equipment. The distortion in the pattern caused by leather stretching and warpage can be rectified by the CVIM2 vision processing system. The system would use marker holes punched in each corner of the matrix, to electronically straighten out the pattern.

2. **Binary Pattern - Small Holes and Large Holes (or two different shaped holes)**

A binary pattern can be produced were a small hole represents a 0 and a large hole represents a 1.

Advantages - Pattern is less susceptible to distortion errors since decoding system only needs to detect hole size and hole order.

Disadvantages - The hole punching mechanism is more complicated than system for producing hole and space pattern.

3. **Multi Shaped Pattern**

A series of different shapes can be used to produce a pattern with higher information density. By using three or more possible shapes to punch each hole, the total number of holes required per pattern will be less.

Advantage - Less holes required.

Disadvantages - Complicated equipment required to punch holes. Hole shape recognition of a large number of different shapes may be difficult due to leather swelling and distortion of holes.

4.1.4 Advantages - Hole Punching Identification System

- Permanent - not destroyed by drumming or tanning process.
- Punched code will survive all mechanical processes including fleshing and leather finishing processes.
- Punched code will survive leather splitting operations, (ie mid drumming and during finishing).
- Human decodable.
- Process has no consumables - therefore no additional consumable cost.

4.1.5 Disadvantages - Hole Punching Identification System

- Hide and Leather can stretch resulting in deformation of hole patterns.
- Possibility of holes closing up due to leather fibre expansion/swelling.
- Difficult to read identification code when hair still on hide.
- Electronic vision system required to automatically decode hole patterns.
  - High equipment cost.
  - Complicated equipment - specialty service skills required.
  - Reliability rate of correct recognition less then 99 %.
- Complicated mechanical equipment required to punch holes.
  - High maintenance.
  - High capital cost.
- Not human readable.
- High risk - unlike other identification technologies, no hole punching system has been extensively tested.

- High cost of punching equipment will mean that punching operation will most probably have to be performed at tannery.
    - Hides will require temporary identification system (ie bar coded tags) to identify then from the abattoir to the tannery.
- There is a possibility that the region of the hide where the holes are punched could be torn off, particularly during hide fleshing.
- Hides will require recoding after ridging, (if hole code is placed in the tail region of the hide).
- Hides must be laid flat with little distortion, in a well lit area for reading device to operate effectively.
- Dirt, grit and dunk in hide may blunten hole punching device, although special hardened steels can be used to minimise this problem.
- Swarf material produced in punching operation.
    - Material must be disposed of.
    - Design of punching equipment must take into account swarf produced.

4.1.6 Equipment

A hole punching identification system will consist of a hole punching device and a reading device.

Hole Punching Device

There is no equipment currently manufactured for punching hole patterns into hides, therefore a suitable device would have to be custom designed and built.

Description of Concept Hole Punching Device - to produce a hole and space coding pattern

The device could consist of a series of vertical punches located in a matrix in a punch head. Each punch would have a matching hole in a plate mounted beneath the punch head so that when the punch head was lowered the punches would protrude through the holes, providing shear edge to cut through the hide material. The punch heads would be tapered to improve the shearing action.

The device would use a series of electro mechanical or pneumatic actuators (one per punch) to extend a punch if a hole was required. The electro mechanical actuators would be controlled by an electronic system (ie PLC) that automatically generates the hole pattern required.

A hide would be inserted under the punch head on the plate. A tensioning device operated by a pneumatic cylinder would tension and grip the outer edges of the hide to minimise distortion of the hole pattern. A second pneumatic cylinder would be used to force each of the extended punches through the hide, producing a punched pattern.

Material punched out of the hides would be transferred through the punching plate and into a collection container.

For more details refer to concept diagram in Appendix B.

Identification Code Reading Device

There are several commercially available electronic vision systems that are suitable for reading and decoding hole punch marks in hides. Vision Abell could also custom design and build a suitable system, although it would be more cost effective purchasing a system off the shelf.

The vision system would operate by capturing a video image, using a video camera, of the region of each hide containing the punched holes. The hides would have to be layed flat with minimal distortion of the holes and well lit to enable a clear image to be captured. Image processing algorithms implemented in software would be used to decode the hole patterns. Several companies including Allen Bradley, manufacture vision systems that would be suitable for hole pattern recognition.

For more details on Allen Bradley Vision Equipment see Appendix C.

4.2 Tattooing

4.2.1 System Overview

A unique identification mark could be tattooed in to the hair side of each hide with an ink that survives the tanning processes. A range of symbols or numbers could be used to produce an identification mark that was both human and machine readable. The tattooed marks could be placed on hides with a device made up of a series of pig striker markers. These markers consist of a series of wedge pointed needles in the shape of a character. The striker markers would be coated with ink or designed to inject ink, and would embed the ink amongst the hide fibres when pressed into the hide. Other alternate methods of tattooing could also be used. An electronic vision system with suitable Optical Character Recognition capabilities would be used to automatically read the tattooed marks without the requirement for human intervention.

The system has the major advantage that the marks are human readable and do not require a sophisticated electronic system to decode the identification information. An electronic system would still be required to read the marks in hide production processes to ensure high levels of reading accuracy and minimise the labour requirement. The marking system has the major disadvantage that the characters are not visible until the hair is removed from the hide. This means the identification method is only suitable for use after the hides have been processed to the wet blue stage. It is predicted that the Optical Character Recognition (OCR) system will have a code reading reliability of less then 95%, which is lower than other identification systems.

It may be possible to design a tattooing system that produces a mark that penetrates through the hide. If this was possible, the identification mark will survive on both the grain and dropsplit when the hide is split.

From trials conducted, standard off the shelf OCR systems were found to be unable to read characters marked in hides with pig striker markers, due to the gaps in the characters between the chisel points. It is assumed that an OCR vision system could be developed that would be capable of reading these characters, although this would be significantly more expensive than off the shelf equipment. Alternatively a more complex and expensive marking system could be developed that could produce higher resolution characters without gaps. It is envisaged that standard off the shelf OCR equipment could be used to read these characters.

An approximate equipment cost is

1. **Custom Developed OCR Vision System - Pig Striker Style Tattoo System**

   Marking Equipment - $30,000 to $40,000
   Reading Equipment - $100,000 to $120,000 (for three reading stations)

2. **Standard off the shelf OCR Vision System - High Resolution Tattooing System**

   Marking Equipment - $50,000 to $60,000
   Reading Equipment - $60,000 to $80,000 (for three reading stations)

4.2.2 Trials

Extensive trials of hide marking with pig striker numbers have been conducted previously at abattoirs and tanneries in Queensland. These trials used a custom designed hand held tool, with several series of modified pig striker numbers connected in chains. The tool was designed so that each chain could be manually rotated, allowing different numbers to be dialled up. In the trials a unique number was punched into each hide while still attached to carcasses at the abattoirs. These numbers were later read after wet blue processing at a tannery. In the Queensland trials, ink was not used to increase the contrast between the punched numbers and the hide. It was reported the numbers were quite easily distinguishable to the human eye. Several problems identified with the marking system from trials conducted in Queensland include:

- The marks were not easily machine readable, therefore it was labour intensive and error prone to manually read the identification marks at the tannery.
- The marks could not be read until after wet blue processing had occurred, due to hair on the hide covering the marks.
- The imprinted numbers were not always clearly defined due to the striker numbers rotating during punching. Badly imprinted numbers could only be detected after wet blue tanning.
- Due to the manual operation and indexing of numbers in the marking system it was possible to have two hides with the same number, this was considered unacceptable by the tannery.

Most of the problems identified above could be overcome by redesign of the marking system and implementation of an automatic mark reading system at the abattoir. It would also be possible to shave the area of the hide that was marked so that the mark could be read between marking at the abattoir and wet blue processing.

A range of additional trials were conducted by Vision Abell to test hide tattooing methods and automatic reading systems to identify any potential system problems.

Standard pig striker numbers were dipped into several different marking inks to determine suitable inks that survive the tanning process. Steadfast Tattoo Ink, designed for pigs and cattle survived the wet blue tanning process reasonable well. By using ink, greater contrast between the characters and the hide was achievable. The additional contrast is required to increase the reading accuracy of an automatic reading system.

Tattooing trials were only conducted on hides up to the wet blue tanning stage. No finished leather trials with the tattoo identification system were conducted. It is envisaged that tattooed marks would be difficult to detect on a dark tanned (ie black) piece of leather.

An assessment of Allen-Bradley vision equipment was also conducted to determine its suitability for use in an automated reading system. It was found that the standard pig striker characters were not compatible with the vision system's OCR software and were therefore difficult to recognise. This problem can be overcome by using symbols and characters that are specifically designed and tested for recognition by OCR systems. Gaps in the letters between the needle punches also caused problems with the OCR system.

For more details of the tattoo trials see Appendix D.

4.2.3 Coding Patterns

- One major advantage of using a tattooed mark for hide recognition, is the mark can be composed of characters (ie numbers and letters) that are human and machine readable. The code would consist of at least 8 characters depending on whether it was placed on the hide at the abattoir or tannery.

4.2.4 Advantages - Tattooing Identification System

- Permanent - not destroyed by drumming or tanning process.
- Tattooed code will survive all mechanical processes including fleshing and leather finishing processes.

- Tattooed code is human readable.
- Process has cheap consumables (tattoo ink).
- Tattooed code can be placed on hide at abattoirs.
- Tattooed code can be read automatically.

4.2.5 Disadvantages - Tattooing Identification System

- Tattoo codes may be difficult to read during leather finishing operations when leather is tanned a dark colour.
- Hide and Leather can stretch resulting in deformation of tattooed characters. Note - because no hide material is removed in the tattooing process, hides are less likely to warp then hides with holes punched through them.
- Tattooed codes can not be read with hair on hide. Note - hair could be shaven from the tattoo region or tattooing device could penetrate through the hide allowing the mark to be read from the flesh side of hide.
- Electronic vision system required to automatically read tattooed marks.
    - High cost
    - Highly complicated equipment - specialty service skills required.
    - Reliability rate for correct recognition less than 98 %.
- Complicated mechanical equipment required to produce tattoo marks.
    - High maintenance.
    - High cost.
- High risk to produce fully developed system.
- There is a possibility that the region of the hide that is tattooed could be torn off, particularly during hide fleshing.
- Hides will require recoding after ridging operation - (dependant on location of tattoo mark).
- Hides must be laid flat, with little distortion of hide in a well lit area for reading device to operate correctly.

4.2.6 Equipment

The tattooing identification system will consist of a tattooing device and an automatic reading device. From trials it was found that most low cost off the shelf OCR systems are not capable of reading pig striker style of tattoo marks with gaps in the characters, although an OCR system capable of reading the characters could be developed at a reasonable high cost. A high definition tattoo system could also be developed that would allow characters to be read with standard off the shelf OCR equipment although at a higher cost. It is therefore envisaged that the following systems could be used for tattoo identification of hides.

System 1 - Custom Developed OCR Vision System - Pig Striker Style Tattoo System

Tattooing Device

A tattooing device to place unique tattooed codes on to each hide would have to be custom designed as no suitable device currently exists. There are German devices available which use pig striker letters to indent characters into hides, although these devices are not designed for tattooing.

The device would consist of the following components:

- *Shaving Mechanism* (if required) - To remove the hair from the region to be tattooed.
- *Needle Characters* - A series of punches similar to pig striker numbers consisting of wedged tipped needles. The characters will be mounted on a series of wheels, with each wheel containing approximately ten characters. The wheels will be rotated electro-mechanically. The rotating of the wheels will be controlled by an electronic system that selects the code to be imprinted on each hide. The needles will be close together to minimise gaps in characters.
- *Ink Injection Device* - Injects ink through each needle into hide.
- *Air Cylinder* - A pneumatic cylinder to force the needles into the hide.

Approximate Cost - $30,000 to $40,000

Reading Device

Off the shelf OCR systems are designed to read standard fonts and characters. The pig striker characters can not be recognised by off the shelf OCR equipment as they do not match standard fonts. Several companies, including Vision Abell could custom design and build a suitable OCR system, although at a significantly higher cost than an off the shelf system.

The vision system would operate by using a video camera to capture a video image of the region of each hide containing the tattooed marks. The hides would have to be layed flat, minimising any hide distortion, and be well lit to enable a clear image to be captured. The image would be processed by the OCR system to identify the tattooed characters.

Approximate Cost - $100,000 to $120,000 (for three reading stations)

System 2 - Standard off the shelf OCR Vision System - High Resolution Tattooing System

Tattooing Device

The tattooing device would be similar in operation to the device required for System 1, although additional tattooing needles would be required to produce characters with higher resolution. The device would therefore be more complicated, cost more to manufacture and require more maintenance.

Approximate Cost - $50,000 to $60,000

Reading Device

As with the punched hole reading system, there are several commercially available electronic vision systems that are suitable for Optical Character Recognition (OCR) of high resolution tattooed marks. Vision Abell could also custom design and build a suitable system, although it would be more cost effective to purchase a system off the shelf.

The vision system would operate in a similar fashion to system 1 by using a video camera to capture a video image and an OCR system to process the image. ORC software operates on a range of different electronic vision systems including Allen-Bradley's CVIM2 system.

Approximate Cost - $60,000 to $80,000 (for three reading stations)

For more details of Allen Bradley's CVIM2 system refer to Appendix C.

4.3 Laser Burning/Marking

4.3.1 System Overview

High powered Carbon Dioxide lasers can be used to mark hides by burning the hide material. Laser technology is well proven with manufacturing companies using similar laser systems to mark and cut leather.

Sophisticated electro-optic scanning systems can be used to guide the laser beam to form a pattern on the hide surface. These systems can be used to burn accurate characters or patterns. A masking technique can also be used to mark the hide. By placing a mask in front of a dispersed laser beam, an image of the mask can be burnt into the material. Trials found that because of the nature of the hide, the most successful method of hide marking with a laser was by using a high intensity, fine diameter beam to burn 1 to 2 mm diameter holes through the hide. This fine diameter beam could be controlled by a scanning system.

Due to the burning nature of the laser, any laser system would require an extensive exhaust system to remove the smoke and smell from the production floor.

The laser marks were difficult to read while the hair was still on the hide, making the identification technique unsuitable for use before wet blue processing.

Laser marking systems main advantages are their flexibility (ie characters to be marked can be programmed into the laser scanning system allowing easy changes) and their high speed operation. Laser systems are also non contact therefore substantially reducing mechanical wear on the equipment.

The cost of a laser system suitable for marking hides is approximately $100,000. This cost is most likely to be too high to make the system viable for installation in abattoirs or tanneries. In the future with further development of laser equipment and a reduction in equipment cost, a laser marking system may be more cost effective. As the system utilises similar vision reading equipment as is required for punched hole and tattoo hide identification systems, it may be possible to retrofit a laser marking device to these systems in the future.

The cost of a reading system is approximately $60,000 to $80,000 (for three reading stations)

4.3.2 Trials

A range of different trials were conducted using a low powered laser to mark the hides. The laser used in the trials did not have a scanning or masking system, so only straight lines and dots could be marked.

It was found that the hair on the hide is an excellent absorber of laser energy and it was therefore difficult to mark a large area of hide with a low intensity laser beam. It is therefore assumed the masking method for marking the hide would be unsuitable.

Trials were also conducted with the laser focused into a high intensity, small diameter beam. This laser beam easily burnt through the hide and would be suitable for controlling with a scanning mirror system.

After wet blue tanning, the laser marks were easily differentiable as pits and lines in the surface of the hide, hence it should be possible to automatically read characters with a vision system.

4.3.3 Coding Patterns

A series of OCR recognisable characters could be used for coding identification information - similar to the tattooing system. This would allow the identification code to be read automatically with an OCR system.

4.3.3 Advantages - Laser Burning/Marking Identification System

- High flexibility in marking characters.
- Quick process.
- Permanent - not destroyed by drumming or tanning process.
- Laser marks will survive all mechanical processes including fleshing and leather finishing processes.
- Human readable.
- Process has no consumables - therefore no additional consumable cost.

4.3.4 Disadvantages - Laser Burning/Marking Identification System

- Difficult to read laser marks when hair still on hide.
- Electronic vision system required to automatically read laser marks.
    - High cost

  - Highly complicated equipment - specialty service skills required.
  - Reliability rate for correct recognition is less than 98 %.
- Laser marking equipment high cost - $100,000 per system.
- Laser marking equipment designed for clean style operating environments.
- There is a possibility that the region of the hide that is laser marked could be torn off, particularly during hide fleshing.
- Hides must be laid flat, with little distortion of hide in a well lit area for reading device to operate correctly

4.3.5 Equipment

A laser marking identification system will consist of a laser marking device and a reading system.

Laser Marking Device

Carbon dioxide laser marking devices are manufactured by a number of companies, and can be purchased as a complete "off the shelf" system. Spectra Physics are agents for the Electrox Scriba laser marking system suitable for hide marking.

For more details refer to Appendix E.

Reading System

The reading system will be similar to the system required for the tattoo identification system and will consist of an OCR vision system.

4.4 Branding

4.4.1 System Overview

There are a variety of different techniques that can be used to brand hides including:

Hot Iron

Used extensively in the field by growers - Most hot iron branders consist of a steel mass that is heated to a red hot temperature and held against the hide for several seconds. The iron burns a mark into the hide burning away the hair at the same time. Standard Hot Iron branders are designed to place a single mark on the hide (ie the mark is non variable). Hot Iron branding has a number of disadvantages for hide identification including:

- High amount of heat energy required to brand hide.
- Burning smell produced from branding process.
- Hot branding tool would be dangerous.
- Branding tool capable of branding variable marks will be mechanically complex (therefore high maintenance and costly to manufacture).
- Branded mark not high contrast, therefore difficult to read with an automatic reading system.

Cryogenic

Cryogenic branding systems are mostly used on live animals. The branding operation is very similar to hot iron branding except an extremely cold object is used to brand the animals. The branding process requires the animal and hide to be alive for the branded mark to "grow" into the hide. For this reason it was considered that cryogenic branding would be unsuitable for use in a hide identification system.

Radio Frequency

Radio Frequency (RF) branding systems have been developed in Holland and are used in the pork processing industry. 2 kW, 27 MHz RF generators are used to mark the skins of live pigs before slaughter. The skins are not removed from the animals during slaughter, therefore the branded marks can be used to track the carcass through the entire process. The RF generator and branding system must be contained within a box to protect operators. Associated disadvantages of RF branding include:

- Large expensive equipment required.

- Protection of operators from RF waves is a problem.
- Brand mark can not be read until hair is removed from hide as system brands through hair.

Electrode

An electrode branding system has been developed in New Zealand by the Meat Research Institute of New Zealand (MRINZ) and Industrial Research Limited (IRL). The system uses a high voltage power supply to brand the hide through electrodes that contact the hide surface. The branding system heats regions of the hide in contact with the electrodes and causes a change within the proteins within the hide structure. Approximately 200 - 400 Volts are required to heat the hide in a sufficiently short time to make the system suitable for a production process. Brand marks made on the hide are the same shape as the electrode. In experiments, round electrodes have been used to place dots on the hides. A dot matrix pattern, similar to hole punching systems could be used to encode information onto the hide surface. Associated disadvantages with electrode branding include:

- High voltage process is dangerous to use in wet abattoir and tannery environment.
- Brand mark can not be read until hair is removed from hide as system brands through hair.
- Expensive equipment required.

4.4.2 Advantages - Branding Identification System

- Permanent - not destroyed by drumming or tanning process.
- Branded code will survive all mechanical processes including fleshing and leather finishing processes.
- Human decodable and possibly human readable.
- Only process consumable is energy.

4.4.3 Disadvantages - Branding Identification System

- Brand marks are low contrast and therefore difficult to read using a vision system.
- Hide and Leather can stretch resulting in deformation of branded patterns.
- Difficult to read identification code when hair still on hide.

- Electronic vision system required to automatically read branded patterns.
    - High cost
    - Highly complicated equipment - specialty service skills required.
    - Reliability rate of correct recognition less than 98 %.
- All branding techniques require complicated systems to brand hides.
    - High cost.
    - High maintenance.
- There is a possibility that the branded region of the hide could be torn off, particularly during hide fleshing.
- Brand marks will not survive leather splitting operation (ie mid drumming and during finishing), and will have to be reapplied after ridging.
- Hides must be laid flat, with little distortion of hide in a well lit area for reading device to operate correctly.

5 ATTACHMENT OF IDENTIFICATION SYSTEM TO HIDE

Several methods of hide identification were investigated where an identification device is attached to the hide.

5.1 Radio Frequency Tags - Transponders

5.1.1 System Overview

Radio Frequency Tags or Transponders are small electronic devices that can be used to store information. The devices consist of an electronic circuit and antenna which is packaged in a non ferrous container (ie glass, plastic, ceramic material). Transponders can be as small as the size of a ten cent piece. The information stored in the units is read by a non contact reading system. The reader powers the transponder tags through their antenna therefore no internal power supply, such as a battery, is required. Reading systems will operate with a gap of up to 0.5 metre between the reader and the transponder.

Transponder technology is fairly modern and is still being adopted for use in industrial identification applications, as the cost of the devices decreases. Typical examples of transponder applications include:

- Identifying rubbish bins - Bins are weighed and identified each time they are emptied, allowing councils to bill residents for weight of rubbish collected.
- Tracking Buses.
- Tracking Livestock - Transponders are implanted under the skin of animals, used extensively with dairy cattle in European countries.

The transponder units are reasonably rugged in design and can be packaged to increase their resilience to mechanical damage by using plastic cases. There are a number of tanning processes that the transponder units would not survive, including fleshing and several of the finishing processes. The transponders would have to be removed from the hides and reattached after these processes, increasing the labour component required to operate the identification system.

Each transponder unit costs between $3 to $7 and therefore would need to be recycled to be cost effective. The reading units cost between $4,000 and $10,000, and are typically "off the shelf" systems.

5.1.2 Coding Patterns

Transponders are available in two formats:

Read Only

A number code is stored in the device during manufacture The code can be read an unlimited number of times, although no further information can be written to the device. This style of device could be used as a simple tag with the tag number being cross referenced to other hide information and stored in an external data base. Each time the tag in recycled the tag number would be associated to a new hide. This type of tag is cheaper then the read and write tags.

Read and Write

Information can be stored on the device after manufacture. The information can be written and read an unlimited number of times allowing information that is specific to each hide to be stored in the device. This type of tag has the advantage that hide information does not have to be kept in an external data base. The disadvantage is the additional cost of the transponder devices.

5.1.3 Advantages - Radio Frequency Tag Identification System

- 100 % correct read rate - no miss reads.
- Information can be coded into transponder - if using a read write tag.
- Reusable tagging system.
- Transponders will not be damaged by chemical tanning process.
- Reasonable cheap and reliable reading system.
- Industrially hardened and trialed tagging method.
- Transponders can be read automatically without direct contact.
- Transponders can be read automatically without visual contact. (ie tags can be read through hide)

5.1.4 Disadvantages - Radio Frequency Tag Identification System

- High cost of transponders.
- Transponders will require a clip or similar device to fix then to the hides.
- Transponders will not survive several of the tanning processes including fleshing and other finishing processes - note the transponders

can be removed from the hides before the processes and reapplied after.

- Most transponders do not have a human readable identification mark - note an identification number could be printed on the outside surface of the transponder or the device used to fix the transponder to the hide.

5.1.5 Equipment

Transponders and reading systems are supplied by several companies in Australia. Most systems are manufactured overseas, although some local manufacturers do exist.

For more details refer to Appendix F.

5.2 Touch Memory Tags

5.2.1 System Overview

Touch memory tags are very similar to read - write transponder tags except the tags require direct contact of a reading device to transfer data. The tags are circular and similar in size to a 10 cent piece. The outside casing of the tag consists of two insulated stainless steel sections, the stainless steel material is required for it's electrical conduction properties and increases the robustness of the tags.

A hand held reading device is used to read the tags. Information stored in the tag is transferred electronically by contacting the reading device against the outside stainless steel shell of the tag. Tag reading can not be fully automated as the reading device must be manually placed on the tags: this is a major disadvantage of this tagging system. The cost of a reader is approximately $700.

The cost of the touch memory tags is between $2 to $3, which is cheaper then transponder tags. The tags are shaped like buttons and therefore would have to be inserted into an additional device for attaching them to the hides.

Touch memory tags are used for a variety of applications including:

- Identification of pallets.
- Monitoring of postal collections from letter boxes.
- Monitoring of security personnel when on security rounds.

5.2.2 Coding Patterns

The touch memory tags have a read/write capability that allows information to be stored in the button. Hide identification information and processing details could be stored in the tag, alleviating the requirement for an external data base system.

5.2.3 Advantages - Direct Contact Electronic Button Tag Identification System

- 100 % correct read rate - no miss reads.
- Information can be coded into tag - if using a read/write tag.
- Reusable tagging system.
- Reasonable cheap and reliable reading system.

- Industrially hardened and trialed tagging method.

5.2.4 Disadvantages - Direct Contact Touch Memory Tag Identification System

- Touch memory tags can not be read automatically without direct contact.
- High cost of touch memory tags.
- Touch memory tags will require a clip or similar device to fix then to the hides.
- Touch memory tags will not survive several of the tanning processes including fleshing and other finishing processes - note the tags can be removed from the hides before a process and reattached after.
- Touch memory tags may be damaged by chemical tanning process, particularly acidic solutions.

5.2.5 Equipment

Touch memory tags and readers are manufactured by several US companies.

For more details refer to Appendix G.

5.3 Bar Code Tags

5.3.1 System Overview

Bar code technology is well developed and used in many different applications for identification purposes. There are a series of standard bar code formats that can be produced and read by most bar code equipment. Each format is designed for a specific application.

Bar codes could be printed directly onto the hide or printed onto labels and then attached to the hide.

Due to the distortion effects that occur when processing a hide, and the difficulty of printing on a hide, it is considered too difficult to print a bar code directly onto the hide.

The bar coding technique of identifying hides has been investigated previously by different groups in New Zealand and Queensland. Bar coding technology has the major advantage that it is well developed, reasonably cheap and an accurate method of identifying objects. Finding a suitable label material and tag attachment technique have been the major problems so far for utilising bar codes for hide identification.

A number of different tag materials have been trialed, ranging from inexpensive woven Tyvak, costing a few cents per tag, to specialty plastics designed for laser marking costing up to $1 per tag.

A number of different attachment techniques have also been trialed including T-bar fasteners, used in the clothing industry, to rings of nylon rope.

The optimum tag material and attachment method is dependant on the use of the tag in the hide tanning process.

There are a large number of different devices that are designed to read bar codes. Most devices use a laser scanning system and detect the laser light as it is reflected off of the clear spaces in the bar code. There are a number of systems available that are designed to scan bar codes on objects as they move along a conveyor. These systems are used in airport baggage handling systems and have a read reliability rate of above 99 %. It is envisaged that one of these devices could be installed above the sammer outfeed conveyor to automatically scan the bar codes on hides as they are graded after samming.

5.3.2 Trials

Bar code Tag Material

A number of different materials were trialed by attaching sample pieces to hides and passing them through the wet blue processing. Four different types of materials were tested.

Laminate materials

These materials are manufactured by gluing two or more layers of material together. The laminate materials have the advantage that the print can be protected from the tanning process by being contained between layers of material.

All of the laminate materials tested failed, due to delamination.

Sheet materials

Several tags made from a single sheet of material including polyethylene and PVC were tested. These materials tended to tear easily, with many of the test samples being torn off during drumming. It is also unknown how well print adheres to these materials.

Moulded materials

A moulded ear tag produced by Allflex has been tested by the Australian Meat and Livestock Corporation (AMLC) for identification of hides. The Allflex tag is injection moulded and consists of a flexible material with metal oxide additives to improve laser marking.

Woven or formed materials

A number of woven or formed materials were tested including Tyvak and Care label materials. These materials are made from strands that are either woven or adhered together. The materials are stronger and have better tear resistant properties then sheet of materials, although they have a rougher surface, tend to crease easily and absorb blood during the green hide stage.

See over leaf for test results.

Table 1 - Summary of Bar Code Tagging Trials

Tag Material	Approx Cost (cents)	Print Method	Supplier	Who Conducted Trial	Survived	Blood Absorption	Description Before	Description After
Syntag 165	2-5	Thermal Print (standard ribbon)	Monarch Marking Systems	Vision Abell	No - Fell off	No	White, thin, plastic like material similar to thick card. Smooth surface.	NA
Syntag 165	2-5	Thermal Print (resistant ribbon)	Monarch Marking Systems	Vision Abell	No - Fell off	No	White, thin, plastic like material similar to thick card. Smooth surface.	NA
Tyvak	1-2	Thermal Print (standard ribbon)	Monarch Marking Systems	Vision Abell	Yes	Yes	White paper like material, composed of strands of synthetic material	Very creased and stained. Bar Code still readable, although tag requires flattening out.
Care label	1-2	Thermal Print (standard ribbon)	Avery Dennison	Vision Abell	Yes	Yes	White synthetic woven material, used for labels in clothing	Very creased and stained. Bar Code still readable, although tag requires flattening out.
Tyvak	1-2	Thermal Print (standard ribbon)	Avery Dennison	Vision Abell	Yes	Yes	White paper like material, composed of strands of synthetic material	Very creased and stained. Bar Code still readable, although tag requires flattening out.
Polyester Laminate	50	Photographic Process	Leigh Mardon	Vision Abell	Yes	No	White, shinny, thin, ridged plastic material	Material delaminated and creased. Print was removed
Polyethylene	20	Ink printing process	Elna Press	Vision Abell	No - fell off	No	Coloured, thin, ridged plastic sheet	NA
PVC	20	Not printed	Elna Press	Vision Abell	No - fell off	No	White, thin, ridged plastic sheet	NA
Polyester	20	Not printed	Elna Press	Vision Abell	Yes	No	White, thin, ridged plastic sheet	Slightly marked from drumming process.
THERMfilm Polycoated Tyvak	2-3	Ink printing process	Unistat	Vision Abell	Not Tested	NA	Tyvak material with shinny ploy coating on top surface.	NA
Polyester Laminate	5	Thermal Print	Quickstik	MRINZ, AMLC	Yes	No	Self Adhesive label with print under laminated layer of polyester	Top layer of polyester delaminates allowing processes to remove printed bar code
Allflex Cattle Ear tag	100	Laser marked	Allflex	AMLC	Yes	No	Pliable plastic material with embedded oxide material for laser marking	Slight discolouration

Bar code Printing

A range of different processes can be used to print bar codes onto the different materials and survive the tanning process. All printer processes must be capable of printing a unique bar code on each tag.

Thermal Printing

The thermal printing process uses a ribbon that contains heat sensitive ink. The ribbon and a roll of tag material are run over a print head that heats the ribbon transferring the ink to the tag. A variety of different inks can be used to suit different tag materials. Chemical resistant inks can also be used. The thermal printing devices cost between $3,000 to $20,000 and are therefore cost effective for use at each abattoir.

For more details see Appendix H.

Photographic Printing

Photographic printing is used by large label manufacturing companies to produce large volumes of sequential bar codes. These bar codes are typically laminated to protect the print.

Laser Marking

Laser marking is a process where a laser beam is used to burn and discolour the surface of a material. Most plastic materials can be marked, although the mark contrast varies from material to material. Some materials are specially produced with a metal oxide chemical embedded in the surface of the material. When heated by the laser beam, the metal oxide changes colour to produce a dark mark. Laser marking systems cost approximately $100,000 and are therefore too expensive for installation in each abattoir.

Bar code Tag Attachment Method

A lot of trial work has been conducted in finding suitable methods for attaching bar coded tags to hides. Two different systems of attaching the tags have been investigated, permanent and temporary.

Permanent tag attachment methods

A number of different permanent tag attachment methods have been trialed. After tag attachment at the abattoir, the tags must remain attached until the hides reach the wet blue stage. Tanneries that split hides mid way through wet blue processing will have to reattach tags after splitting. These attachment methods are more applicable to low cost disposable tags that can remain attached and do not need to be removed.

T-bar end fastening devices have been trialed by MRINZ, AMLC and Vision Abell. The devices are made from nylon and consist of a fine strand with a T-bar at each end. The fasteners are inserted through the tag and hide by using a hand or pneumatically operated tool. The fastening devices are available from several companies including Avery Dennison and Monarch Marking.

MRINZ in New Zealand have developed a system that incorporates two Avery Dennison PS100 E pneumatic fastener applicators. The system applies a label to the hair side of a hide using two T-bar fastening devices that are inserted through folds in the hide. Tags fastened using this device have been passed through a fleshing machine and processes to wet blue stage with a 97.5% retention rate. The MRINZ tagging device can be purchased for approximately NZ$6,000.

AMLC in Queensland have also conducted research into a T-bar tag fastening system that uses a PS100 E pneumatic fastening tool. The device is designed to insert a T-bar fastener through the top layer of a hide so the fastener does not protrude to the flesh side, protecting it from the fleshing process.

Trials have been conducted in Queensland with tags sewn onto the hides. In these trials an industrial sewing machine was used to run a row of stitches along one end of a tag. This method of tag attachment had several problems including the stitches on the flesh side of the hide were occasionally cut off by the flesher blades and the sewing process was tedious. The problems could possibly be overcome by tacking the tags in all four corners with stitches that are pulled deep into the hide to protect them from the flesher.

Temporary tag attachment methods

Several methods of attaching tags using temporary attachment devices have been trialed. Temporary attachment of the tags has the advantage that the tags can be removed during the arduous mechanical processes such as fleshing, therefore ensuring the tags survive the processes. The tags can also be removed at the end of the process and recycled. The drawback of temporary attaching systems is the extra labour that is required to remove and reapply the tags at each process.

AMLC in Queensland have investigated using loops of thin nylon cord to attach Allfelx ear tags to hides. The cord is fed through slits in the hide and looped back over the top of the tag. By using a pliable cord material the loops are self locking and do not tend to come undone, although are easily undone by an operator.

Other clips style devices, where a tool is required to release a catching mechanism, could also be used for tag attachment. These devices would be more expensive than nylon loops, although would be quicker to remove and reapply.

5.3.3 Coding Patterns

There are a range of standard bar code patterns with which most reading and printing systems are designed to operate. Code 39 is a commonly used industrial code suitable for use for hide identification.

For more details see Appendix I.

Some printing systems are capable of printing two orthogonal codes on the same tag. This increases the readability of the tag when using an automatic scanning system.

If bar codes are printed externally from the abattoir (ie laser marked), the tag's identification number will have to be linked in an external data base system to other carcass data when being attached to the hide. If bar codes are printed on the abattoir production floor (ie thermal printing), details specific to each carcass can be included in the bar code (ie abattoir id, kill date, body number, producer).

5.3.4 Advantages - Bar Code Tag Identification System

- 99 % correct read rate - very few miss reads.
- Reasonably cheap and well developed identification system.
- Cheap tagging system - disposable tags cost a few cents.
- Some tags reusable.
- Industrially hardened and trialed identification method.

5.3.5 Disadvantages - Bar Code Tag Identification System

- Bar code tags are prone to falling off during processing.
- Suitable cheap tag material still to be identified.

- Tags may not survive several of the tanning processes including fleshing and other finishing processes - note the tags can be removed from the hides before the processes and reattached after.

5.3.6 Equipment

Tag Manufacture (Printing)

A range of bar code printing techniques are identified in bar code printing section above.

Bar Code Readers

There are a large number of bar code reading devices available ranging from hand held manual readers costing a few hundred dollars to fully automatic reading systems costing up to $50,000. The outfeed conveyor of the sammer is for suited using an automatic scanning system to read the bar codes as hides are graded.

For more details see Appendix J.

6 IDENTIFICATION VIA INTRINSIC PROPERTY OF HIDE

A range of different methods of recognising a hide identity through an intrinsic hide property were considered. Identification of hides through an intrinsic property has the advantage that no hide modification or tag is required.

All intrinsic property identification systems would require a data base system into which the unique hide characteristics would need to be saved at the time when the hide is removed from the animal at the abattoir. This style of system would have higher operating costs than other systems investigated.

All methods of hide recognition from intrinsic properties investigated were found to be unsuitable. It is therefore considered not possible, with current technology to use an intrinsic hide characteristic for hide identification.

The intrinsic hide identification methods considered are identified in the following sections.

6.1 Hide shape and size

Each hide has a different shape and size and therefore could be differentiated from other hides on this basis. Problems associated with this method of identification include:

- The hides must be laid flat for identification.
- Hides stretch and distort during processing.
- Regions of hides are trimmed during different processes.

6.2 Hide grain and hair pattern

Hide grain and hair patterns can potentially be used to differentiate between hides. The grain pattern only becomes visible at the wet blue processing stage. Problems associated with this method of identification include:

- Both grain and hair patterns are not viewable throughout entire tanning process.
- May be difficult to differentiate between hides using hair pattern.
- Hide grain patterns have low contrast - difficult to detect using vision system.

6.3 Hide DNA

Although each hide has an unique DNA pattern there is no technology currently available that can identify and match DNA patterns that would be suitable for use in a tannery or production process. Therefore hide recognition through DNA matching is considered unsuitable.

7. ALTERNATIVE IDENTIFICATION SYSTEMS - SYSTEM TRADEOFF

There are a large range of different identification methods that can potentially be employed as a hide identification system. The optimum system design may consist of one or more individual systems that are suited to different hide processing steps and cost effective to employ. The following section details a trade off between different identification systems, to determine an optimum system.

7.1 Alternative Hide Identification Systems Overview

System 1 - Transponder Tags

Standard transponder tags are used to track the hides through entire tanning process. Cheap disposable tags are used to replace transponder tags when hide leaves tannery, allowing transponders to be recycled.

System 2 - Disposable Bar Code Tags

Disposable bar code tags are used to track the hides through entire tanning process. Tags need to be removed before, and reattached after some processing operations.

System 3 - Laser Marked Bar Code Tags and Punched Hole Patterns (Tag removed prior to samming)

High cost laser marked bar code tags are used to track hides through to samming operation in tanning process. The tags are recycled and hole patterns are punched in the hides to identify hides to end of tanning process.

System 4.1 - Laser Marked Bar Code Tags and Punched Hole Patterns (tag removed prior to fleshing)

Similar to System 3, except high cost tags are replaced with punched hole pattern after fleshing.

System 4.2 - Disposable Bar Code Tags and Punched Hole Patterns (tag removed prior to fleshing)

Similar to System 4.1, except disposable bar code tags used instead of high cost laser marked tags. By printing the tags at the abattoir, a unique identification code can be given to each hide.

System 5.1 - Tattoo Mark

Custom Developed OCR Vision System - Pig Striker Style Tattoo System

Hides are marked with tattoo at abattoir. Additional tattoo marks may have to be placed on hides through process when hide is split.

System 5.2 - Tattoo Mark

Standard off the shelf OCR Vision System - High Resolution Tattooing System

Hides are marked with tattoo at abattoir. Additional tattoo marks may have to be placed on hides through process when hide is split.

Table 2 - Overview of Hide Identification Systems

	Hide Process	Location of Process	**System 1** Transponder	**System 2** Disposable bar code	**System 3** Laser marked bar code - Punched holes	**System 4.1** Laser marked bar code - Punched holes	**System 4.2** Disposable bar code - Punched holes	**System 5.1 and 5.2** Tattoo mark
1	Hides produced	Farm						
2	Animals Transferred to abattoirs	Transit	Grower ID tag attached to tail	Grower ID tag attached to tail	Grower ID tag attached to tail	Grower ID tag attached to tail	Grower ID tag attached to tail	Grower ID tag attached to tail
3	Animals slaughtered	Abattoir	Abattoir Body Number ID attached to carcass	Abattoir Body Number ID attached to carcass	Abattoir Body Number ID attached to carcass	Abattoir Body Number ID attached to carcass	Abattoir Body Number ID attached to carcass	Abattoir Body Number ID attached to carcass
4	Back half of hide removed from carcass	Abattoir	Transponder tag attached to hide	Disposable bar code tag attached to hide	High cost Laser marked tag attached to hide	High cost Laser marked tag attached to hide	Disposable bar code tag attached to hide	Hides shaven and unique ID number tattooed
5	Hides fully removed from carcass	Abattoir						
6	Hides transferred to tannery - hides may be salted, refrigerated or transferred direct	Transit						
			[illegible]		[illegible]	Bar code tag removed	Bar code tag removed	

7.2 System Comparison Against Hide Identification Requirement Matrix

	Requirement	Priority Rating	System 1 Transponder	System 2 Disposable bar code	System 3 Laser marked bar code - Punched holes	System 4.1 and 4.2 Laser marked bar code -Punched holes	System 5.1 and 5.2 Tattoo mark
1	Machine Readable	5	Yes	Yes	Yes	Yes	Yes
2	Unique Code on Each Hide	5	Yes	Yes	Yes - (codes recycled)	Yes	Yes
3	Human Decodable	5	No	Yes - if human readable characters printed with bar code	Yes - if human readable characters printed with bar code Yes - Punched holes	Yes - if human readable characters printed with bar code Yes - Punched holes	Yes
4	Able to be applied to green hides	5	Yes	Yes	Yes	Yes	Yes
5	Better then 99% retrieval/recognition	5	Yes	Yes	Yes - Bar code 98 % Punched Holes	Yes - Bar code 98 % Punched Holes	95 %
6	Eight character code minimum	5	Yes	Yes	Yes	Yes	Yes
7	Hygienic and safe	5	Yes	Yes	Punching process slightly dangerous	Punching process slightly dangerous	Tattooing process slightly dangerous
8	Human readable	4	No	Yes - if human readable characters printed with bar code	Yes - if human readable characters printed with bar code No - Punched Holes	Yes - if human readable characters printed with bar code No - Punched Holes	Yes
9	Survival to finished leather	4	Yes - transponders need to be removed and reattached for some processes	Yes - tags need to be removed and reattached for some processes	Yes - Punched Holes	Yes - Punched Holes	Yes - may be difficult to read on dark leather
10	Apply while hide on animal	4	Yes	Yes	Yes - Bar code	Yes - Bar code	Yes
11	Read with hair still on hide	4	Yes	Yes	Yes - Bar code	Yes - Bar code	No - hair must be shaven
12	Automatic application	3	Possible	Possible	Possible	Possible-	Possible
13	Software driven code	3	Yes	Yes	Yes	Yes	Yes
14	Sixteen character code maximum	2	Yes	Yes	Yes - large area required	Yes - large area required	Yes - large area required
15	Readable on grain and dropsplit	1	Yes - additional transponder needs to be attached	Yes - additional tag needs to be attached	Yes - assume holes survive in grain and drop split	Yes - assume holes survive in grain and drop split	Yes - additional tattoo may need to be applied

Priority Code: 5 - Highest; 1 - Lowest

7.3 System Costing Analysis

A costing analysis was performed on the different seven different identification systems to determine the most cost effective system.

7.3.1 Assumptions

A number of assumptions were made in performing the costing analysis.

Abattoir Processing

- Number of hides processed per year - 7,000,000.
- Number of abattoirs in Australia - 240.
- 20% of abattoirs are large (48), these abattoirs process 80% of the hides (5,600,000).
- 80% of the abattoirs are small (192), these abattoirs process 20% of the hides (1,400,000).
- Cost to identify hides at abattoirs has been averaged between large and small abattoirs to calculate the overall hide identification cost. This average is weighted in the same ratio as hides are processed, ie 80/20.

Wet Blue Tanneries

- Number of Wet Blue Tanneries in Australia - 12.
- Number of hides processed in Australia - 3,150,000 (45% of total)

Finished Leather Tanneries

- Number of Finished Leather Tanneries in Australia - 6.
- Number of hides processed in Australia - 1,260,000 (18% of total, 40% of Wet Blue)

- Capital equipment is depreciated over a period of 8 years.
- System development costs have not been included in the costing. Approximate system development costs have been included in a separate table at the end of this section.

- Each large abattoir processes an equal number of hides.
- Each small abattoir processes an equal number of hides.
- Each wet blue tannery processes an equal number of hides.
- Each finished leather tannery processes an equal number of hides.

- Labour cost is $25/hr.

- Operators only costed for time spent attaching and removing identification devices (ie if operator not required full time for tagging, assumed operator performs other tasks for additional time).
- Time required to read tags is not considered in costing - assumed time is minimal and can be performed by existing operators when handling hides.
- All export hides are identified. Expensive tags and identification devices if used (ie transponders) are replaced with disposable bar code tags before hides are exported.

7.3.2 Costing Summary

For summary of costing analysis see table on following page.

Explanation of terms

Fixed Equipment Costs

Cost of identification equipment that only needs to be purchased once. These costs include marking and tagging equipment, reading devices, computer systems and tags if recyclable. These costs are depreciated over a 10 year period.

Variable Costs

Cost of any thing that varies with the number of hides processed. These costs include disposable tags and labour.

Table 3 - Costing Analysis Summary

	System 1 Transponder	System 2 Disposable bar code	System 3 Laser marked bar code - Punched holes	System 4.1 Laser marked bar code -Punched holes	System 4.2 Disposable bar code -Punched holes	System 5.1 Tattoo mark	System 5.2 Tattoo mark
Large Abattoir Costs							
Fixed Equipment Costs ($)	$ 431,000	$ 25,000	$ 54,400	$ 54,000	$ 16,000	$ 60,000	$ 100,000
Variable Costs ($/hide)	$ 0.055	$ 0.09	$ 0.052	$ 0.052	$ 0.065	$ 0.083	$ 0.083
Small Abattoir Costs							
Fixed Equipment Costs ($)	$ 46,000	$ 25,000	$ 12,600	$ 12,600	$ 16,000	$ 60,000	$ 100,000
Variable Costs ($/hide)	$ 0.055	$ 0.09	$ 0.052	$ 0.052	$ 0.065	$ 0.083	$ 0.083
Total Average Abattoir Cost ($/hide)	$ 0.58	$ 0.19	$ 0.14	$ 0.14	$ 0.13	$ 0.34	$ 0.51
Wet Blue Tannery Costs							
Fixed Equipment Costs ($)	$ 90,000	$ 85,000	$ 130,000	$ 130,500	$ 130,500	$ 160,000	$ 155,000
Variable Costs ($/hide)	$ 0.24	$ 0.25	$ 0.222	$ 0.12	$ 0.12	$ 0.033	$ 0.033
Total Wet Blue Tannery Cost ($/hide)	$ 0.29	$ 0.30	$ 0.28	$ 0.18	$ 0.18	$ 0.11	$ 0.09
Finished Leather Tannery Costs							
Fixed Equipment Costs ($)	$ 100,000	$ 35,000	$ 60,000	$ 60,000	$ 60,000	$ 160,000	$ 155,000
Variable Costs ($/hide)	$ 0.62	$ 0.228	$ 0	$ 0	$ 0	$ 0.033	$ 0.083
Total Finished Leather Tannery Cost ($/hide)	$ 0.68	$ 0.25	$ 0.04	$ 0.04	$ 0.04	$ 0.18	$ 0.18
Total Identification System Cost ($/hide)	$ 1.54	$ 0.74	$ 0.46	$ 0.35	$ 0.35	$ 0.63	$ 0.77

For more details of costing analysis see Appendix K.

7.4 Summary of Costing Analysis

System 1 - Transponder Tags

Highest cost system to operate due to high capital cost of transponders and labour required to attach and remove devices in tanneries - system too expensive.

System 2 - Disposable Bar Code Tagging System

Reasonable high cost system to operate. Tagging cost for smaller abattoirs is 51 cents per hide.

System 3 - Laser Marked Bar Code Tags and Punched Holes (after samming)

Reasonable low cost, although extra labour is required in wet blue tanneries to attach and remove tag twice (at fleshing and samming processes).

System 4.1 - Laser Marked Bar Code Tags and Punched Holes (after fleshing)

Along with system 4.2, one of the lowest cost identification systems to implement.

System 4.2 - Disposable Bar Code Tags and Punched Holes (after fleshing)

Similar to system 4.1 except disposable bar code tags are used. Disposable bar code tags are slightly cheaper for large abattoirs, although more expensive for small abattoirs. Disposable bar code tags have the advantage that a unique number can be given to each hide, as tags are not reused. Overall system cost is about the same as system 4.1.

System 5.1 - Tattoo Identification System

Pig Striker Marking Device - approx cost $30,000
Custom Built OCR Vision System. - approx cost $100,000 for 3 reading stations
Overall system cost is 63 cents per hide, although cost to small abattoirs is approximately $1.11 per hide.

System 5.2 - Tattoo Identification System

High Definition Tattooing Device - approx cost $50,000
Standard "off the shelf" OCR Vision System. - approx cost $55,000 for 3 reading stations.
Overall system cost is 77 cents per hide, although cost to small abattoirs is $1.80 per hide.

7.5 Recommended Identification System

From the costing analysis of different identification systems, System 4.1 (Laser Marked Bar Codes and Punched Holes) and 4.2 (Disposable Bar Codes and Punched Holes) have the lowest overall operating cost of approximately $0.35 cent per hide, significantly cheaper than other systems. The identification systems are cheaper to operate due to the smaller amount of capital investment required by abattoirs and a lower operator requirement for removing and reattaching tags.

Both System 4.1 and 4.2 equally well meet the requirements, as detailed in MRC's Hide Identification Requirements Matrix. The areas where the systems do not fully meet the requirements are:

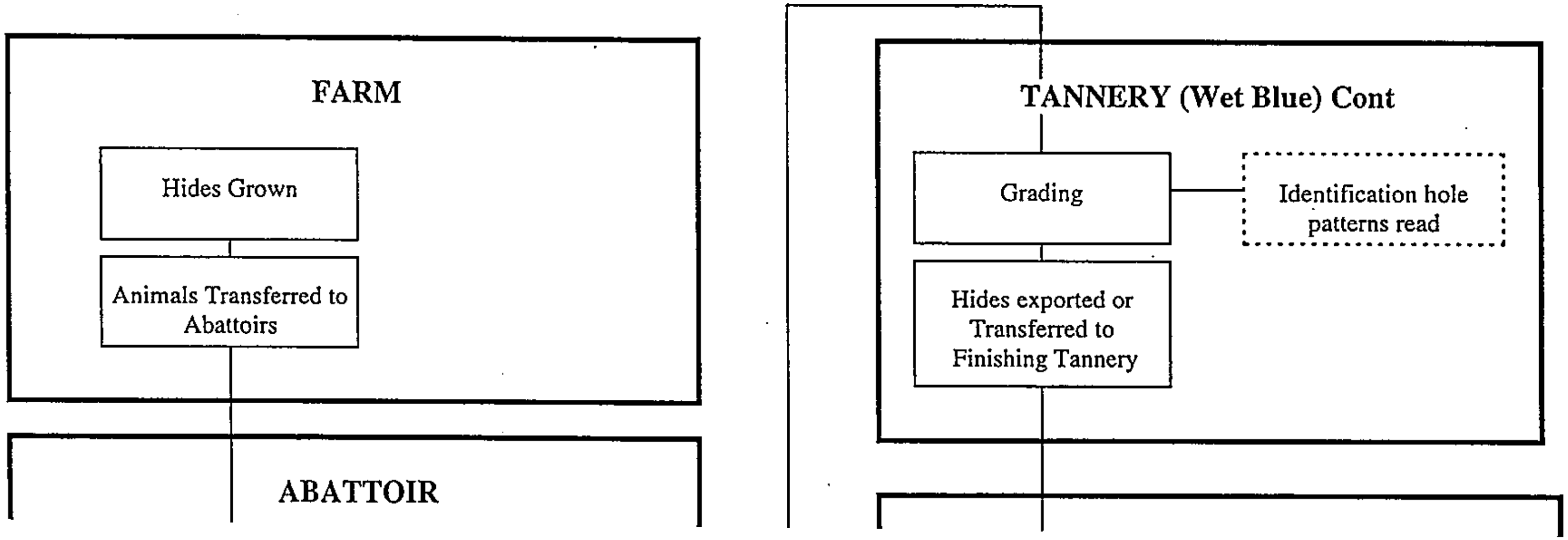
- Hole punched code can not be read with hair on hide, although hole patterns should not need to be read until hair removed by liming.
- Punched hole pattern will not be human readable, although will be human decodable.

System 4.1 has the associated disadvantage that identification numbers will not be unique on each hide and therefore a complex data base system will be required to track the identification data. Due to the high cost of the laser marked bar code tags, cheaper disposable tags will have to be used to identify hides that are exported from the abattoirs before wet blue processing and hole punching. This means additional equipment will be required at the abattoirs.

System 4.2 has possible disadvantages associated with the survival of disposable tags during salting and rehydration of hides before wet blue processing. Further testing of different tag materials will be required to identify suitable materials that will survive these processes.

It is therefore recommended that both System 4.1 - Laser Marked Bar Code Tags and Punched Holes, and System 4.2 - Disposable Bar Code Tags and Punched Holes be considered as systems for hide identification.

7.6 Recommended Hide Identification Systems Process Flow Chart



8 RISK MANAGEMENT OF RECOMMENDED IDENTIFICATION SYSTEM

A variety of different risks are associated with the implementation of the hide identification system. The following section details possible system development risks and appropriate risk reduction methods.

Refer to Table 4 - Risk Management Summary on following page.

Table 4 - Risk Management Summary

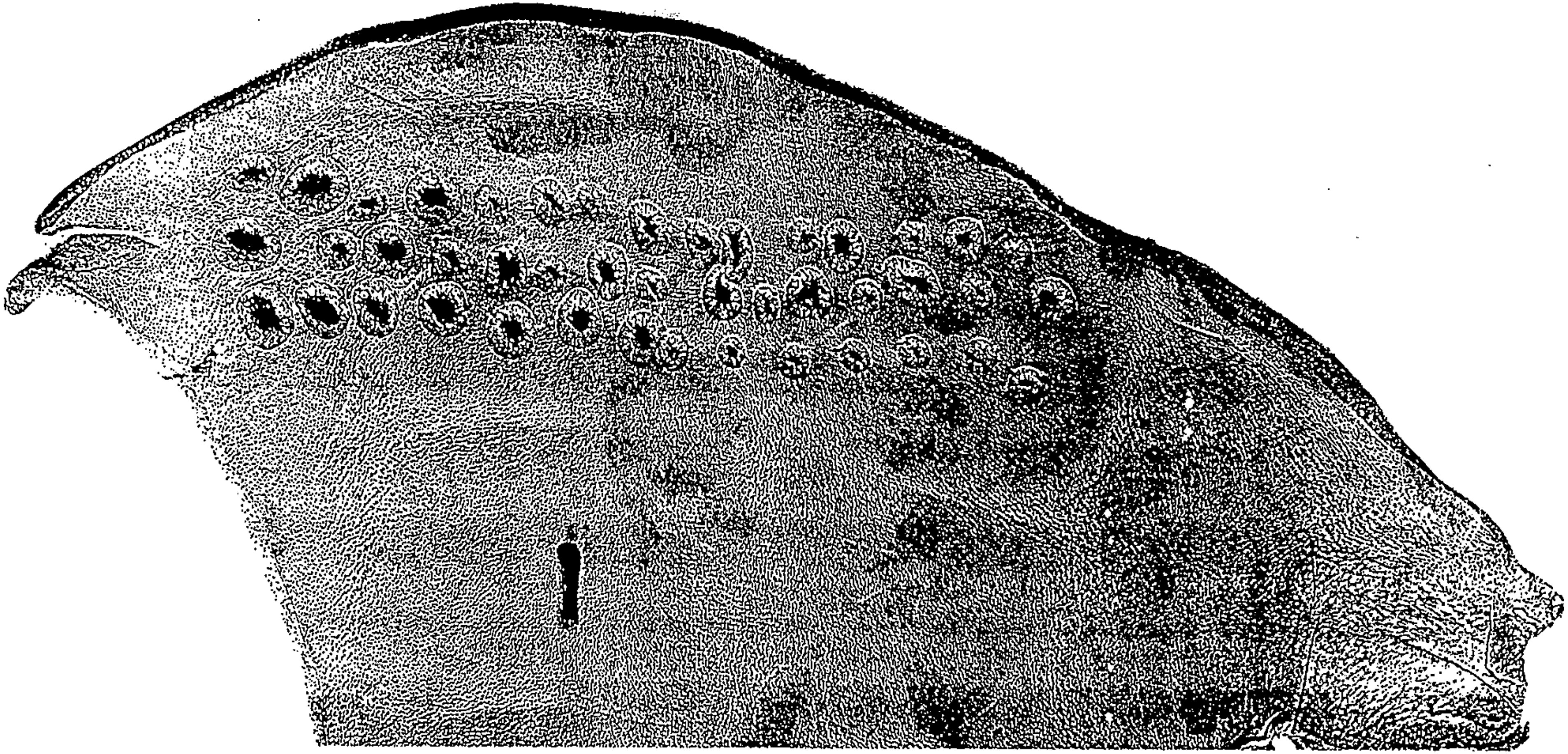
	Risk Description	Nature of Risk	Risk Level	Risk Reduction Method
1	Tag attachment method	Tags may fall off due to poor attachment method therefore losing hide identification.	Med	Extensive trials of different attachment systems will determine reliable attachment device.
2	Tag failure	Tags may fail if being recycled several times.	Low	Selection and trials of different tag materials.
3	Pattern recognition difficulties	System requires a read reliability above 99% if possible. Pattern recognition system may not have required recognition reliability.	High	Trailing different patterns to determine optimum design. Trailing commercial vision systems to determine optimum system.
4	Hide swelling	Hide swelling may cause hole patterns to close up.	Med	Determine hole size that does not close due to swelling
5	Hide distortion	Hide distortion may make hole patterns unreadable.	Med	Select vision system with distortion correction capabilities. Allen Bradley CVIM2 system has these features. Use hole pattern that is not effected by hole swelling.
6	Hole pattern Torn off	Different processes may tear off hole patterns.	Med	Holes will be punched after fleshing process to reduce this risk. Determine what areas are susceptible to tearing off, punch holes in different areas.
7	Splitting operation	Hole pattern may be destroyed when hide split.	High	Conduct trials to determine if hole pattern will survive splitting process. If hole patterns do not survive splitting process, hole patterns could be read before splitting and new patterns punched after splitting.
8	Ridging operation	Hole pattern may be destroyed when hide ridged.	Low	Punch hole pattern in position where not effected by ridging process.
9	Punching system design	Automated hole punching system may be difficult to design and build. Equipment design still in concept phase.	Med	Build test rigs and perform trials to ensure punching system will work.
10	Reading hole pattern when hair on hide	After samming and before drumming the hide will be identified with a punched hole pattern that is difficult to read with hair on the hide.	Low	System should not require hole pattern to be read with hair on hide. Hole patterns can be read from flesh side of hide if required.

Risk Management Summary (Cont'd)

	Risk Description	Nature of Risk	Risk Level	Risk Reduction Method
11	Punching Equipment Reliability	Punching system will be complicated mechanical device and may have reliability problems.	Med	Consider possible system failure methods when designing equipment. Design equipment so device can be maintained by tannery staff. Have back up system at each tannery.
12	Hole pattern reading system reliability	Hole pattern reading system will be complicated electronic device and may have reliability problems.	Med	Use industrially hardened components (ie Allen Bradley equipment) with proven industrial track record. Use "off the shelf" systems where possible with good service backup.

APPENDIX A

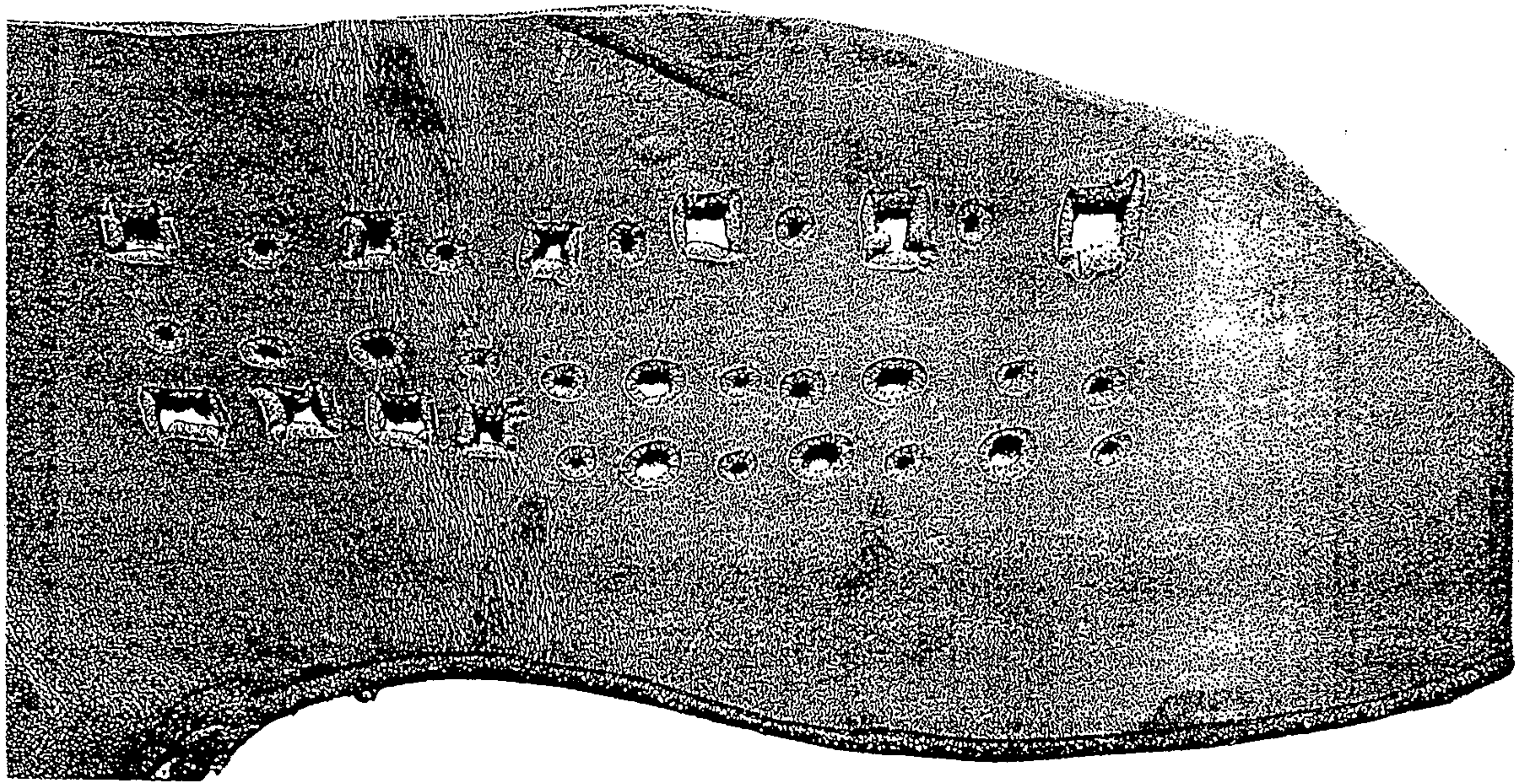
Hole Punching Trial Details



First Row:	5mm diameter, 8mm diameter holes alternating.
Second Row:	8mm diameter, 5mm diameter holes alternating.
Third Row:	7 x 8mm diameter, 7 x 5mm diameter holes.

(Hide sample processed to Wet Blue stage)

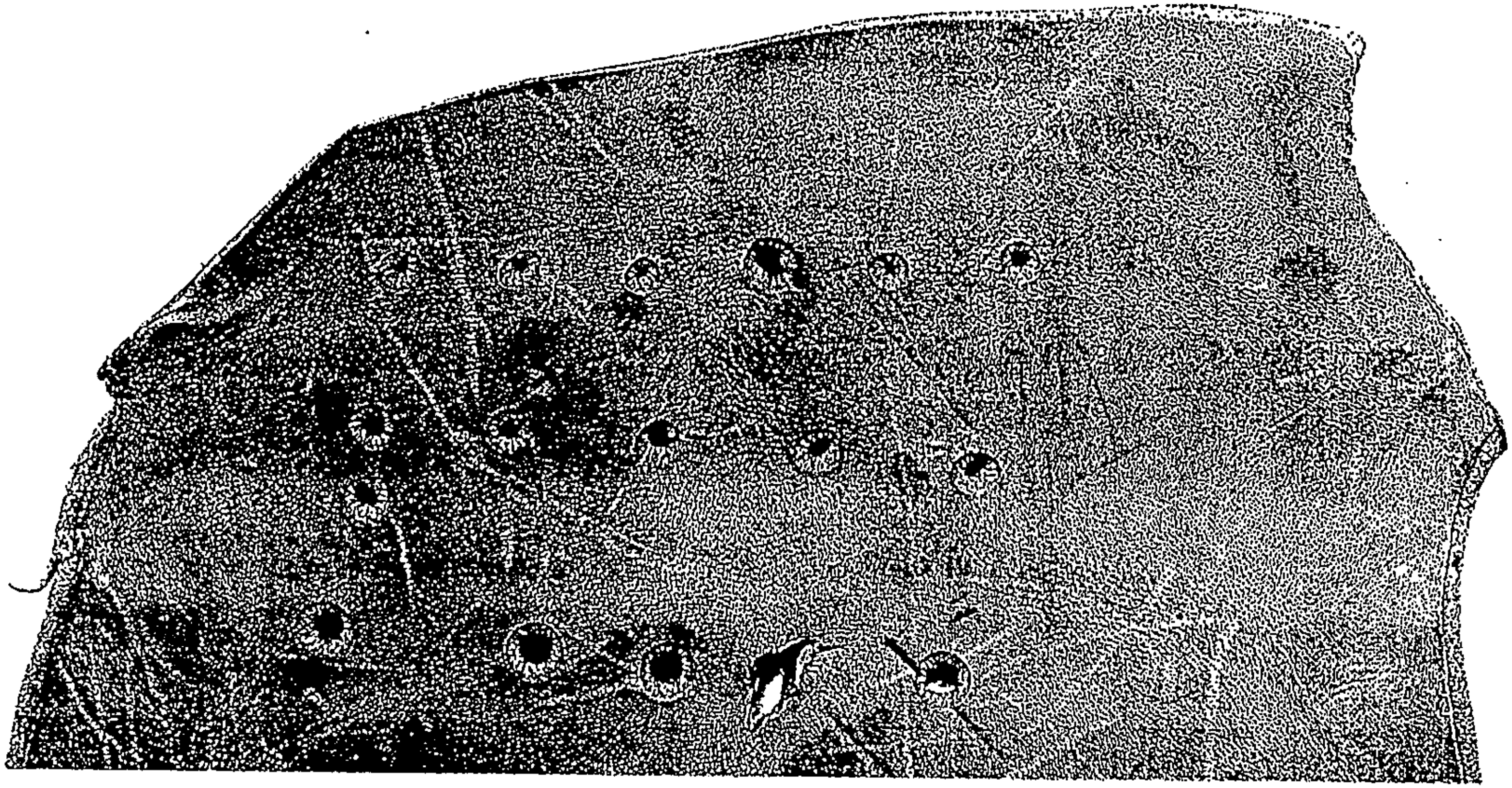
Hole Punching Trial - Sample 1



First Row: 9 mm square, 5mm diameter holes alternating.
Second Row: 5mm diameter, 6mm diameter, 8mm diameter hole pattern repeated.
Third Row: 4 x 9mm square, 5mm diameter, 8mm diameter holes alternating.

(Hide sample processed to Wet Blue stage)

<u>Hole Punching Trial - Sample 2</u>



First Row:	5mm diameter holes (4th hole 8mm diameter).
Second Row:	6mm diameter holes.
Third Row:	6mm diameter hole.
Fourth Row:	8mm diameter holes.

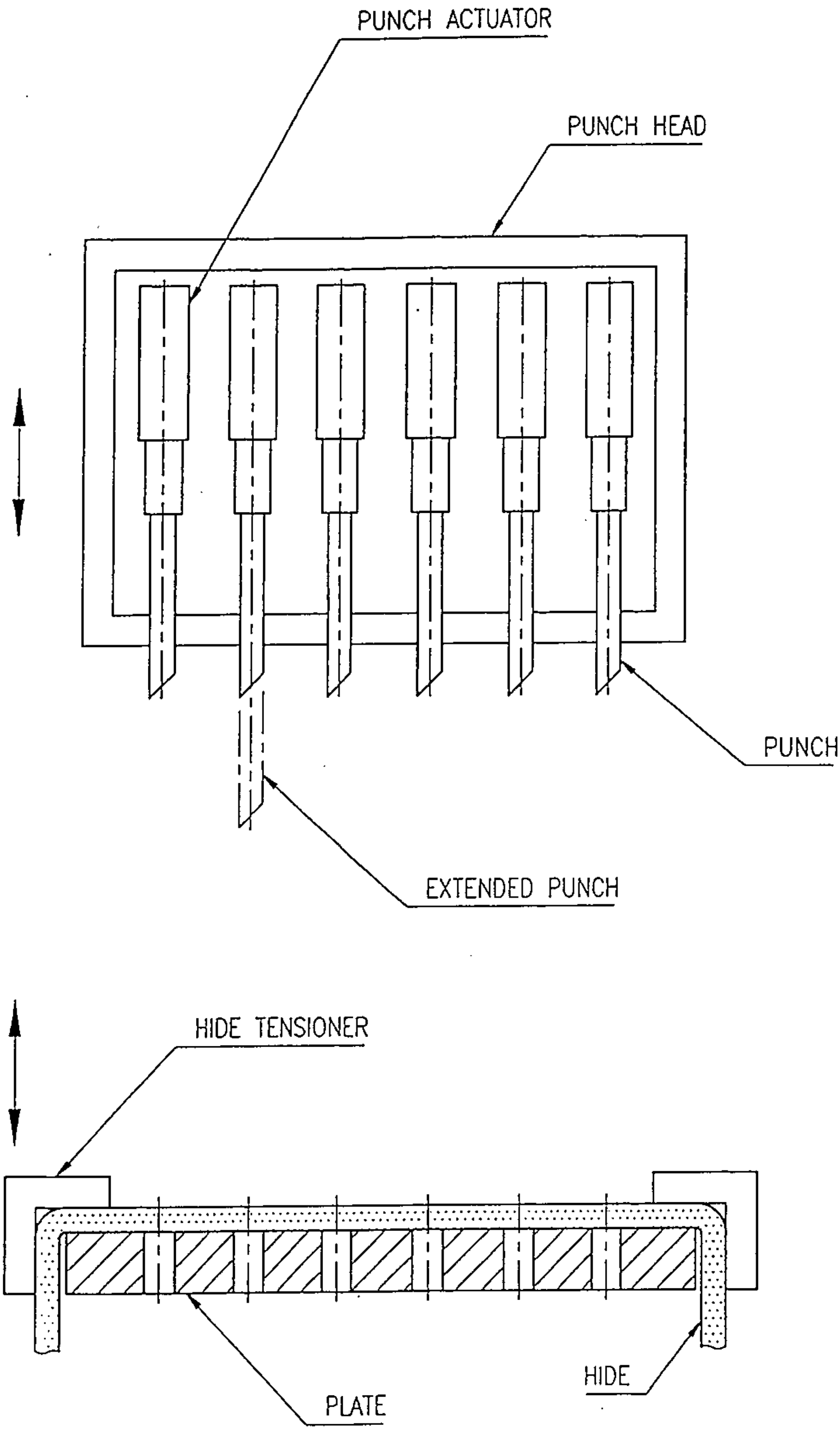
(Hide sample processed to Wet Blue stage)

<u>Hole Punching Trial - Sample 3</u>

Vision Abell

APPENDIX B

Hole Punching Device - Schematic



Hide Punching Device - Concept Diagram

APPENDIX C

Allen Bradley Vision System Brochure

ALLEN-BRADLEY

FOCUS ON INSPECTION PERFECTION

ALLEN-BRADLEY FAMILY OF VISION PRODUCTS

VISION FAMILY

Presenting the Allen-Bradley family of Vision Products — systems that perform inspection more often, with more speed and with greater confidence.

In many industries today, machine vision performs successful, vital tasks. Uses range from inspection and verification, through gaging to sorting and Optical Character Recognition.

Machine vision can:

- Reduce waste by inspecting each part more often, and providing real time process feedback
- Perform inspections at assembly line speeds
- Increase inspection reliability

The Allen-Bradley vision family provides an adaptable set of vision tools to meet a wide range of applications, consisting of:

VIM2™ Vision Input Module

A low-cost, single-camera system — compatible with Allen-Bradley's Universal 1771 I/O products — that can perform practical inspection tasks in a rugged environment.

Line Scan Camera

With built-in electronics, light pen and menu display, the line scan camera provides a fast, low cost, high resolution inspection device.

Smart Linear Sensor

A self-contained NEMA-4X rated linear sensor designed to economically perform continuous process gaging, web control, simple texture analysis and part/void counting to make accept/reject decisions and provide SPC data.

CVIM™ Configurable Vision Input Module

A versatile and powerful system, featuring both binary and gray scale image analysis that's easy to learn and use.

Color CVIM™

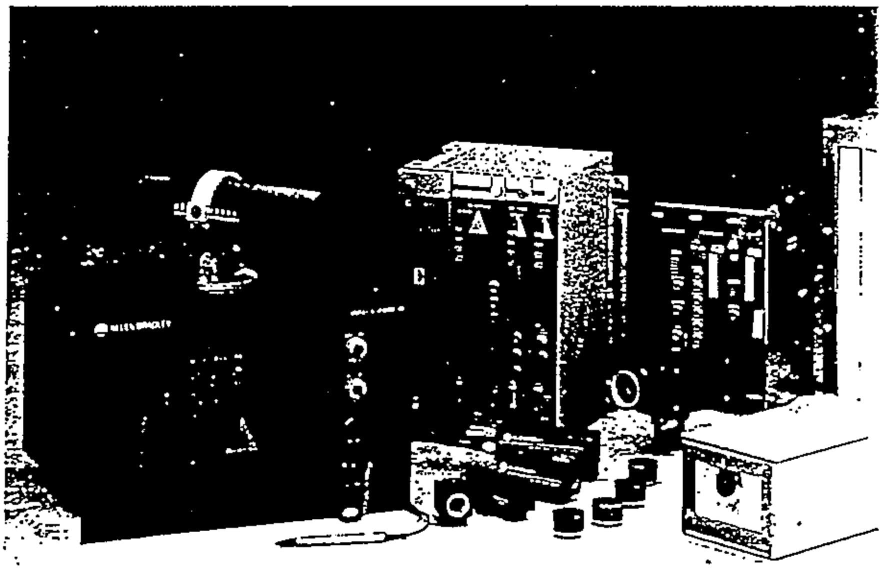
Building on the CVIM platform, Color CVIM adds a powerful new dimension of inspection in full color.

CVIM2™

The highest level of vision inspection is possible with this member of our family — offering a six-camera capability and advanced hardware and software tools.

Global Integration

Machine vision products are manufactured for use globally, providing customers around the world with the ease and convenience of using manuals and screen text translated into multiple languages. Products like the Smart Linear Sensor and the CVIM modules have configuration software that is available in several languages. In addition, all equipment, including peripherals, is designed to operate from AC power used worldwide.



HIGH PERFORMANCE AT LOW COST

High-speed inspection. Real-time data processing. More accurate statistical process control. Minimized production waste. Reduced warranty costs. Allen-Bradley vision products can improve product quality, lower start-up costs and reduce time-to-market.

Each product is industrially hardened to operate in manufacturing environments. And on the plant floor, these vision tools are an important cost-saving device, since they can monitor quality before value is added to a product.

Their ease of use reduces training and set-up costs. When connected to system controllers, Allen-Bradley vision products become a highly accurate source of rapid, real-time data and an integral part of the quality control process.

Allen-Bradley machine vision products can perform:

Inspection

Vision systems can examine a part (in either black and white, gray scale or color) and compare it to stored information at assembly-line speeds. Based on this comparison, accept/reject decisions are made.

Gaging

Allen-Bradley machine vision products can perform non-contact measurements such as length, width, contour and area.

Location

Machine vision can pinpoint the location of a particular feature, object or default.

Trend Detection

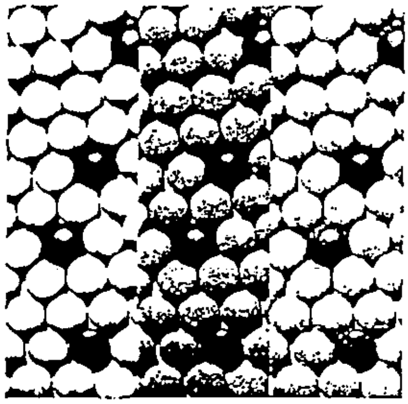
Machine vision can improve the statistical control of your product or process by providing run-time inspection information to the control system. Real-time inspection information facilitates the detection of trends so that the production process can be kept under control.

OCR

Optical Character Recognition (OCR) has become essential in many industries to inspect proper date/lot codes and ensure correct labeling. Combined with other inspection tools, OCR inspection provides a powerful solution.

In addition, Allen-Bradley machine vision products are supported by a full line of peripheral products and accessories, including lighting and optics, cameras, monitors, power supplies and cables. All designed to help support your specific application needs.

Allen-Bradley. A leader of quality for over 90 years. Providing quality for the industries of tomorrow . . . today.



"Allen-Bradley machine vision systems combine high performance with ease-of-use to fill a key role in factory automation."

[redacted] [redacted]

VIM2: Vision Input Module

The VIM2 module is housed in the Allen-Bradley 1771 I/O chassis architecture and can operate in stand-alone mode, talk with an Allen-Bradley PLC through the backplane or communicate to other host devices via the RS-485 serial port. The VIM2 has a single black and white camera input and processes binary images at inspection rates of up to 30/second.

All application parameters are configured with menu driven icons using a light pen and monitor, and are stored in non-volatile EEPROM. Multiple configurations can be stored on a host PLC or via RS-485 communication.

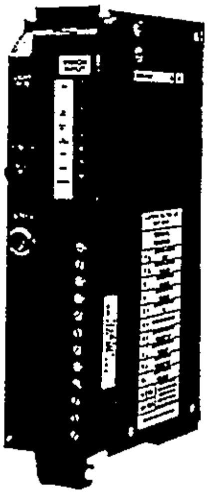
In addition to standard pixel counting windows and line gage tools, the VIM2 has built-in math tool capabilities, including:

- Add, subtract, multiply, divide
- Logical AND, OR

and computes powerful learn mode statistics:

- Total triggers
- Total failed inspections per tool
- Minimum range value
- Average range value
- Maximum range value

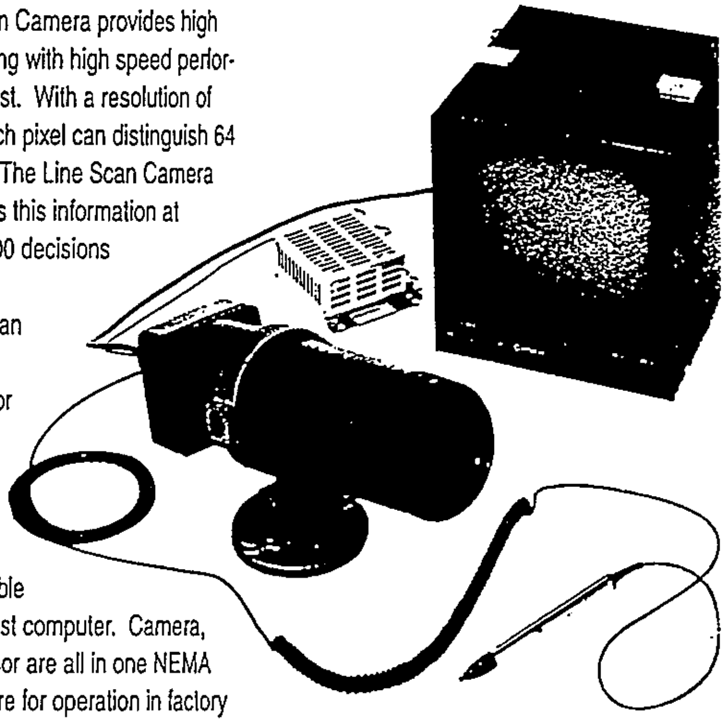
It also features tool registration, X-Y positional compensation and automatic lighting compensation.



Line Scan Camera

The Line Scan Camera provides high resolution imaging with high speed performance at low cost. With a resolution of 2.048 pixels, each pixel can distinguish 64 shades of gray. The Line Scan Camera can then process this information at a speed of 12,000 decisions per minute.

The camera can operate as a standalone unit or be controlled via an RS-232 port with an Allen-Bradley PLC programmable controller or a host computer. Camera, lens and processor are all in one NEMA Type 4X enclosure for operation in factory floor environments.



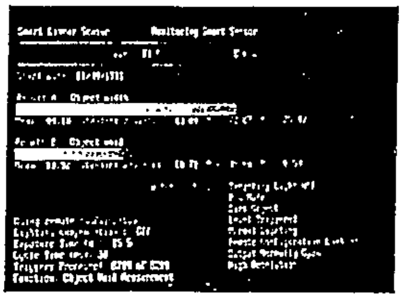
The camera has built-in diagnostics, "Help" screens and a document page for instant status reports, and can be easily configured with a light pen and monitor.

Applications for the Line Scan System include sorting, counting, inspecting, fill position and width measurement. The Line Scan Camera takes advantage of 17 measurement functions, using 4 line gages to count and measure features. It has the ability to locate a part or feature and conduct an inspection at that location. A built-in light meter compensates for variations in lighting and an X-Float feature compensates for variations in movement.

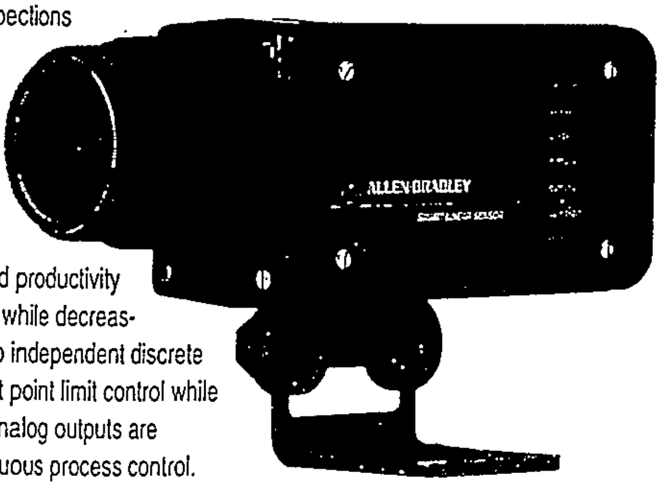
"Allen-Bradley's low-end vision products perform dedicated inspection tasks reliably and without failure to help ensure consistent product quality."

Smart Linear Sensor

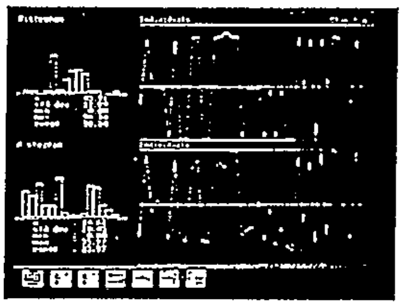
The Smart Linear Sensor brings high-performance machine vision technology with ease of use to the shop floor at low cost. The Smart Linear Sensor provides dedicated functionality that's easy to set up and easy to use.



The SLS provides real-time gray-scale data acquisition for computer integrated manufacturing. Its high-speed capability of up to 3,000 inspections per minute and continuous sensor interfacing for most process control systems results in increased productivity and overall quality while decreasing downtime. Two independent discrete outputs provide set point limit control while two independent analog outputs are available for continuous process control.

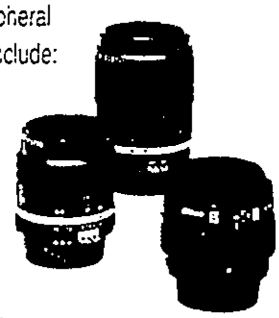


An optional multi-language IBM®-PC compatible software package is available to monitor process variables in addition to real-time inspection results. A powerful set-up aid, it can also upload and download configurations, monitor inspection results and provide powerful SPC capabilities, including custom charts displaying inspection results in real-time. Up to four SLS outputs can be monitored simultaneously when a four port PC serial board is used.



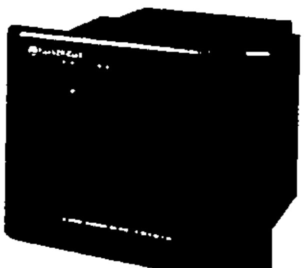
Peripheral Products

The Allen-Bradley family of machine vision products is supported by a number of peripheral products which include:

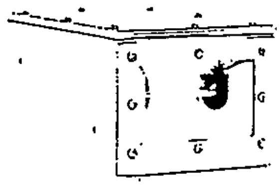


Lenses

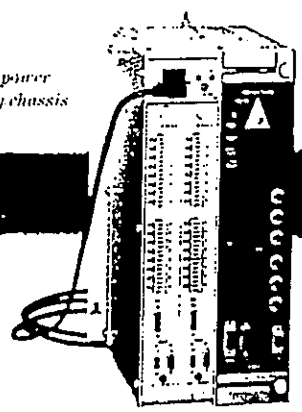
Black and white camera



VGA monitor



Area strobe light



CVIM power supply chassis

The CVIM Family

All of the CVIM modules are designed for sophisticated process inspection and control, yet are highly adaptable and easy to use. Installation and set-up costs are minimized through rugged, modular design and minimal training is required for operation.

Application parameters are configured with a light pen and monitor using pop-up menus and are stored in non-volatile EEPROM. No software programming is required and any modifications required later can be made without having to unravel programming code. Multiple configurations can be stored on a host, PLC or by using a portable memory card.

The CVIM modules are housed in the Allen-Bradley Pyramid Integrator™ I/O chassis architecture and can operate in stand-alone mode, talk with an Allen-Bradley PLC through the backplane or communicate to other host devices via Local, Serial or Remote I/O. Integration into this architecture provides high speed data communication between the shop floor and the highest levels of your control system.

CVIM

The core of our group is the CVIM module. It has an extensive set of vision analysis tools to automate manufacturing processes that require inspection, gaging and measurement, part identification, sorting or process control. It can provide machine vision solutions to the manufacturing process in many applications, which include part positioning, dimensional checking, presence/absence of parts, sorting, flaw detection, motion control and OCR/OCV (Optical Character Recognition and/or Optical Character Verification).

Applications for CVIM include:

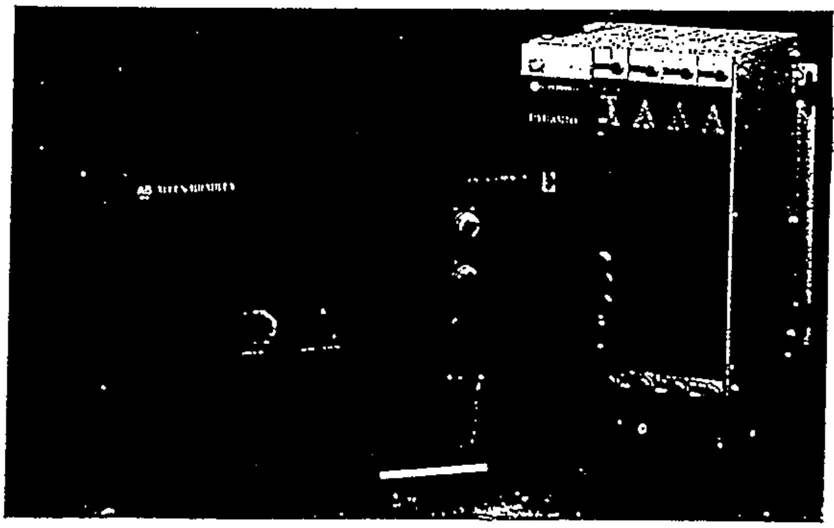
- **Packaging** Label positioning, fill level detection, cap closure and date and lot code
- **Pharmaceuticals/Medical** Counting, safety seal, optical character recognition (OCR), syringe, vial and catheter inspection
- **General** Extrusion gaging, positioning and discrete part inspection/ measurement
- **Automotive** Spark plugs, battery and air bag inspection

Color CVIM

Color CVIM has an added dimension to its capability: the ability to inspect in full color. Able to see the complete rainbow of colors, each system can be "taught" to look for 32 of your own specific colors. Color CVIM is able to segment colors in both the RGB (Red, Green, Blue) and HSI (Hue, Saturation and Intensity) domains. HSI allows for greater tolerance of lighting variation, providing a broader range of solutions when black and white processing just won't do.

Applications for Color CVIM include:

- **Pharmaceuticals** Tablet inspection/sortation, blister pak and package inspection
- **Food** Portion verification, aseptic packages, labels and fill levels
- **Baking** Asymmetrical shape and other defects
- **Cosmetics** Sortation by color and assembly verification
- **Electronics** Component identification by color, sortation and flaw detection
- **Packaging** Leak detection, sort by color code



CVIM2

The newest member of the CVIM family, CVIM2 has many additional hardware and software features for advanced applications. Offering a six camera capability with a resolution of 640x480, CVIM2 also provides more memory and higher speed capabilities. Multiple on-screen inspection views with text and graphics are inherent in the system.

Applications for CVIM2 include:

- High Speed Image processing and analysis
- Multiple Camera Applications 360° container inspection and asynchronous acquisition
- High Resolution Applications Dimensional gaging and flaw detection
- OCR/OCV User adjustable tolerance and dot matrix recognition

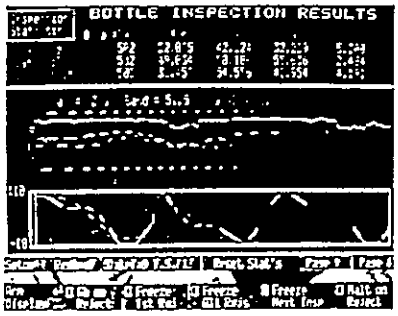
Optional PAKs

In addition, the CVIM modules accommodate optional add-on functions, called "Packages," which can be installed with a RAM card, if additional features are needed. Once loaded, these PAKs become a permanent part of the operating system.

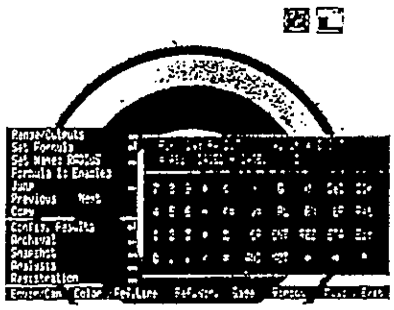
USER-PAK™ can be used to customize displays for a particular application by modifying or deleting existing menus. Custom results screens can also be created. Another benefit of USER-PAK is that it allows the vision module to be configured with a mouse or trackball instead of the light pen normally used. USER-PAK is an option available for CVIM and Color CVIM; it is embedded in CVIM2.

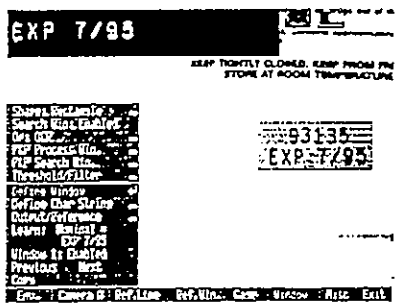
MATH-PAK™ can combine and process individual tool inspection results in order to determine the overall pass/fail status of a given inspection. For example, if you wanted five out of seven line gage measurements to comprise a pass result, MATH-PAK can do it. MATH-PAK is an option available for CVIM and Color CVIM; it is embedded in CVIM2.

OCR-PAK™ (Optical Character Recognition) is used to read the legible printing of date and lot codes on packages [illegible]parts. These tasks can be performed at [illegible]uction line speeds and transmit this information to another device, or perform a match/comparison with whatever was supposed to be printed on that part. There are two OCR-PAKs available. OCR-PAK is for CVIM; OCR2 provides advanced features for CVIM2.
OCR is not available for Color CVIM.



USER-PAK


MATH-PAK



OCR-PAK

WHICH FEATURES DO YOU NEED?

TO PERFORM THIS TASK:	THE SYSTEM INCLUDES THIS FEATURE:	SLS	VIM2	LSC	CVIM	COLOR CVIM	CVIM2
Acquisition	High speed inspection	□	□	□	□	□	□
	Multiplexed camera support		□		◪	□	■
	Simultaneous camera support				◪		■
	Gray scale image processing	□			□	□	■
	Color image processing					□	
	Binary image processing	□	□	□	■	■	■
	Built-in light meter to compensate for lighting variations	□	□	□	□	□	□
	Automatic synchronization with a strobe	□	□	□	□	□	□
	Automatic location of vertically or horizontally mispositioned parts	□	□	□	◪	◪	■
	Automatic location of rotated parts				□	◪	■
	Measurements can be converted from pixels to standard units of measure (inches, centimeters, etc.)				□	□	□
Image Process and Analysis	Inspection windows to concentrate inspection to a portion of the image:						
	Rectangular, donut and circular		□		◪	◪	■
	Polygon: user defined				□	□	□
	Pixel counting		□		□	□	□
	Contour analysis				□	◪	■
	Template match				□		■
	Optical Character Recognition				□		■
	Measurement gages to count and locate:						
	Linear	□	□	□	□	□	□
	Circular or arched				□	□	□
	Filtering to suppress image noise	□	□	□	◪	◪	■
	Image processing	□			◪	◪	■
	Mathematical processing of results		□		◪	◪	■
Communication and Operator Interface	Pass/fail decisions sent to output terminal(s)	□	□	□	□	□	□
	Allen-Bradley remote I/O network				□	□	□
	RS-232 communications supported	□		□	□	□	□
	RS-485 communications supported		□				
	Proportional control, analog output	□		□			
	Memory/RAM cards				□	□	□
	Freeze on reject displays		□	□	◪	◪	■
	Statistical Displays	■	□		◪	◪	◪

Levels of functionality: Basic □ Intermediate ◪ Advanced ■

ALLEN-BRADLEY
A ROCKWELL INTERNATIONAL COMPANY

Allen-Bradley has been helping its customers improve productivity and quality for 90 years. We design, manufacture and support a broad range of [illegible] products worldwide. They include logic processors, power and [illegible] machine interfaces and sensors and a variety of software. [illegible] Rockwell International, one of the world's leading [illegible]

With major offices worldwide

Algeria • Argentina • Australia • Austria • Bahrain • Belgium [illegible] • Costa Rica • Croatia • Cyprus • Czech Republic • Denmark • Ecuador • Egypt • El Salvador • Finland [illegible] • Hong Kong • Hungary • Iceland • India • Indonesia • Ireland • Israel • Italy • Jamaica • Japan • Jordan • Korea [illegible] • Netherlands • New Zealand • Norway • Oman • Pakistan • Peru • Philippines • Poland • Portugal • Puerto Rico • Qatar [illegible] Slovak Republic • Slovenia • South Africa, Republic • Spain • Switzerland • Taiwan • Thailand • Turkey [illegible] • Venezuela • Vietnam • Yugoslavia

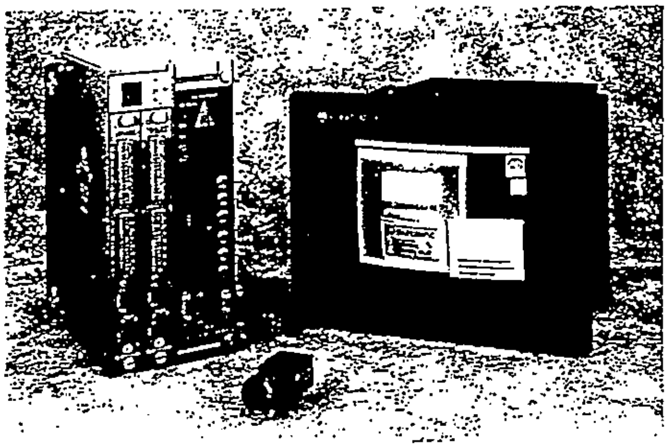
World Headquarters [illegible] WI 53204 USA, Tel: (1) 414 382-2000 Fax: (1) 414 382-4444

Rockwell Automation
Allen-Bradley

New CVIM2™ Machine Vision: Easy, Flexible and Fast

Bulletin 5370
CVIM2 Configurable Vision Input Module
(Catalog No. 5370 – CVIM2)

Product Profile



The CVIM2 machine vision system from Allen-Bradley retains all of the easily configurable features of the popular CVIM™ module plus these enhancements:

- multiple on-screen inspection views with text and graphics
- six-camera capability
- dedicated image processing hardware, providing higher inspection speeds
- optional software packages to increase system functionality
- customization of on-screen views and menus

Able to acquire and process image information from up to three high-resolution cameras simultaneously, the CVIM2 module is ideal for use in:

- packaging
- material handling
- inspecting
- assembly operations

Industrially hardened for the plant floor environment, the CVIM2 module combines the ease-of-use of a configurable system with the flexibility of a programmable system.

With the CVIM2 system extensive training is minimized because a programming language is not required. The operator defines the parameters of the inspection system using a light-pen or mouse and pull-down menus.

Features

A CVIM2 system can be used for inspection on multiple independent lines or multiple stations on a single line. In certain applications, the CVIM2 module can also inspect up to six separate views of a single product.

The CVIM2 module can also handle camera resolutions up to 640x480 pixels.

In addition to basic CVIM Inspection Tools, the CVIM2 system has the following new tools:

- reference tools for randomly orientated parts
- completely circular gage (no head or tail)
- "fat" gages up to 16 pixels wide
- contour analysis for position, orientation and shape
- template match score and position
- circular orientation finder for round objects
- security and system administration function
- math tool
- file system to manage multiple configurations
- image processing tools (convolution, morphology, perspective)
- circular unwrap for high speed inspection of round objects

Options

With the optional OCR2-PAK™ software and binary correlator daughter board, the CVIM2 module is capable of reading and verifying printed characters in the most demanding applications.

Specifications

Ambient Temperature Range

Operational: 0° C to 60° C (32° F to 140° F)
Storage: -40° C to 85° C (-40° F to 185° F)

Relative Humidity

5% to 95% RH (Non-condensing)

Packaging

Two-slot Pyramid Integrator™ Vision Module compatible with:

- Vision Platform (2801–AM2)
- Pyramid Integrator (5510-A4 and 5510-A8) chassis compatibility

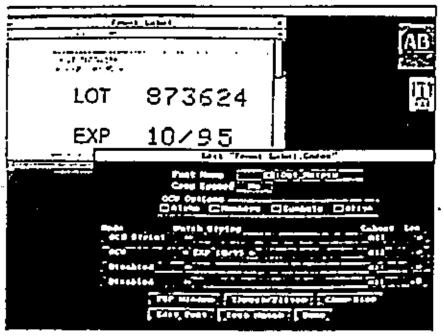
Communications

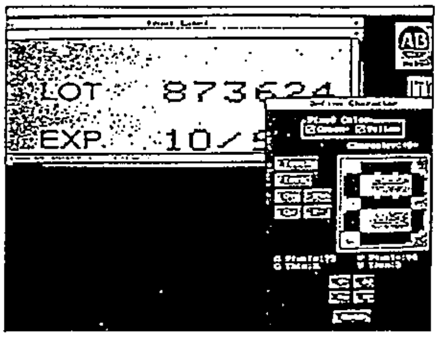
Remote I/O
RS-232 serial ports (4)
Local I/O (32)

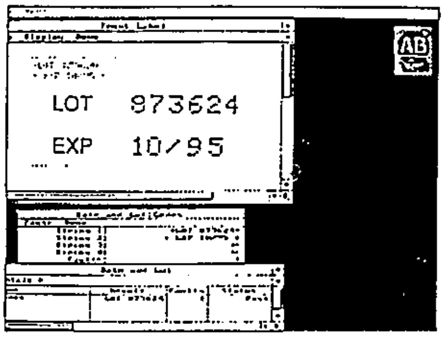
Rockwell Automation
Allen-Bradley

Bulletin 5370-OCR2
OCR2-PAK™
Software Option for the CVIM2™ Module

Product Profile







Bulletin 5370-OCR2, OCR2-PAK, is an optional software package for the CVIM2 Configurable Vision Input Module which adds processing algorithms to perform Optical Character Recognition and Verification capabilities for pharmaceutical, general packaging, electronics and other applications.

OCR2-PAK for the CVIM2 Module offers a high speed, hardware-based approach to Optical Character Recognition (OCR) and verification (OCV).

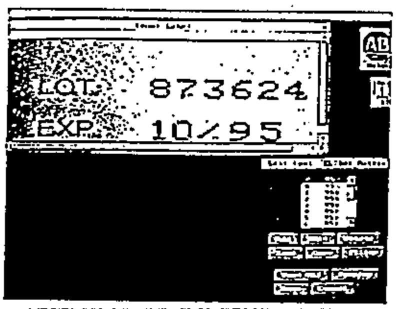
Some of the capabilities include:

- ability to teach any character or symbol
- multiple fonts per inspection
- accommodates scaling and rotation
- adjustable verification tolerances (% correlation)

OCR2-PAK is a licensed software product and is distributed on a memory card. The software is permanently installed into the CVIM2 module's program memory in minutes. The CVIM2 module hardware must be a 5370-CVIM2BC. The firmware revision must be B01 or later to support OCR2-PAK, Series B.

Features

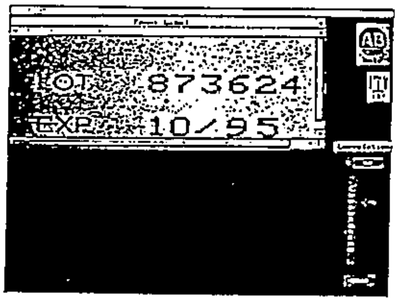
The CVIM2 OCR2 option offers the ability to teach any character or symbol, including dot matrix printing. It also accommodates full character rotation and can read circular character strings. Each OCR tool window can read or verify up to 4 character strings of up to 20 characters each. Multiple OCR tools and fonts can be used in an inspection.



Font Editing

Character and font teaching is done through the user interface quickly and easily. Characters are taught by positioning a window over each character in the string. The system automatically learns the character within the window. Each character has a correlation percentage that can be modified to accommodate variations in print quality.

Product change over is simplified with an easy-to-use character resize function. The system automatically determines the character size and updates the scaling parameters. This avoids the need to constantly reteach fonts or to precisely adjust camera position to obtain a preset character size.



Adjustable Correlation

Additional features include:

- fully integrated into CVIM2 configurable environment
- adds an OCR tool and font editor to the standard system
- can utilize standard CVIM2 functions, including rotation and position compensation, image processing, communications and security
- multiple fonts can be used in a single inspection
- in recognition mode, character strings are read and sent out on user designated communication ports
- in verification mode, OCR2-PAK performs string-match operations and provides match/no-match decisions
- match strings include an extensive set of metacharacters and can be entered by an operator or downloaded from a host computer
- all characters and strings are displayed on the run-mode screens in green when successful. Strings that fail a match-string operation are displayed in red to indicate the failure
- parameters may be modified on-line, at any time in the same manner
- image processing and filtering capabilities optimize the image within the window to provide accurate and repeatable results

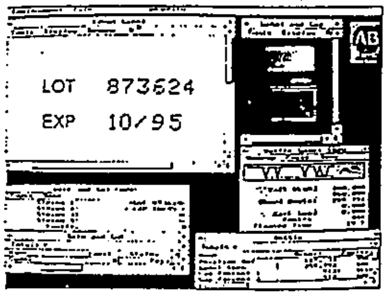
Specifications

A variety of product specifications show the accuracy, speed and flexibility of OCR2-PAK. They include:

- 5-10ms (typical) inspection time per character
- reads any character and can verify characters, symbols and logos
- font characters are A-Z, a-z, 0-9 and all keyboard symbols
- spaces and non-characters can also be detected
- system adapts to changes in character intensity and lighting changes
- full compensation for position and rotation
- operates in all CVIM2 module image resolutions: 256 x 240, 320 x 240, 512 x 240, 640 x 240, 512 x 480, and 640 x 480
- match-string option for verification applications
- built-in test function for application troubleshooting

Communication Enhancements

Communication is a key component in today's factory automation solutions. OCR2-PAK communication enhancements consist of character strings that can be read by a host computer, programmable controller or logged to a printer or operator display. Match strings can be changed quickly using a host computer or remote terminal.



Multiple Inspections

CVIM2 Module Product Features

Allen-Bradley's CVIM2 offers the highest level of vision inspection in the vision family. It has six-camera capability with a resolution of 640 x 480. CVIM2 also provides more memory and higher speed capabilities than the CVIM and Color CVIM. Multiple on-screen inspection views with text and graphics are also inherent to the system.

Additional CVIM2 module product features include:

- reference lines
- reference windows
- rotation finder
- light compensation
- pixel counting
- contour analysis
- template matching
- image processing
- math formulas
- multiple run-time displays

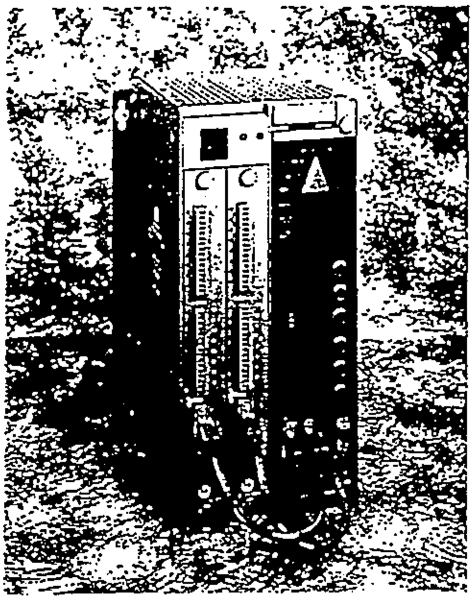
Note: The CVIM2 module can be ordered with or without OCR2 capability.

Pharmaceutical Validation

Federal regulations issued by the FDA on August 3, 1993, require most pharmaceutical packaging companies to conduct 100 percent inspection of labels. The ruling is part of the industry "Current Good Manufacturing Practices" or CGMP. A-B's CVIM2 vision system with the OCR2-PAK option provides the technology to meet these inspection demands.

Starter Kits

CVIM2 Module in Vision Platform



Rockwell Automation

Allen-Bradley

Allen-Bradley, a Rockwell Automation Business, has been helping its customers improve productivity and quality for more than 90 years. We design, manufacture and support a broad range of automation products worldwide. They include logic processors, power and motion control devices, man-machine interfaces, sensors and a variety of software. Rockwell is one of the world's leading technology companies.

Worldwide representation.

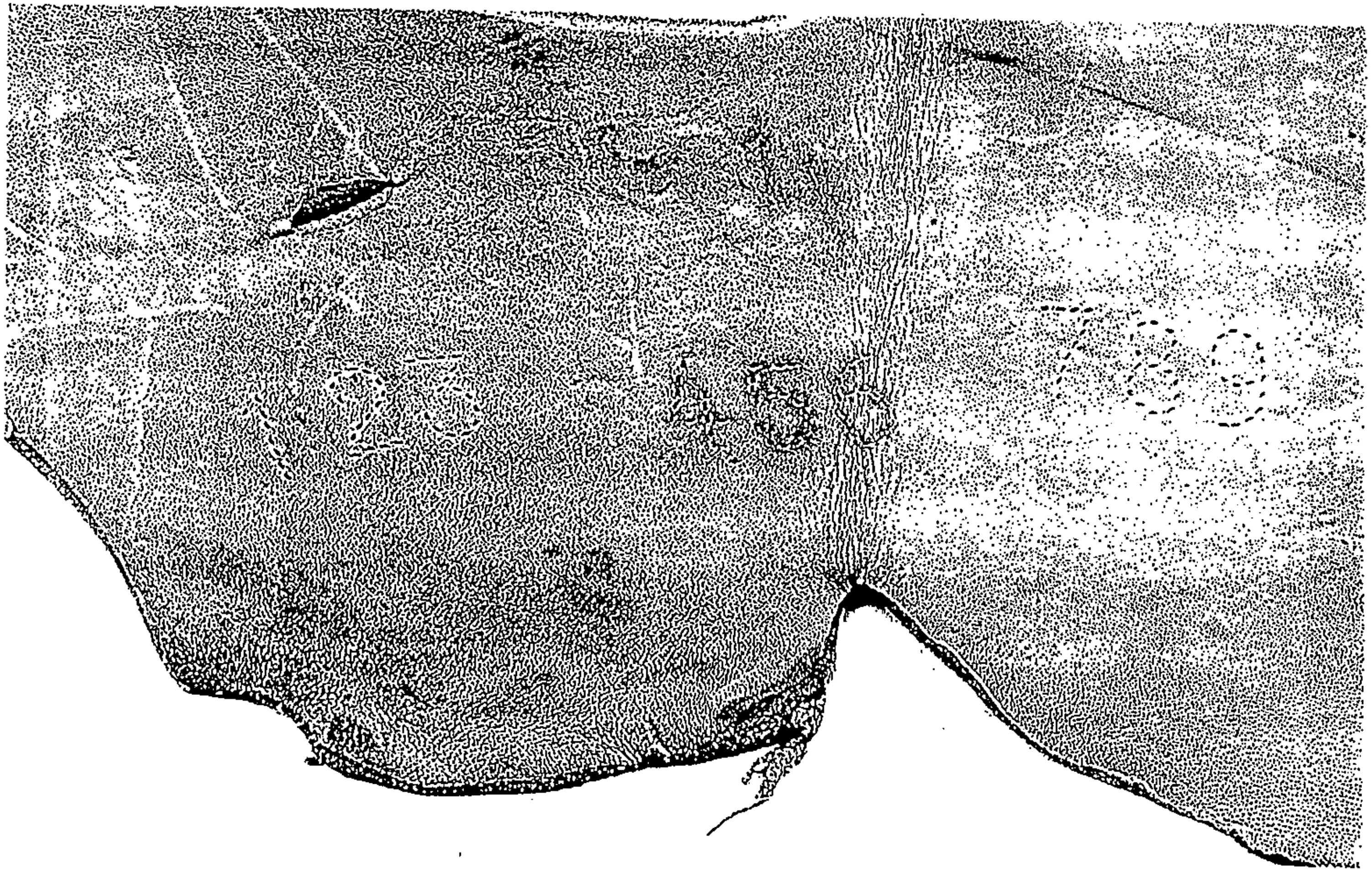
Argentina • Australia • Austria • Bahrain • Belgium • Brazil • Bulgaria • Canada • Chile • China, PRC • Colombia • Costa Rica • Croatia • Cyprus • Czech Republic • Denmark Ecuador • Egypt • El Salvador • Finland • France • Germany • Greece • Guatemala • Honduras • Hong Kong • Hungary • Iceland • India • Indonesia • Ireland • Israel • Italy Jamaica • Japan • Jordan • Korea • Kuwait • Lebanon • Malaysia • Mexico • Netherlands • New Zealand • Norway • Pakistan • Peru • Philippines • Poland • Portugal Puerto Rico • Qatar • Romania • Russia–CIS • Saudi Arabia • Singapore • Slovakia • Slovenia • South Africa, Republic • Spain • Sweden • Switzerland • Taiwan • Thailand Turkey • United Arab Emirates • United Kingdom • United States • Uruguay • Venezuela • Yugoslavia

Allen-Bradley Headquarters, 1201 South Second Street, Milwaukee, WI 53204 USA, Tel: (1) 414 382-2000 Fax: (1) 414 382-4444

Vision Abell

APPENDIX D

Tattooed Mark Trial Details



Numbers	1,2,3:	Strikers only - No ink.
	4,5,6:	Strikers dipped in Steadfast Tattoo Ink.
	7,8,9:	Strikers dipped in Black Printing Ink - Ink was removed by wet blue tanning process.

(Hide sample processed to Wet Blue stage)

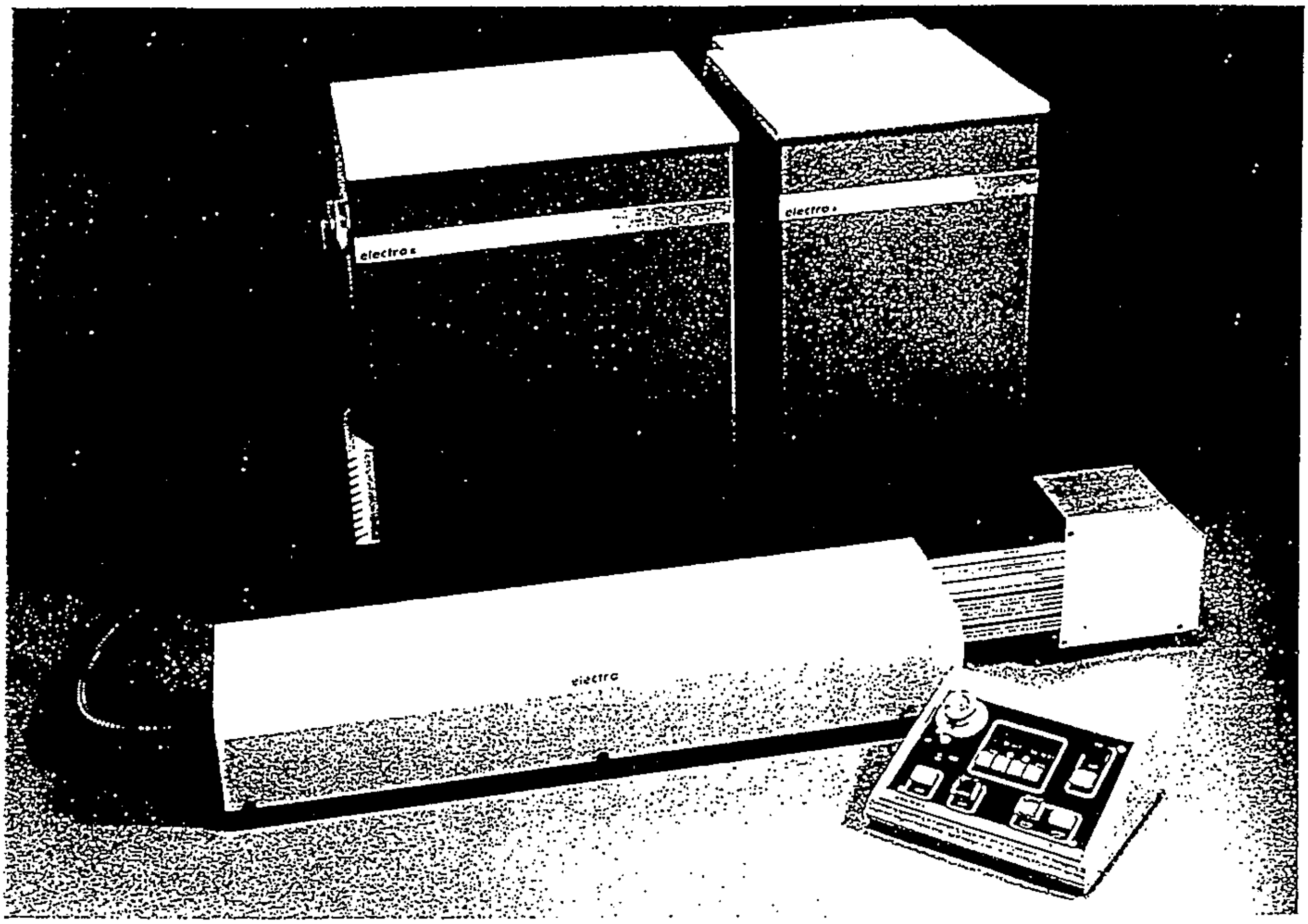
<u>Hide Tattooing Trial - Sample 1</u>

APPENDIX E

Electrox Scriba Laser Marking System Brochure

Scrība

Laser Marker System



Scriba heralds a new era of Electrox Nd:YAG Laser Markers. and is the result of over 15 years experience in industrial laser design.

Scriba offers high speed. high quality marking of text. security and bar codes. logo's and graphics on a wide range of materials.

Designed for easy integration. *Scriba* is compact. The main assembly comprising of the control unit and cooling system. measure 625mm x 73[illegible]mm x 432m [31.13" x 17.83" x 25"]. allowing integration into almost any system. In addition the components can be floor or bench mounted giving extra flexibility.

Scriba incorporates components designed and built by Electrox. these include the laser. electronics. and cooling system. All elements have been optimised to provide a high performance. simple to use. Laser Marker

Scriba employs the latest advances in microprocessors to improve both set-up time and throughput. The software allows test files. images and CAD files to be easily integrated into the marker program.

Scrība - The Leading Edge in Laser Technology

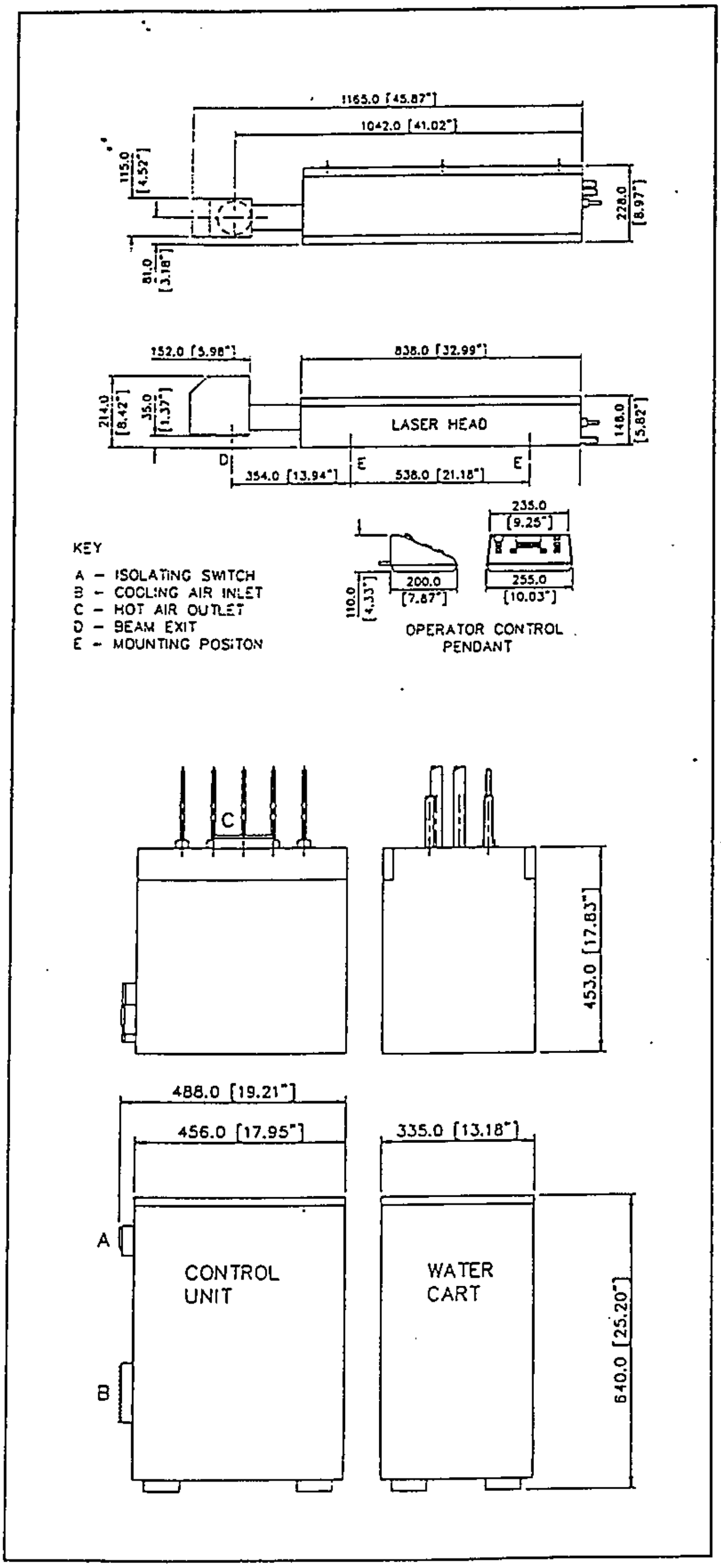
* High Speed. High Quality Marking
* Small Footprint
* Unique design to simplify integration
* Higher productivity
* Low maintenance costs

electrox

LASERS FOR INDUSTRY

THE 600 GROUP

Scrība Specification

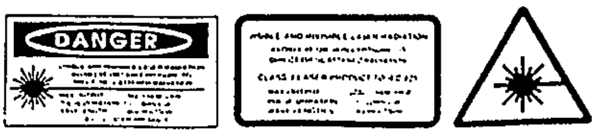


Rated Power	75 watts
Q-switch Frequency	Max. 50 kHz
Writing Speed	0.5 - 3800 mm[0.02 - 150"]/sec
Resolution	7 micron[0.00025"]
Character Marking	0.5 mm - 100 mm[0.02" - 3.9"]
Character Marking Speed (3 mm[0.12"] character)	up to 150/sec
Voltage (3 phase-3wire and Earth) 50 or 60 Hz	208, 240, 360, 380, 416, 420, 450 or 480 volts
Fonts	Helvetica and OCR-A Up to 10 simultaneous loaded fonts Auto fill of outline characters
Power	6.5 KVA
Cooling Water (intermittent demand)	Max. 19 litres/min. [5 galls/min.]
System Controller (not supplied)	Apple Mac or IBM Compatible PC
Weights — Laser Head	27 kg[59.5lbs]
Control Unit	85 kg[187lbs]
Water Cart (with DI water)	80 kg[176lbs]

ELECTROX LTD
Fen End, Astwick Road,
Stotfold, Hitchin,
Herts, SG5 4BA
England
Tel: (0462) 834848
Fax: (0462) 835488

ELECTROX INC
2701 Fortune Circle, East Drive
Indianapolis, IN 46241
USA
Tel: (317) 248 2632
Fax: (317) 240 5787

electrox
LASERS FOR INDUSTRY



THE 600 GROUP

Vision Abell

APPENDIX F

Transponder Manufacturers Brochures

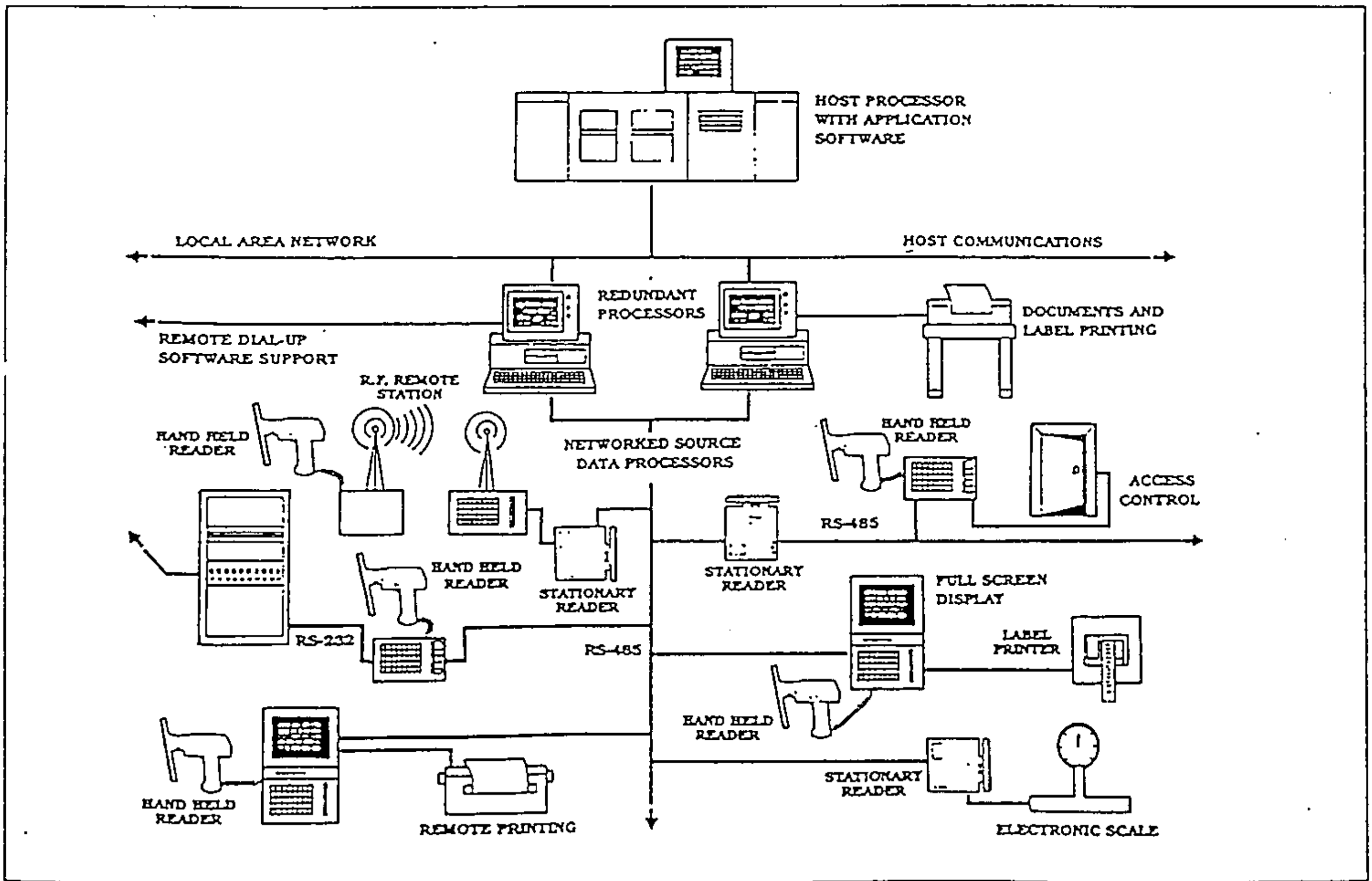
trovan™
ELECTRONIC IDENTIFICATION SYSTEMS

Passive Transponder System

The passive transponder system will perform tasks for which no acceptable solutions were available until now.
In many applications the passive transponders can replace the bar code system with its many limitations related to the size of the bar code, its reading distance, scan angle, and its usefulness in environmentally adverse conditions.
The size of the passive transponder need be only a fraction of the size of a single bar of a bar code symbol and it may be interrogated by a hand held reader at distances greater than eight inches (some transponders can be interrogated at a distance greater than 3 ft.) regardless of angle of scan, light or environmental conditions.
The principle behind the operation of the system is a hand held or stationary reader emitting a low frequency magnetic field which activates the passive transponder within its range. The passive transponder has no power source of its own (unlimited lifespan) as it derives the energy needed for its operation from the magnetic field generated by the reader. The transponder may take any form; a miniature glass encapsulated animal implantable, a credit card or a badge or a plastic encapsulated unit available in a variety of sizes and shapes for applications to suit the users needs.
Each individual transponder is given a unique code at the time of its manufacture. Once programmed, the code cannot be altered. The number of possible code combinations is close to one trillion and gives the user of the PTS a means of identification with an unmatched degree of security.
The passive transponders, unlike the bar code, are environment independent, will operate submerged in liquids and can be read spherically from any direction, through most materials, except some metals. The only limitation to the operational lifespan of the transponder is the durability of its protective encapsulation.
The activated transponder transmits its unique code to the reader. There, the code is forwarded to a decoder logic for code analysis, is simultaneously displayed on the LCD and stored in the reader memory for immediate or future processing.
Hand held readers, or scanners, serve as an excellent substitute for traditional clipboards and keyboard data entry and collection methods.
Primary benefits from using a combination of hand held readers and coded passive transponders include a reduction in the number of clerical errors in recording data; a reduction in labor and paperwork to process the data, faster and more accurate inventory taking; and enhanced efficiency of item or animal tracking/control.

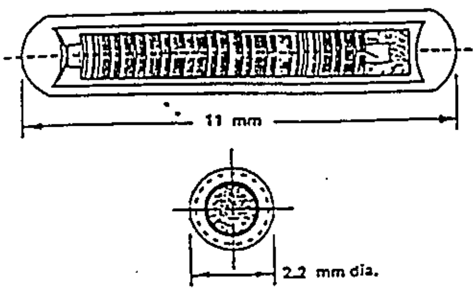
The PTS (Passive Transponder System) is a new technology which will revolutionize the identification industry, giving it a completely new dimension and opening new areas in the identification of both animate and inanimate objects.

Hand held readers are powered by rechargeable batteries. Data is stored in solid state memory for later transmission by either direct link or phone line to a computer. Typically the reader memory can store several thousand code numbers. A computer can "download" a portable unit with operator directives to facilitate activities such as order picking. By following the computer directives, an operator would, for example, proceed to the location displayed on the unit, use the portable reader to scan the item code, enter a quantity from a menu tablet, and proceed to the next picking location. At the end of the picking cycle the gathered data is transmitted to the main computer where inventory counts are updated. Property management presents another worthwhile application. Plastic encapsulated, code programmed passive transponders can be attached to all capital assets. The current inventory can be established by operators using portable readers scanning the transponders. Stationary readers can be operated in a stand-alone mode or be on line interacting with a host device while performing real time data collection. Serial ports can be made available for interfacing computers, CRT's, printers, and additional readers in various network configurations. Stationary units mounted on shop floor work stations or assembly areas throughout the plant can be used to perform work-in-process, by monitoring industrial type passive transponders attached to containers identifying each lot of material. As the material is processed through each work station, the code is read and the process results are transmitted to a master computer. Real time production information ensures that orders are delivered on time and that the product has been subjected to a thorough inspection operation.

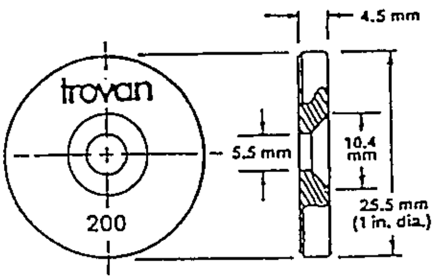


SPECIFICATIONS

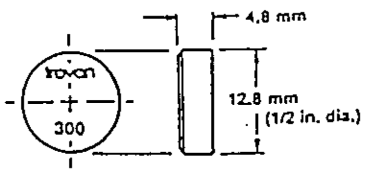
Model - ID 100
Implantable Transponder



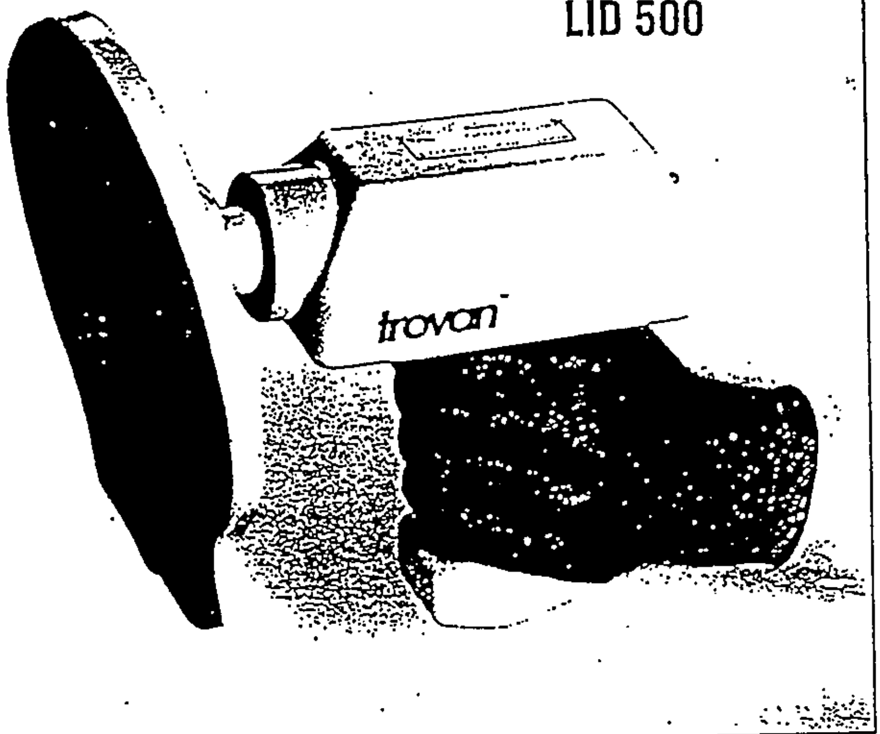
Model - ID 200
Industrial Transponder



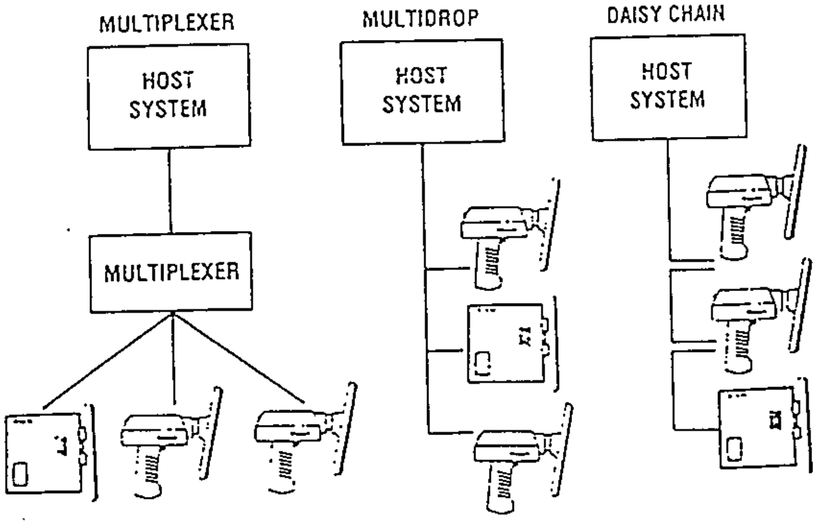
Model - ID 300
Industrial Transponder



HAND HELD READER
LID 500



NETWORK CONFIGURATIONS

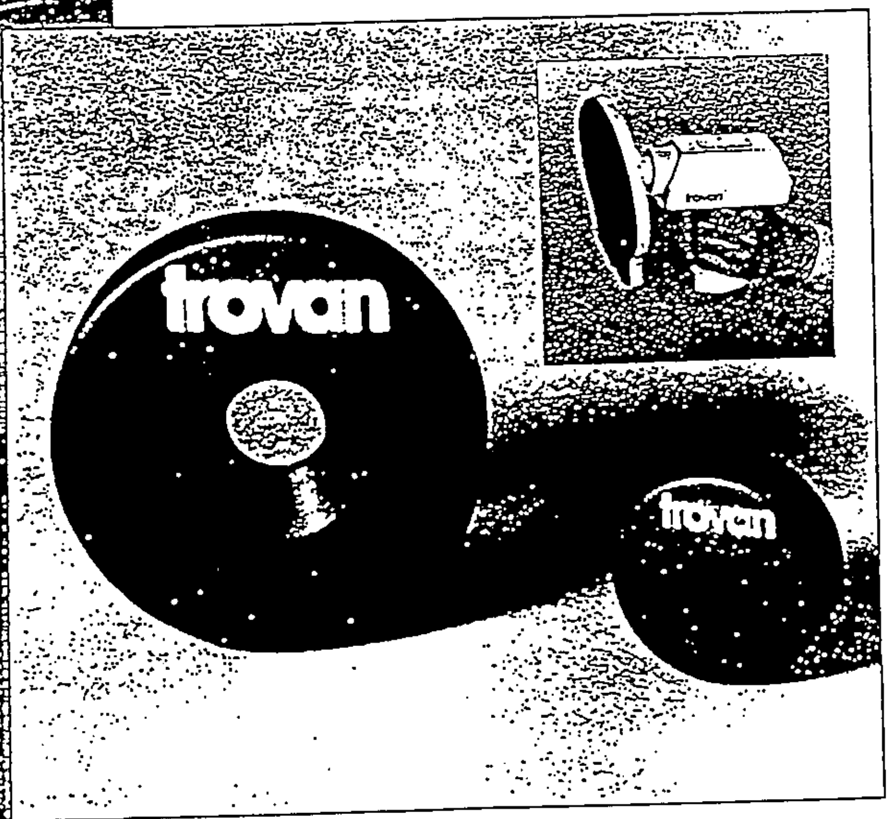


trovan™
ELECTRONIC IDENTIFICATION SYSTEMS

Model - ID 200/300

Industrial Passive Transponder

A new technology providing a means for cost effective electronic identification. The passive transponders will perform tasks for which no acceptable solutions were available until now.



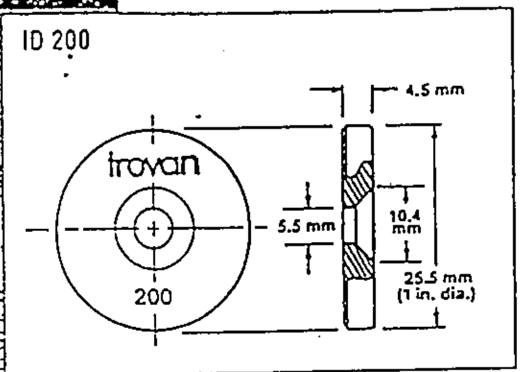
Manufactured by AEG

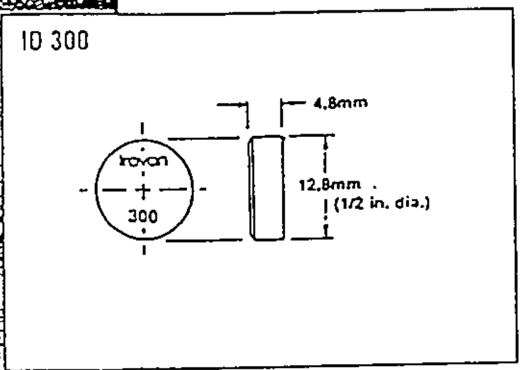
In many applications the passive transponders can replace the bar code system with its many limitations related to the size of the bar code, its reading distance, scan angle, and its usefulness in environmentally adverse conditions.
The size of the passive transponder need be only a fraction of the size of a single bar of a bar code symbol and it may be interrogated by a hand held reader at distances greater than eight inches (some transponders can be interrogated at a distance greater than 3 ft.) regardless of angle of scan, light or environmental conditions.

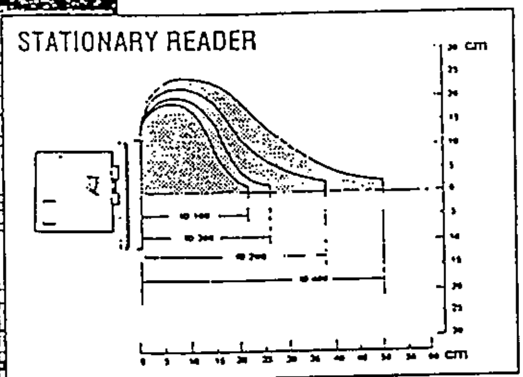
trovan™

ELECTRONIC IDENTIFICATION SYSTEMS

Model - ID 200/300







NOTE: Best reading distance under optimal conditions.

Description -

Each individual transponder is given a unique code at the time of its manufacture. Once programmed, the code cannot be altered. The number of possible code combinations is close to one trillion and gives the user of the PTS a means of identification with an unmatched degree of security.

The passive transponders, unlike the bar code, are environment independent, will operate submerged in liquids and can be read spherically from any direction, through most materials, except some metals. The only limitation to the operational lifespan of the transponder is the durability of its protective encapsulation.

The activated transponder transmits a unique code to the reader. There the code is forwarded to the decoder logic for code analysis, is simultaneously displayed on the LCD and stored in the reader memory for immediate or future processing.

Typical Applications -

- Automoblie industry, production control, coded chassis numbers, theft protection, traffic flow control, parking, automatic toll accounting
- Copyright protection, video film, computer software
- Textile industry, production, dry cleaning, etc.
- Valuable items registration, insurance
- Documents, passports, drivers licenses
- Access control, I.D. cards, credit cards, badges
- Warehouse/stock handling, work-in-process monitoring
- Aviation parts, item shelf life control
- Military applications, ammunitions, arms, spare parts
- Shipping, containers, luggage tags integrated with reservation systems, cargo pallets
- Customs, seals
- Survey monuments
- Laboratory applications, blood samples, animals, etc.

Specifications -

Transponder, industrial, plastic encapsulated, ID 200/300

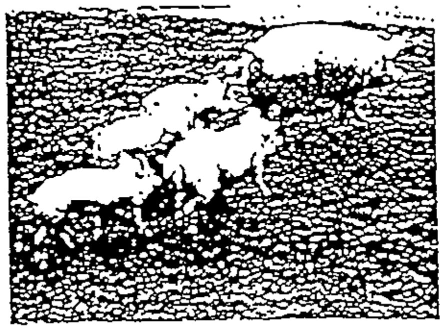
Size / Overall	25.5 mm x 4.5 mm / 12.8 mm x 4.8 mm
Identification Code	64 Bits
Scan Angle	Spherical
Reading Range	20 - 28 cm (depending on application)
Transmit Time	119 MS/BIT (8375 BAUD)
Storage Temperature	-40° C to +140° C (-40° F to 284° F)
Operating Temperature	-20° C to +80° C (-4° F to 176° F)
Operating Frequency	128 KHZ
Humidity	Submersible

Acceptable environmental conditions will vary depending on application.
Manufactured by AEG

PRESENTED BY:

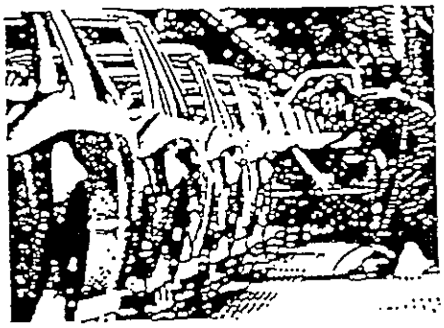
TROVAN reserves the right to change technical specifications of the product without prior notice.

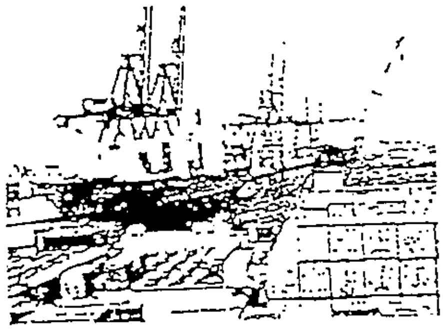
APPLICATIONS



Just a few examples for the use of the same basic transponder and reader:

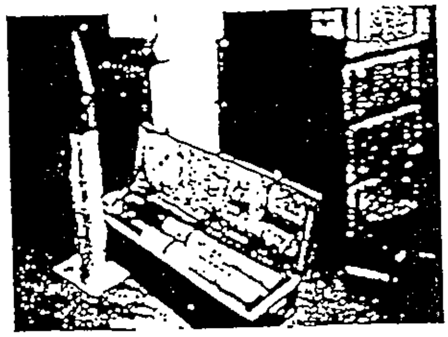
- Live stock and animal control (replaces eartags, tatoo, branding), fisheries
- Automoblie industry, production control, coded chassis numbers, theft protection, traffic flow control, parking, automatic toll accounting
- Copyright protection, video film, computer software
- Textile industry, production, dry cleaning, etc.
- Valuable items registration, insurance
- Documents, passports, drivers licenses
- Access control, I.D. cards, credit cards, badges
- Warehouse/stock handling, work-in-process monitoring
- Aviation parts, item shelf life control
- Military applications, ammunitions, arms, spare parts
- Shipping, containers, luggage tags integrated with reservation systems, cargo pallets
- Customs, seals
- Survey monuments
- Laboratory applications, blood samples, animals, etc.





PRESENTED BY:

COMWARE
137 RUNDLE STREET
KENT TOWN SA 5067
PH(08)3629230 FAX(08)3632842

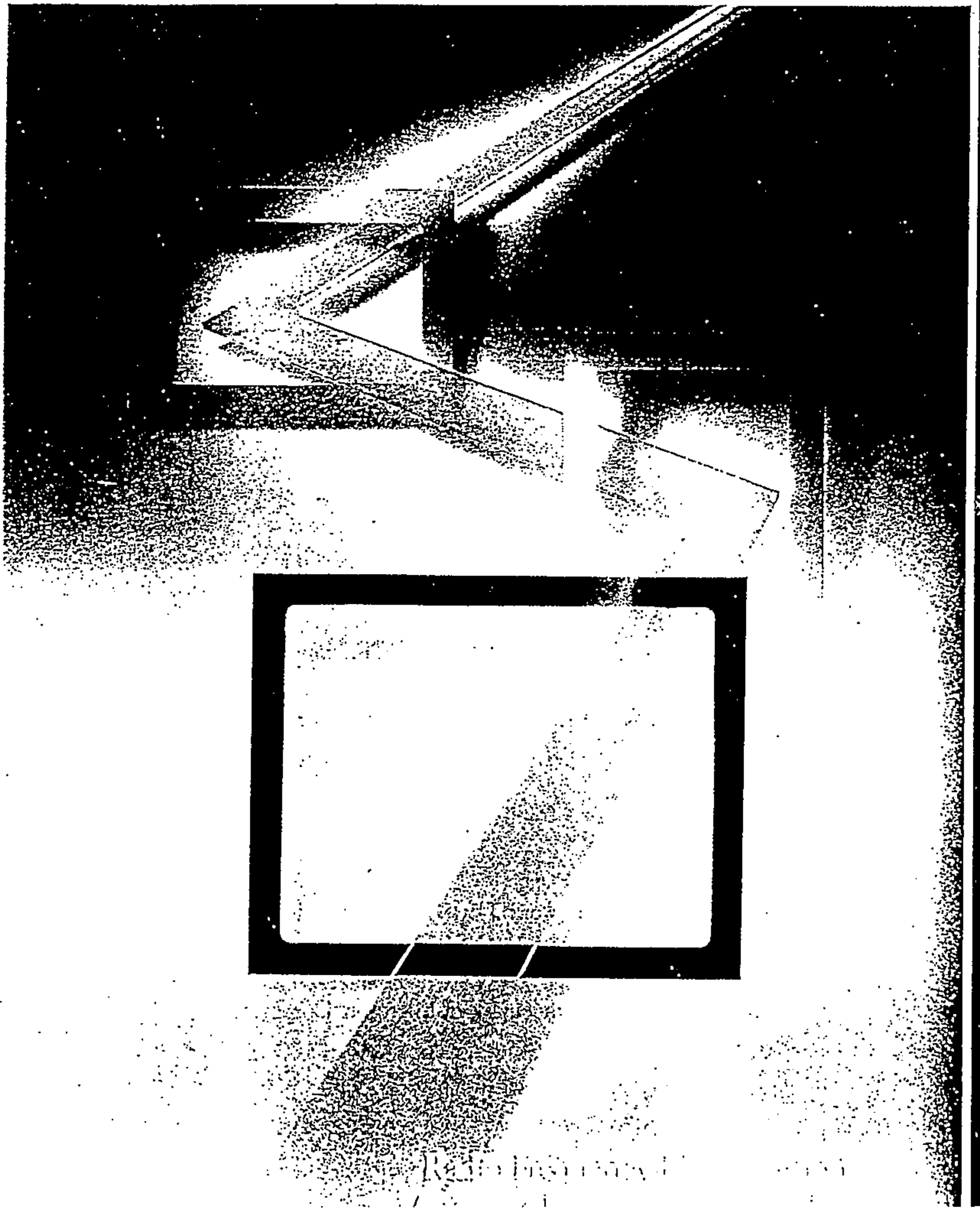


REPRESENTATION IN: Australia, Austria, France, Germany, Holland, Italy, Scandinavia, Switzerland, and the United States.

TROVAN IDENTIFICATION SYSTEMS are manufactured by AEG/Telefunken in Germany.

TEXAS INSTRUMENTS REGISTRATION AND IDENTIFICATION SYSTEMS

TIRIS – Overview of Technology, Products and Applications



Document Number 11-03-001
Edition Notice: First edition - December 1991
Second edition - February 1992
Third edition - December 1992
Fourth edition - November 1993

TIRIS Overview

Preface - TIRIS Profile

In March, 1991 Texas Instruments announced its entry into the radio frequency identification systems market with the worldwide introduction of TIRIS (Texas Instruments Registration and Identification System).

TI's radio frequency identification (RFID) technology is the result of a multi-year development program originally targeted at the livestock industry. At the completion of a strategic planning process called "Vision 2000", TI management concluded that the automatic identification market and specifically the radio frequency segment had tremendous growth potential in many application areas, and that TI's products could take a leading position. Thus, the TIRIS business was formed.

Texas Instruments is the first large company, with a sound image and credibility, to enter the low frequency RFID industry. TI has an opportunity to help guide and shape the industry structure.

TIRIS draws upon Texas Instruments core competencies in advanced semiconductor knowledge, microelectronic packaging capabilities, computer system design, and global deployment of manufacturing and technical support.

Overall, the strategy is to gain early leadership through:

* Product performance/cost advantage.
* Credibility and substantial resources as a large company.
* World class product quality, service, and reliability.
* Partnerships with solid third-party companies.
* Active involvement in the standardization process.
* Continued investment in R&D to maintain a leadership edge.

TIRIS is targeting many industrial application segments such as automotive, security access, inventory control and distribution, factory automation, vehicle identification, waste management and livestock.

TIRIS is funded and managed along venture capital lines reporting to its own advisory board of directors. The organization includes over 250 employees in engineering, marketing, and manufacturing. Design centers are located in Almelo, The Netherlands and Freising, Germany. Manufacturing facilities are located in the United States, Germany, Japan and Malaysia. The worldwide headquarters are in Bedford, UK with marketing centers located in twelve worldwide locations to enable close contact with customers.

TIRIS Overview

I. Introduction

The Texas instruments Registration and Identification System (TIRIS) is a highly reliable way to electronically detect, track, and control a variety of items. TIRIS is a radio frequency identification system based upon innovative advancements in electronics.

The core of the system is a transponder (RFID tag) that can be attached to or embedded in objects. A TIRIS reader sends a radio frequency wave to the tag and the tag broadcasts its stored data back to the reader. The system works basically as two separate antennas, one on the tag and one on the reader.

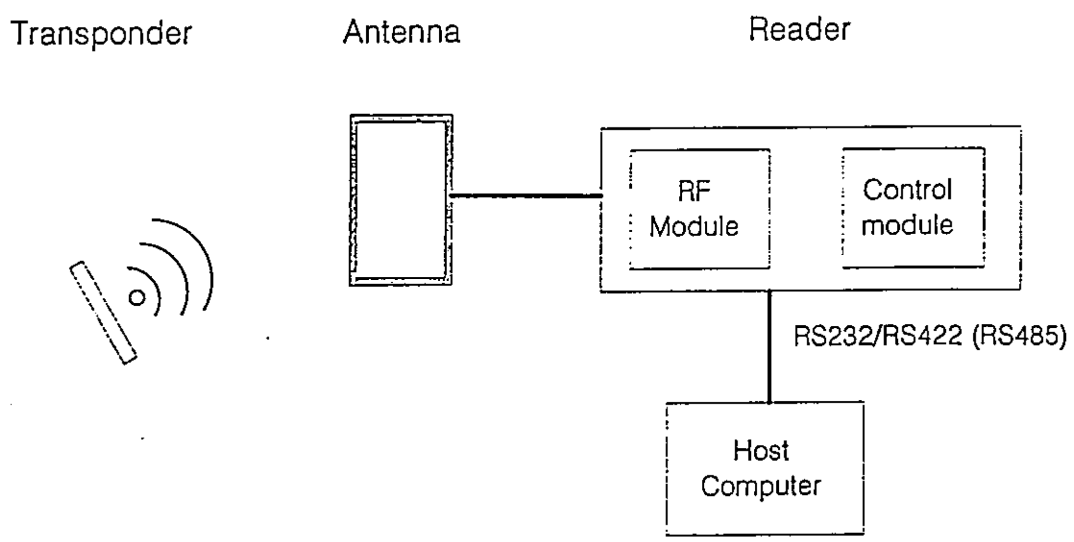


Figure 1: Basic TIRIS System

The data collected from the transponder can either be sent directly to a host computer through standard interfaces, or it can be stored in a portable reader and later uploaded to the computer for data processing.

The process is often called "automatic data capture". It has the benefits that it is not dependent upon a human operator, that it is "contactless" data transmission, and that it overcomes the limitations of other automatic identification approaches because it works effectively in environments with excessive dirt, dust, moisture, and poor visibility. In addition, the TIRIS low frequency system can also read through most nonmetallic materials.

II. How the low frequency, read only system works

The three major parts of the system are the transponder, antenna, and reader.

When a batteryfree, read only transponder is to be read, the reader sends out a 134.2 kHz power pulse to the antenna lasting approximately 50ms. The magnetic field generated is "collected" by the antenna in the transponder that is tuned to the same frequency. This received AC energy is rectified and then stored in a small capacitor within the transponder. When the power pulse has finished, the transponder immediately transmits back its data, using the energy stored within its capacitor as the power source. See Figure 2.

The Texas Instruments Registration and Identification System (TIRIS) is a highly reliable way to electronically control, detect and track a variety of items. TIRIS is a radio frequency identification (RFID) system based on low frequency FM transmission techniques.

In total, 128 bits are transmitted (including error detection information) over a period of 20ms. This data is picked up by the antenna and decoded by the reader unit. Once all data has been sent, the storage capacitor is discharged, thereby resetting the transponder to make it ready for the next read cycle. The period between transmission pulses is known as the "sync time", and lasts between 20ms and 50ms depending on the system setup. See Figure 3.

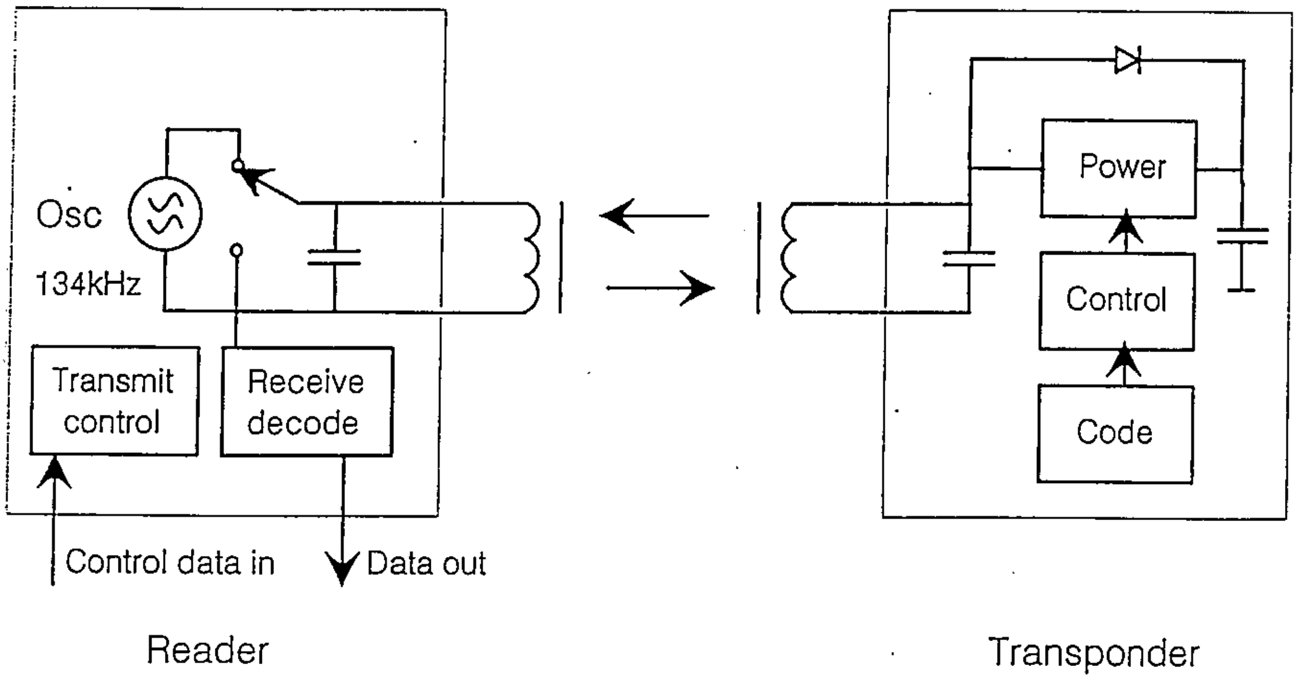


Figure 2: TIRIS sequential FM system

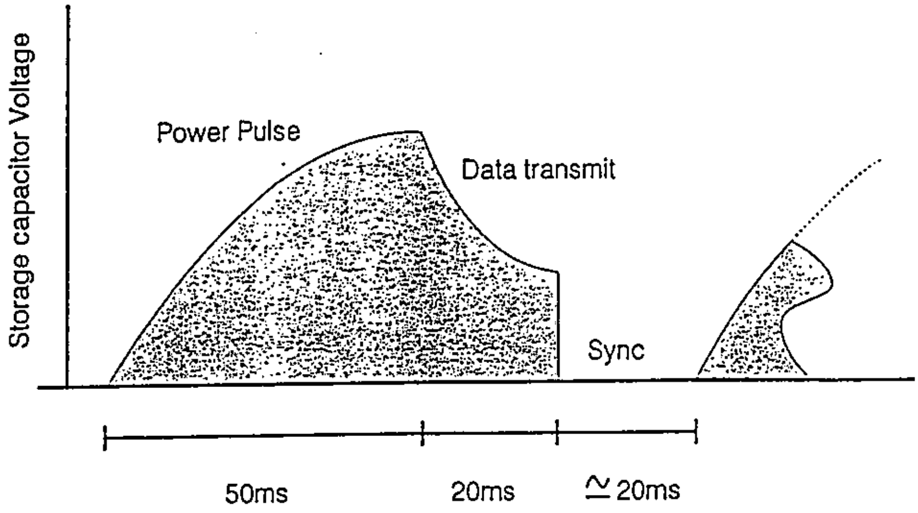


Figure 3: Typical transponder readout timing showing storage capacitor charge levels

The transmission technique used between the transponder and the reader is Frequency Shift Keying (FSK) with transmissions between 134.2kHz and 124.2kHz. This approach has comparatively good resistance to noise while also being very cost effective to implement.

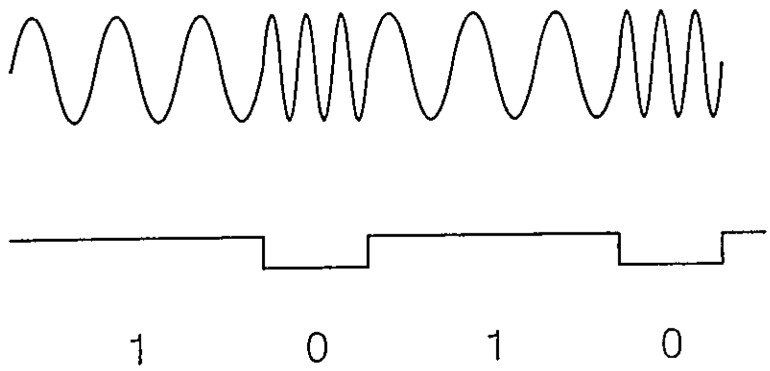


Figure 4: Example of Frequency Shift Keying

III. TIRIS systems and products

TIRIS offers several approaches to RFID ranging from low frequency to high frequency systems. The low frequency systems (134.2 kHz) demonstrate the best read range in their class, are batteryfree, contain a large choice of different transponders and readers, and can be used in a wide variety of applications.

The high frequency systems are targeted mainly to vehicle identification in the area of Intelligent Vehicle Highway Systems (IVHS). The tags are active (with battery), require line-of-sight for reading, have a very fast data rate, large memory capacity, and read ranges that can reach 50 meters.

A. Transponders

Low frequency transponders come in a variety of sizes, shapes, read range performances, and functionality. They are grouped into:

* Glass Capsule Series
* Vehicle & Container Series
* Badge & Card Series
* Disk Series

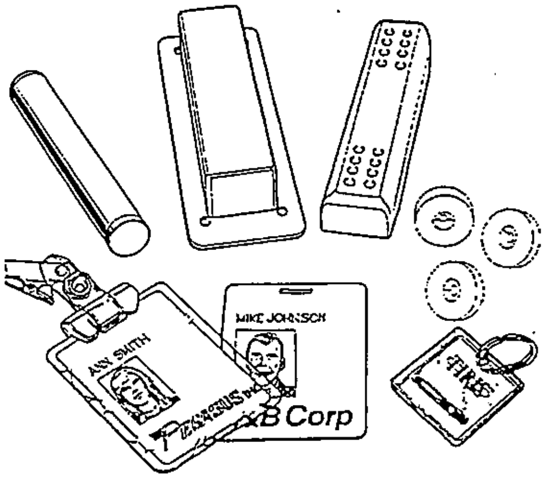


Figure 5: Variety of fully compatible transponders

Each series is available in two different versions:
- Read Only (R/O), containing a unique, factory programmed, 64-bit code.
- Read/Write (R/W), with a range of memory capacities.

A R/O transponder can be used as a "license plate", allowing any item to which the tag is attached to be uniquely identified. Data about the item is stored in a computer database that can be updated or changed when the item's ID number is read.

R/W transponders act as reprogrammable "data carriers". They allow identification codes and other data to be programmed, read or changed thousands of times. Programming occurs without contact; within the electromagnetic field created by the reader. Users can create their own coding and numbering system to easily integrate data with their computerized information systems. For instance, shippers in the transportation industry can use the R/W transponder to track products from the warehouse to final delivery, or to collect and edit data on their trucking fleet's time or mileage performance. Manufacturers can use the R/W transponder to update "build instructions" or inspection results on an item going through the production process.

TIRIS offers a variation on R/W systems that is unique in the industry. This is termed a "multi-page RFID system". It includes R/W transponders with user programmable memories of either 256, 512, or 1024 bits. The memories are partitioned into 64-bit "pages". Each page can be individually programmed and/ or read. In addition, the transponder contains a "Page 1" (64 bits) that is factory-programmed with a tamperproof ID number, and each of the programmable pages can be irreversibly locked to become R/O for security purposes.

This product is suited for applications that want to build up a record of information in successive steps, or where only parts of the stored data are relevant to any one operation. An example might be in flexible manufacturing for products like automobiles where each page contains the "build instructions" important to a particular station on the production line. It can also be used to track gas bottles that are subject to many different handling steps.

All of the TIRIS low frequency R/O and R/W transponders are fully compatible with one another. Readers are downwardly compatible to all transponders. With the newest model reader, a user can mix and match different transponders within the same installation. In many applications the glass capsule transponder can be enclosed in secondary packaging to offer protection and ease of attachment. Examples of this are described in Section V, Applications.

B. Stationary, handheld, and programmable handheld readers

There are many different readers that can be used with TIRIS low frequency systems. They are catagorized as: stationary, handheld, and programmable handheld. Readers can even be mixed within the same installation.

The TIRIS stationary readers for fixed installations, such as access control or factory automation, are the Series 1000 (now available), and the Series 2000 and Series 4000 Reader Systems to be introduced and available in 1994.

Series 1000 Stationary Reading Unit

The Series 1000 (commonly called STU) is the first generation TIRIS reader and is comprised of a Radio Frequency Module (RFM) and a Control Module (CTL). The RFM is used to both generate the power pulse for energizing the transponder via the antenna, and to receive and demodulate the incoming FSK signal. The Control Module contains a microprocessor whose tasks are to process the raw data from the RFM and to handle the communications with the host controller. This reader is equipped with an RS232 or an RS422 interface allowing data to be easily exchanged from the reader to a central computing system. (An RS485 interface is available on request.)

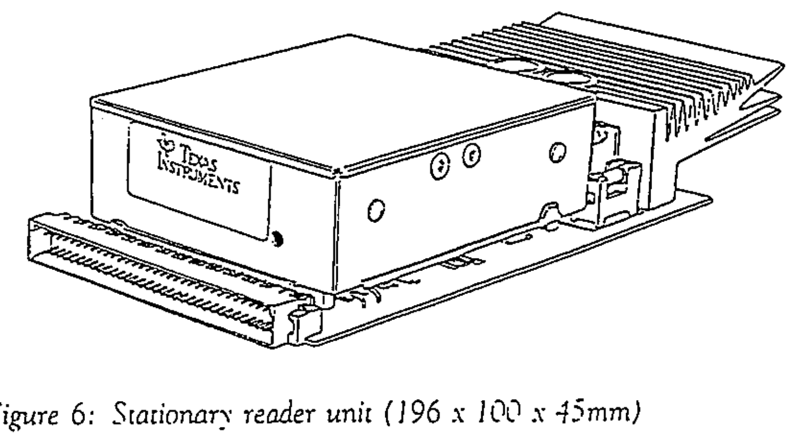


Figure 6: Stationary reader unit (196 x 100 x 45mm)

Voltage regulators are built into the control module to allow users to connect it to a large variety of different supply voltages. The output of one regulator can be adjusted to adapt the RF field strength to the limits allowed by the local government agency regulations.

This reader can operate in either unsolicited or polled mode. In unsolicited mode the reader outputs each tag number as it is read. The user can choose whether each and every valid reading is transmitted or only if the "just read" ID is not already in memory. In polled mode a reading is only made when the reader is instructed to do so by the host computer.

Series 2000 Reader System

This reader, based on standard hardware and software, offers ease in the areas of application development, system integration, installation, and customization. It can be designed-in as an integral part of an overall control scheme, or it can be incorporated into a simple system using a standard configuration.

At the heart of this reader is a standard microprocessor for which efficient high-level programming tools are readily available. Programmers can create application-specific code in the C-language and link them to TIRIS library functions, or write their own completely new routines.

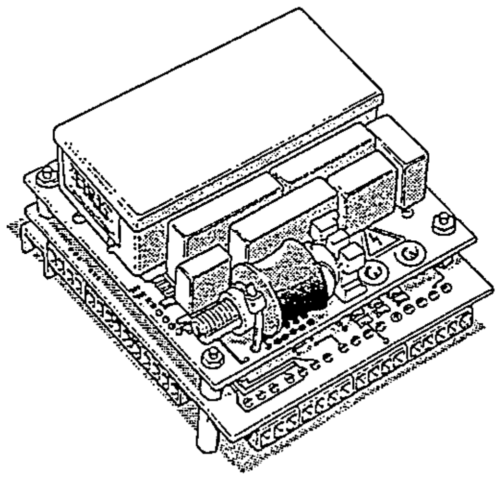


Figure 7: Series 2000 Reader System

Eight digital Input/Output ports, that can be configured by software, allow the user to connect a wide variety of devices and link them to identification codes. Used as inputs, the ports can be connected to photocells, proximity switches, or other sensors to trigger reading cycles or provide interlocking functions. Used as outputs, the ports can operate alarms, status indicators, or provide command signals to other processes, such as opening a door or to start a manufacturing sequence. There is a standard RS232 interface. Among options are RS422/485 and EPROM and RAM expansions. Due to the flexible design, it is fairly easy to add special functionality with plug-on hardware and with software, such as to increase memory size, add a realtime clock, add relays, or add communications adaptors to permit the reader to be integrated into existing networks.

Series 4000 Reader System

For larger configurations, this reader based on industry standards and a modular design offers integration of data management tasks from the point of basic data capture up to networked system solutions. The products offered for this system are a family of modular hardware and software that allows users to combine elements in various ways, in a building block approach, to create complete, application-specific systems quickly. Many, connected remote reading points can be controlled from a central host computer. Data can be collected fast and used for sophisticated information management.

Individual read points can be equipped with I/O features, such as, sense and control functions to input signals from other devices and take action accordingly.

The "open architecture" design of this reader system lets users easily add off-the-shelf, third-party products to expand capabilities. And, users can upgrade the system with additional read points and new capabilities without discarding any hardware.

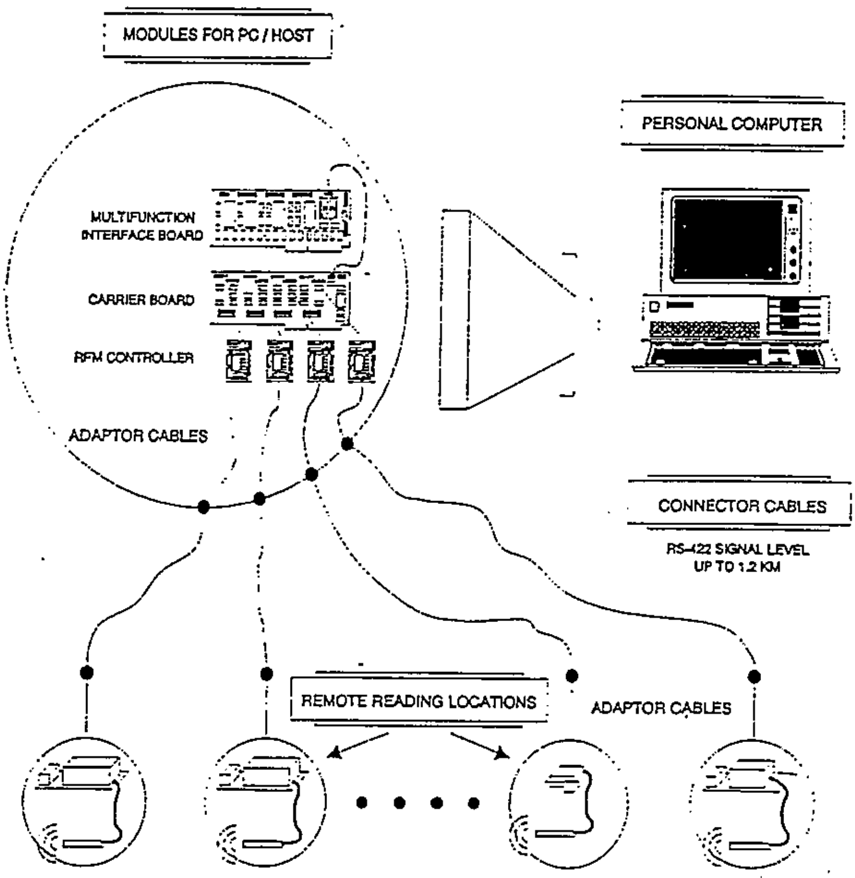


Figure 8: Series 4000 Reader System

Handheld Readers

TIRIS offers its own battery-powered, self-contained unit that can read and store more than 900 ID codes while in the field. This data can be later transfered to a host computer through standard interfaces.

More third-party companies who sell handheld readers have integrated TIRIS into their products than any other RFID technology. These include companies like Telxon and Symbol who offer programmable handheld readers that do "infield" computing. These "mobile data capture" devices combine functions such as reading RFID tags with computing, barcode scanning, and radio frequency data communications.

C. Standard antennas

Antennas are available in two types: gate antennas and ferrite rod antennas. The ferrite rod antenna is a short cylindrical device used in stationary applications where either space is limited or where the antenna must be mounted in close proximity to the objects being identified. An added advantage of the rod antenna is that it allows for discrimination between tags that are in close proximity.

The gate antenna is designed for use in doorways, entrances, corridors, beside conveyors, or any location where the reading field coverage needs to be maximized. The gate antenna is available in three sizes: small, medium and large. Although, in general, the larger antennas offer superior reading range, the increased noise sensitivity of these antennas can be a limiting factor.

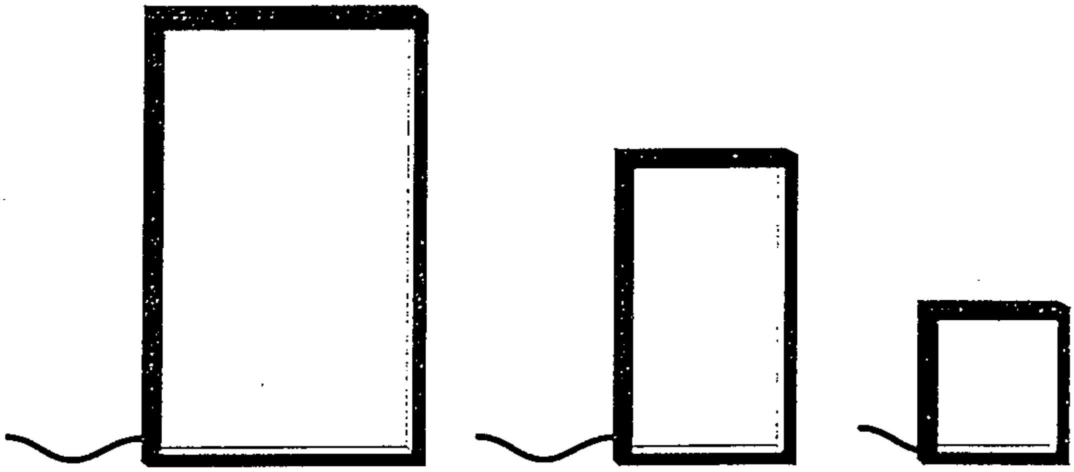


Figure 9: G03 antenna (940 x 520 x 16mm), G01 antenna (715 x 270 x 16mm) and G02 antenna (200 x 200 x 16mm)

IV. System performance

A. Reading distance

One of the key benefits of the TIRIS system is its superior reading range with low power consumption. The actual reading distance that can be achieved depends on many criteria: transponder type, electromagnetic noise, transponder orientation, antenna type and government regulations. In general, a standard 32mm glass capsule transponder can be read with a stationary reader and a gate antenna from a distance of up to 1m (see Figures 10 and 11). Larger transponders achieve ranges of up to 2m. Handheld readers offer a lower range, typically up to 0.5m with a 32mm glass capsule transponder, due to the limited energy that can be generated from the batteries.

B. Data accuracy

The TIRIS system uses a powerful 16-bit Cyclic Redundancy Check algorithm (CRC-CCITT) which ensures that only "valid" data is sent from the reader to its associated controller. To date there have been no cases of an incorrect identification number being read from a transponder. In cases where the transponder signal is not strong enough for the data to be received without error, the reader responds with "No read" or "Invalid".

C. Antenna selection

Of the two standard antenna types (ferrite rod and gate), the larger gate antennas give the best reading range. Although in some environments an overall better performance can be achieved with smaller antennas.

Each antenna has its own specific "readout pattern", the electro magnetic field emanating around the antenna within which the transponder is charged-up adequately to return its unique ID code. Examples of these patterns are illustrated in the following figures.

The shape and size of this pattern depends upon the specific readout antenna selected, and a country's government regulations that define the amount of electromagnetic field strength that can be generated. Electromagnetic noise in the environment can limit the readout range.

Each application should be analyzed to determine the best readout antenna for the job.

D. Transponder orientation

The orientation of the transponder with respect to the antenna also impacts reading range. For maximum range the orientation of the antenna with respect to the transponder must be optimized to achieve maximum coupling. If orientation is not optimal, the reading range is reduced. Figures 10 and 11 show how coupling and optimum orientation vary in the field surrounding an antenna.

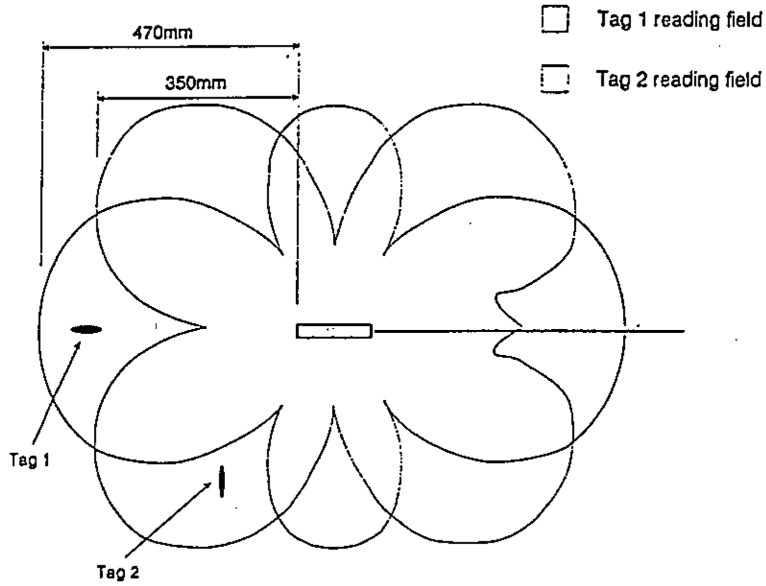


Figure 10: Typical reading range versus orientation for 32mm transponder and S01 ferrite rod antenna. (UK RF Power levels)

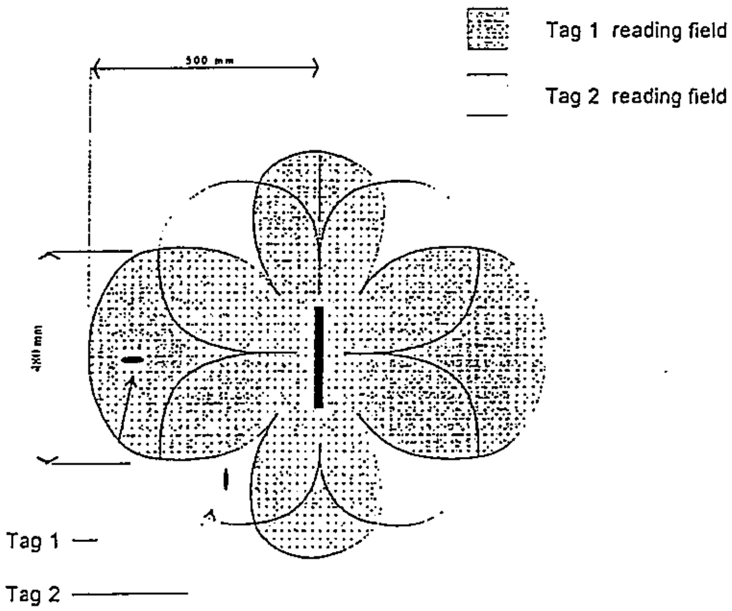


Figure 11: Typical reading range versus orientation for 32mm transponder and G02 gate antenna. (UK RF Power levels)

E. Reading speed

Many applications require that transponders attached to objects be read while travelling at specific speeds by a readout antenna. Since a standard stationary reader completes one "read" of a transponder in approximately 120ms, a transponder must remain within the boundaries of a readout pattern for at least that amount of time. Since readout patterns are variable, it is difficult to generally state exact reading speeds, although as a guide 32mm transponders can be read at typically 3m/s using the appropriate reader and antenna.

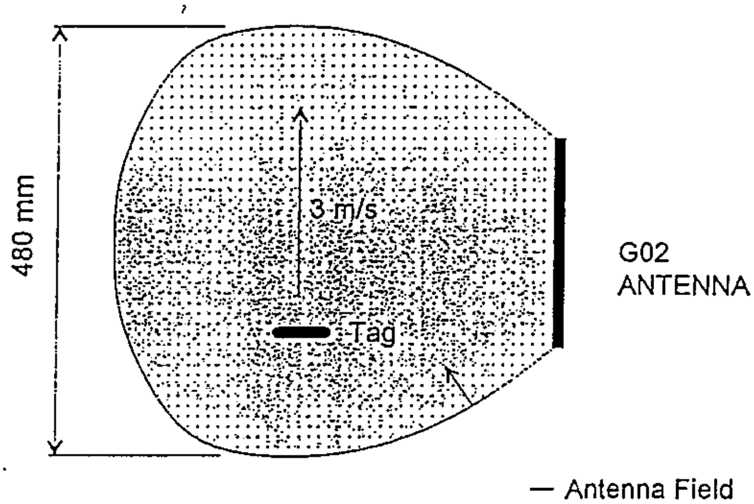


Figure 12: Transponder moving through antenna field

There are several different ways to customize TIRIS systems to achieve even faster read speeds than those achieved by standard products. Some examples are to reduce the actual charge-up time for transponders, and to separate the charge-up and readout functions of the system by using two dedicated antennas.

With larger antennas, designed for Automatic Vehicle Identification (AVI), TIRIS has performed successfully at read speeds of 65 m/s (about 150 mph, 240 km/h).

V. Applications

A. Installation issues

1. Noise

Electromagnetic noise can play an important part in the application of RFID systems. The effect of noise must be considered when installing a new system to ensure optimum performance, although the TIRIS use of an FM transmission technique greatly improves its performance in comparison to similar RFID systems.

Devices generating noise in a frequency range from 116 kHz to 140 kHz have the largest impact. Examples of such sources include switched mode power supplies and video display screens.

In many cases the impact of noise can be minimized by careful placement of both the reader antenna and the transponder, and by taking advantage of the adjustment features included in some model TIRIS readers.

2. Effect of metallic objects

To achieve its long reading range TIRIS uses high Q antennas, both attached to the reader and integrated into the transponder. One consequence of this approach is that metallic objects in close proximity to either the reader antenna or the transponder can "detune" the system, thereby reducing reading range. There are differences in this effect according to the amount and the density of the metal – grid vs. solid, etc.

If the reader antenna needs to be attached near to metallic objects, the detuning effects can to a large extent be removed by simply retuning the antenna. Special adjustment features are included in several model TIRIS readers to ease this task.

In many applications however it is necessary to mount transponders close to or on to metallic objects. Although direct mounting of the transponder on to metal will impact performance, leaving a small gap between the two greatly minimizes this effect. In the case of the standard 32mm transponder, only a gap of about 10mm need be left. Within the Vehicle & Container Series, a metal-mount transponder is available for this purpose.

3. Government communication regulations

Each country has different regulations regarding the use of RFID systems. At present TIRIS is "Type Approved" for use in many countries worldwide, which means that each customer need not apply for an individual license. However, the power levels that can be used in each country do differ; leading to a variation in the reading range. As an example, the regulations in both the UK and Australia are fairly relaxed, allowing excellent read range performance. Regulations in other countries, such as the Netherlands, are more strict.

In some circumstances "site approval" can be agreed with the agency allowing higher power levels to be used within a given area such as a factory.

4. Secondary packaging for glass capsule transponder

It is often necessary to house the glass capsule transponder within some form of secondary packaging. This simplifies affixment and increases the transponder's resistance to shock and bending.

The most typical materials used for secondary housing are plastics. One may choose to embed the transponder in a solid material, house it in an off-the-shelf package designed for this purpose, or create a custom designed housing, such as a molded carrier.

In all cases, it is necessary to cushion the glass transponder with some kind of flexible material. The most popular choice is a silicon compound or the use of a silicon sleeve.

The following diagram shows how this can be done:

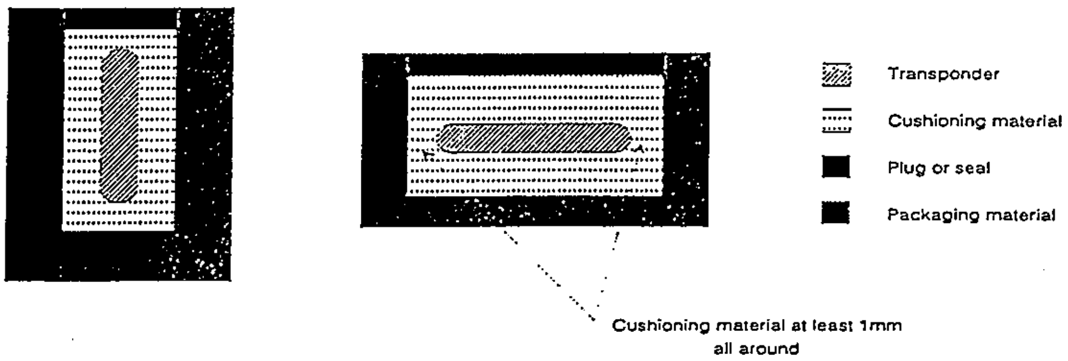


Figure 13: Examples of secondary packaging techniques

5. Transponders in close proximity

As with most FM systems, when several transponders enter a reading field, the device with the strongest signal is read. As the transponders move along, this dominance changes.

Example: If two transponders, separated by 10cm pass by a reader, first the leading transponder is read, followed by the second device as soon as it is closer to the reader than the first device.

If two transponders are equidistant from the reader and oriented exactly the same, neither device is read. As the separation between the transponders increases, the ability of the system to differentiate between them improves. Typically a standard 32mm transponder can be read if it is separated from another transponder by 50mm.

When it is necessary to read several transponders in close proximity, it is easier to do so when they are moving as their relationship to the reader is constantly changing.

6. Synchronization of multiple readers

If two or more readers need to operate in the same area, it is necessary that their transmission pulses be synchronized. TIRIS readers are designed to detect the presence of another reader system and automatically synchronize. In some applications it is advisable to physically link the readers by wire to ensure correct operation. With the Series 4000 Reader System, where a central control point can manage multiple readers in groups, synchronization occurs intrinsically and is totally transparent to the user.

B. Typical Applications

1. Vehicle access

TIRIS is well suited to the automatic control of car park barriers as it offers low system costs, high reading speeds, batteryfree operation, and flexibility in system design. Tags can be attached directly to vehicles or held by the driver, and antennas can be mounted just below the road surface or mounted above ground beside the roadway. As each vehicle passes over the antenna its tag ID is read and compared with a central database of authorized users.

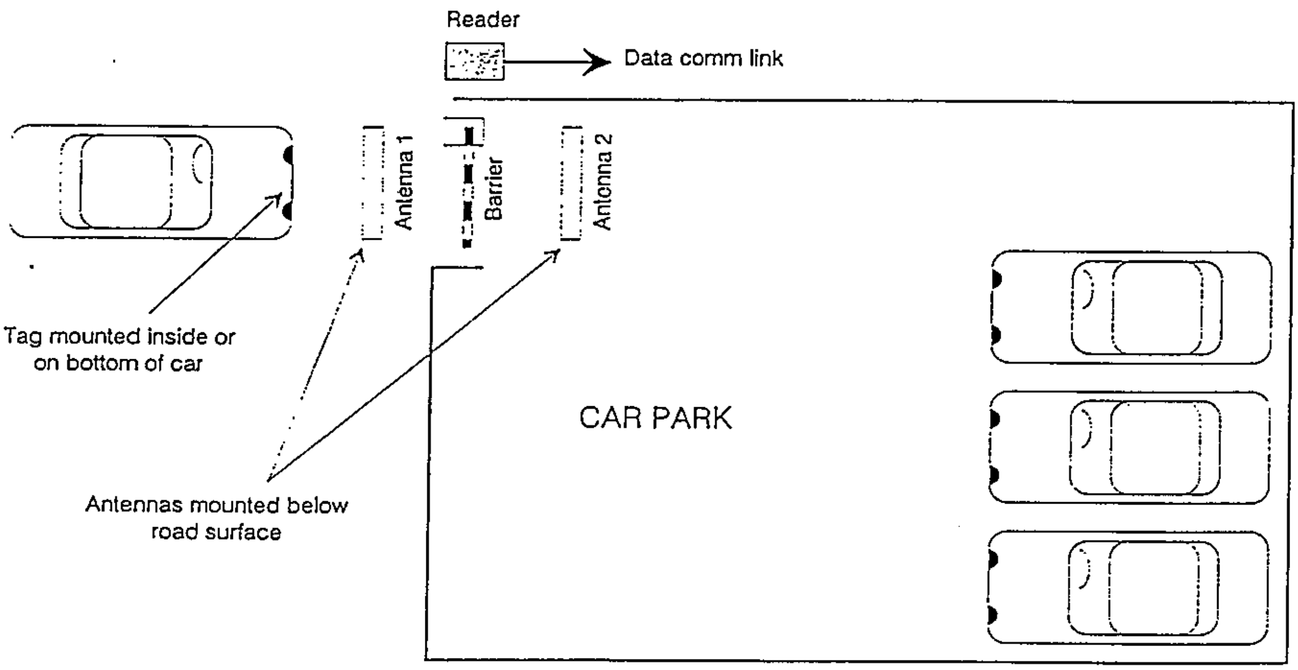


Figure 14: Automatic car park access system using TIRIS

2. Other automotive applications
TIRIS was recently integrated into the anti-theft system of a major automotive company where a transponder in the key is one part of a "vehicle immobilizer system".

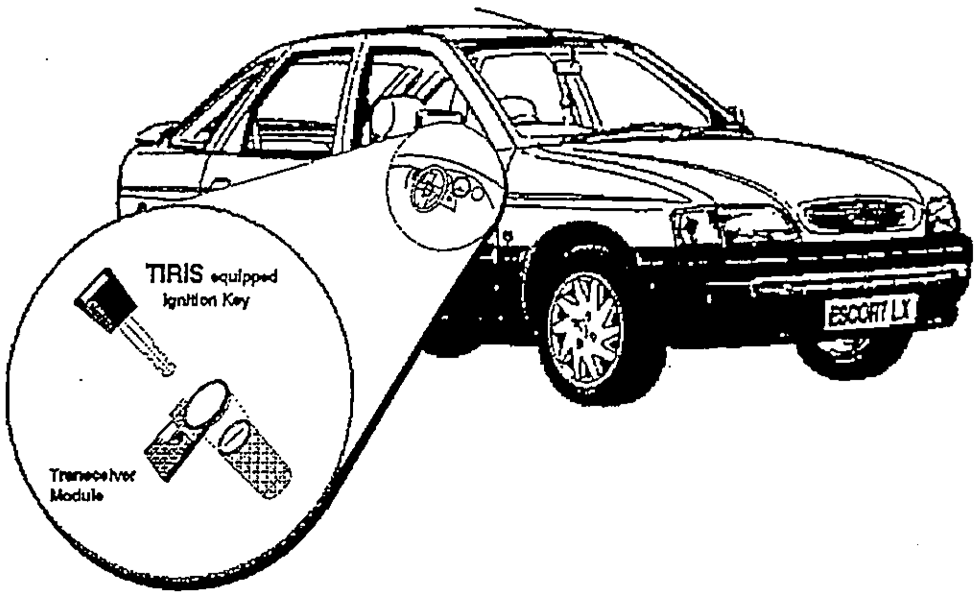


Figure 15: Vehicle immobilizer system based on transponder in key

Another automotive application is the automatic dispensing of fuel with a transponder mounted beside the fuel tank.

3. Access control
TIRIS offers "hands-free" personnel access with two different, but compatible approaches. Applying TIRIS to access control is simplified by the availability of a "badge mount transponder housing" that allows the glass capsule transponder to be mounted on top of a badge carrying another access control technology like Weigand strip or magnetic stripe. This lets companies upgrade to RFID in stages without replacing all of the badges currently in use.

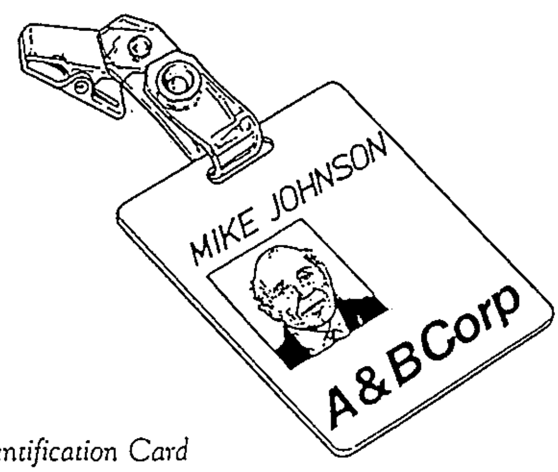


Figure 16: TIRIS Identification Card

If companies want a standard RFID badge for access control, TIRIS offers an identification card that has up to 1m in read range and can also be combined with other methods. An individual can leave the badge clipped to his clothes (or even in a pocket) when passing the reader; unlike proximity cards that need to be placed within 5-15 cm of the reader to function properly.

4. Factory automation
RFID is a popular "data capture" technology for automobile manufacturers who attach the tags for many types of work-in-process tracking applications. This technology is well-suited because the tags must survive high temperature, paint, dirt, and grease in the environment.

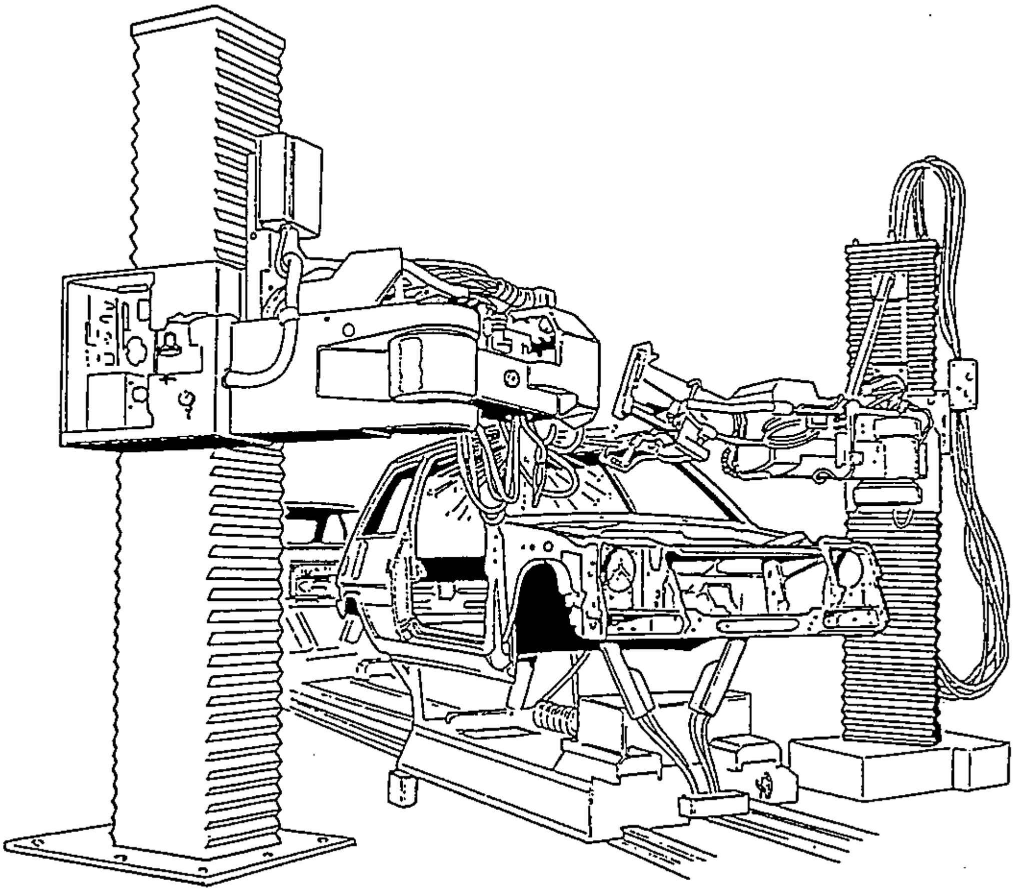


Figure 17: TIRIS helps automate production lines

Simarly, TIRIS is used in a pharmaceutical production process where it is attached to large steel racks that transport medical fluid through a sterilization process that has high temperatures of around 120° C.

A major food company uses TIRIS to help monitor the cooking cycles of prepackaged foodstuffs, and to help with the blending of bulk ingredients in other processes. Another division of the same company is using the transponders to identify bulk tobacco in cigarette making.

5. Freight
Large freight and courier companies are looking for ways to streamline their parcel and freight delivery operations. A major problem for these companies is that the parcels can be all shapes and sizes which makes automatic sorting very difficult. With TIRIS, it is no longer necessary to be able to see the address label or a barcode. The signal transmission can work over several feet even if the transponder is hidden underneath the package.

6. Waste management
TIRIS transponders are mounted on thousands of household waste containers in communities in Germany, Australia and the U.S. where they enable automatic invoicing to customers based upon garbage weight and/or frequency of pickup. Electronic tagging of the collection trucks allows waste companies and municipalities to track and improve the efficiency of waste deliveries to centralized deposit sites as well.

For more information regarding applications contact your local TIRIS Sales or Application Center.

TIRIS Sales & Applications Centers

Europe

France

Texas Instruments
Boite Postale 67
8 - 10 Avenue Morane Saulnier
78141 Velizy-Villacoublay Cedex
France
FAX: 33 1 30 70-1054
Phone: 33 1 30 70-1065

Germany

Texas Instruments
Haggertystrasse 1, MS4297
85356 Freising
Germany
FAX: 49 816 180-4918
Phone: 49 816 180-4225

Holland

Texas Instruments
Kolthofsingel 8,
PO Box 43, MS 4220
7600 AA Almelo
The Netherlands
FAX: 31 5490 70535
Phone: 31 5490 79555

Italy

Texas Instruments
Centro Direzionale Colleoni
Palazzo Perseo
Via Paracelso, 12
20041 Agrate Brianza, Milan, Italy
FAX: 39 39-632299
Phone: 39 39-63221

United Kingdom

Texas Instruments
Manton Lane, MS TIL45
Bedford,
England. MK41 7PA
FAX: 44 234-223459
Phone: 44 234-270111

North America

United States

Texas Instruments
12501 Research Boulevard,
MS 2243
Austin, TX 78759
FAX: 1 512-250-6826
Phone: 1 512-250-6542

Texas Instruments
34 Forest Street, MS 20-27
Attleboro, MA 02703
FAX: 1 508-699-3647
Phone: 1 508-699-3174

Canada

Texas Instruments
280 Centre Street, East
Richmond Hill, Ontario
L4C 1B1
FAX: 1 416-884-7739
Phone: 1 416-884-9181

Asia Pacific

Australia

Texas Instruments
171-175 Philip Highway
PO Box 63
Elizabeth,
South Australia 5112
FAX: 61 8 255-2809
Phone: 61 8 255-2066

Hong Kong

Texas Instruments
8th Floor, World Shipping Centre
7 Canton Road, Kowloon
Hong Kong
FAX: 852-7354954
Phone: 852-7351223

Japan

Texas Instruments
Aoyama Fuji Bldg. 5F
3-6-12 Kita Aoyama
Minato-Ku,
Tokyo 107, Japan
FAX: 81 3-3409-7903
Phone: 81 3-3498-2195

Korea

Texas Instruments
29F Trade Tower 159, MS 4202
Samsung-Dong
Kangnam-Ku
Seoul, Korea
FAX: 82 2 551 2889
Phone: 82 2 551 2806

Malaysia

Texas Instruments Electronics Systems
1 Lorong Enggang 33,
Empang/ulu Kelang,
54200 Kuala Lumpur,
Malaysia
FAX: 60 345 13211
Phone: 60 345 72097

Singapore

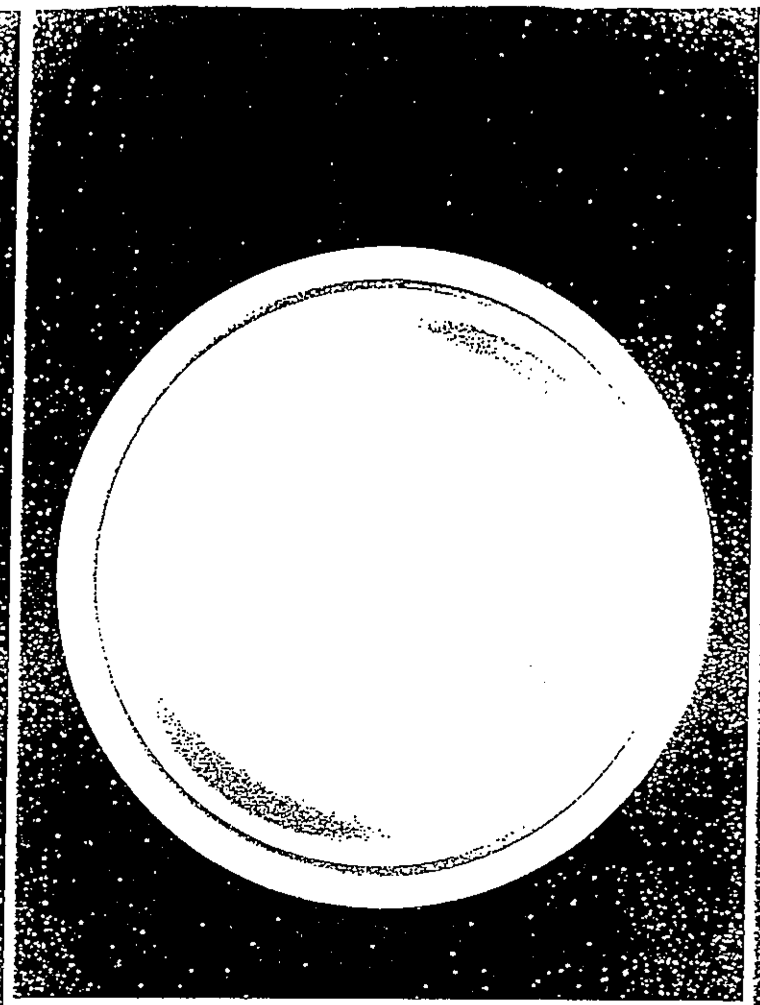
Texas Instruments Singapore
(Pte) Ltd.
Asia Pacific Region,
990 Bendemeer Road,
Singapore 1233.
FAX: 65 3907 063
Phone: 65 3907 100

Taiwan

Texas Instruments Taiwan Ltd.
Taipei Branch
23F, No. 216, Sec 2, Tun Hua S. Road
Taipei 106, Taiwan
FAX: 886 2 378 2718
Phone: 886 2 378 6800

APPENDIX G

Dallas Touch Memory Tag Brochure



50 WAYS TO

TOUCH MEMORY

SECOND EDITION

From the company
that took the memory
out of the computer

DALLAS
SEMICONDUCTOR

INTRODUCTION

Semiconductor memory chips, to date confined to the printed circuit board inside of computers, can now be directly attached to almost anything. Dallas Semiconductor has designed Touch Memory chips so that they can be taken outside the computer and stuck in all kinds of novel places: on hospital bracelets, pallets, garbage cans—even cows. DS199x Touch Memory chips are stainless steel, self-stick labels that read or write with a momentary contact.

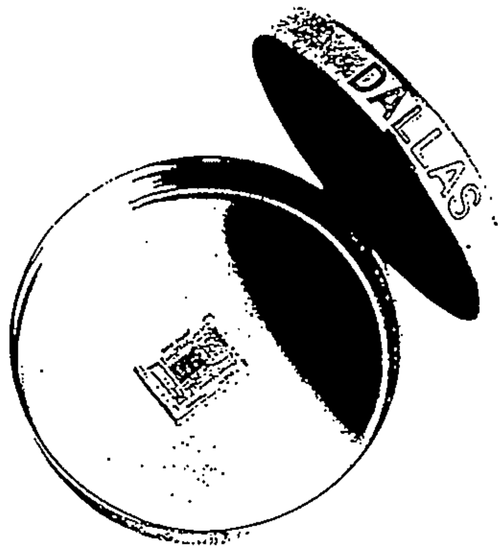
When a memory chip becomes a label, information is available immediately on the spot — there's no need to reference a remote computer's memory.

Large amounts of up-to-date information accompany the tagged object. Data can be added with little or no worker involvement. As the object moves from point to point, information is transferred free from the restrictions of a wired network. Further, it is not limited by the radio interference, range, and degradation of an RF network. Even with many objects arriving from multiple originations, relevant information about a particular object is selected with the specificity of a touch.

Touch Memory chips are packaged in coin-shaped MicroCans to withstand harsh environments. The simple conductive surfaces of this package are the conduit for error-free data transfer to other chips in the system with the economy of a direct chip-to-chip digital link.

Getting a memory chip to operate with just one signal plus ground was critical to make practical a memory that reads or writes with a touch. Other semiconductor memories such as DRAMs have multiplexed address signals to reduce connections, but stop far short of the magic of a solo signal. Touch Memories are intensely multiplexed using Dallas Semiconductor's 1-Wire Touch Protocol. The Touch signal transitions between 0-volt and +5-volt levels. The host chip stimulates the Touch Memory

Touch Memory is housed in a stainless steel container called a MicroCan™. Canning is a high-volume, low-cost packaging methodology known for its excellent ability to preserve contents.



by sourcing +5 volts; the Touch Memory responds by pulling the signal down with an input resistance that changes between 500,000 ohms and 50 ohms. This four order-of-magnitude resistance shift permits easy sensing of the digital signal, even with substantial contact resistances (> 500 ohms). The length of time (long or short) that the signal is pulled down represents 1's or 0's.

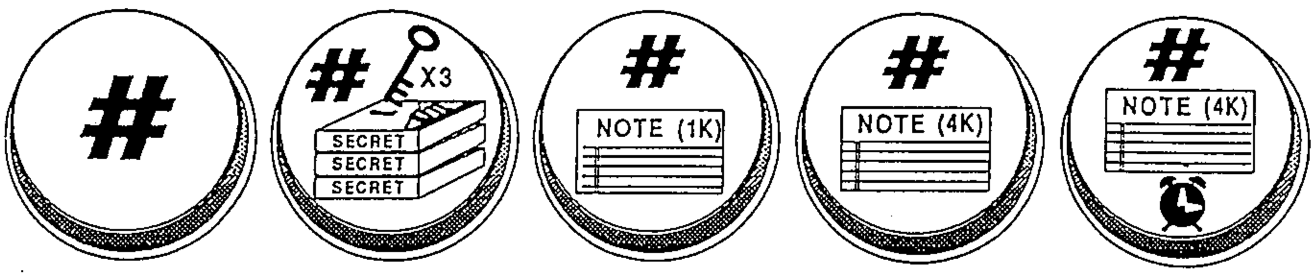
The coin surfaces of the Touch Memory can be extended to facilitate automation. The touch surface area can be enlarged, reshaped, folded, and designed for rubbing motion. A distance of 300 meters between the Touch Memory and the chip it is communicating with can be accommodated. As an example, the Touch Memory's surface can be extended to incorporate the bumper of a truck for contacting the loading dock, circumventing the need to align a probe to the smaller MicroCan itself.

Application software support is available from Dallas Semiconductor for Touch Memories, Touch Transporters, Touch Pen, Touch Editor, PC keyboard, PC COM port, VAX terminals (VT101 and VT220) and a teleserviced dumping cradle that allows information in the Touch Memory to be transferred to a remote computer over the phone lines.

No two Touch Memories are the same. Each contains a guaranteed unique serial number that is lasered into the chip at the time of manufacture in Dallas. This number is a permanent registration code engraved in silicon that provides absolute traceability.

This booklet illustrates some 50 application examples and is an invitation to Touch Memory *your* way.

DS199x TOUCH MEMORIES



DS1990 DS1991 DS1992 DS1993 DS1994

Information at the touch of a button has often been promised but seldom delivered. Dallas Semiconductor Touch Memory makes good on that promise in the most literal way. Inside the button's protective (and conductive) shell is a special read/write microchip that holds up to 512 characters (4K bits) of information.

Touch Memory Characteristics

- Read or write with a momentary contact
- Unique, factory-lasered 48-bit serial number for traceability
- MicroCan can be affixed to almost any object
- Communicates to host via a single signal
- Announces connection to host with a presence detect
- Data retention > 10 years

MicroCan Package

- 16.3mm button shape is standard to entire Touch family
- Durable stainless steel case
- F5 package height is 5.8mm with an attachment flange around the base for mounting
- R3 package height is 3.2mm; attaches with an adhesive pad

Environmental Conditions

- Temperature Range
  - Operational -20 to +70°C (DS1990 -40 to +85°C)
  - Storage -20 to +70°C (DS1990 -40 to +85°C)
- Mechanical Shock 500 g's (6 axis)
- Immersion in Saline 24 hrs.
- Drop Test 5 ft. to concrete
- Crush Test 25 lbs. for 30 sec.
- Contact Durability 10^6 insertion/withdrawals

Touch Protocol

- 16K bits/sec. bidirectional data transfer rate
- Multiple devices can share a common conductive surface
- Unknown devices in a field of many discovered at a rate of 72 per second
- Data integrity insured by use of CRC's, scratchpad, verification and page writes via an uninterruptible copy command
- Can transfer data with intermittent, resistive contact

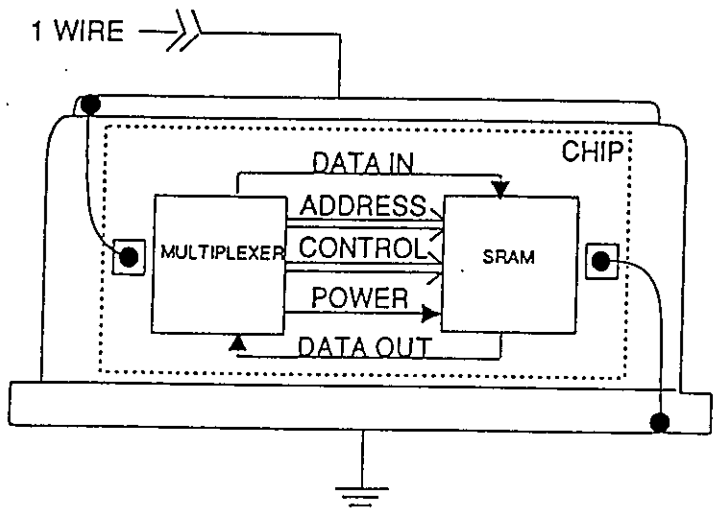
Touch Family

Part	Description	Serial No.	NV RAM	Organization	Scratchpad	Interrupt	MicroLAN
DS1990R3/F3	Touch Serial Number, ROM only	8+48+8 bits	--	--	--	--	***
DS1991LF5	Touch MultiKey, 3 Secure Partitions*	8+48+8 bits	1,344 bit	3x64bits+ 3x384 bits	512-bit	--	YES
DS1992LF5	Touch Memory 1K	8+48+8 bits	1,024 bit	4x256 bits	256-bit	--	YES
DS1993LF5	Touch Memory 4K	8+48+8 bits	4,096 bit	16x256 bits	256 -bit	--	YES
DS1994LF5	Touch Memory Plus Time**	8+48+8 bits	4,096 bit	16x256 bits	256-bit	YES	YES

*Three secure memory partitions each protected by a 64-bit password; incorrect passwords return random data to confuse unauthorized listeners.
**Calendar date and time, interval timer, and access counter included with alarm; lock bit prevents tampering.
***Only one DS1990 can operate on a MicroLAN with other devices.

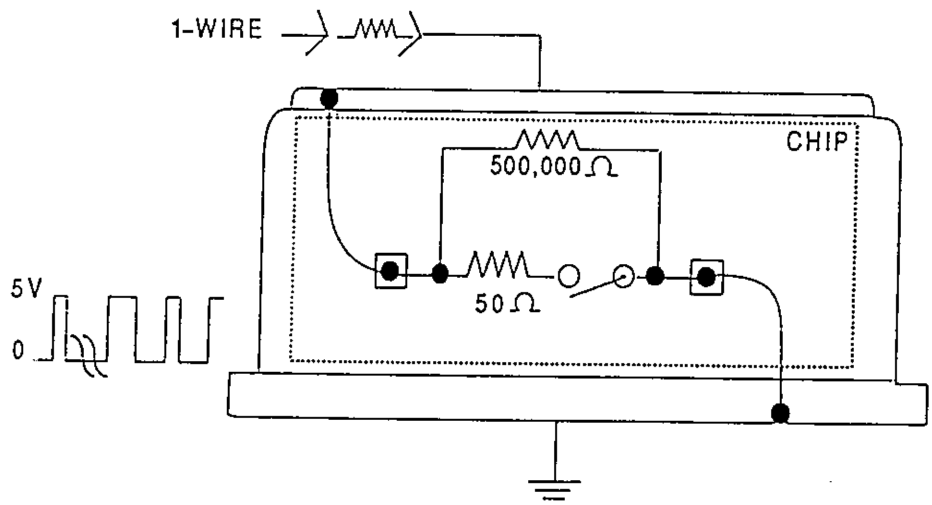
Touch Memory uses digital signals to activate electric locks, providing convenient entry to secure areas.

Multiplexing



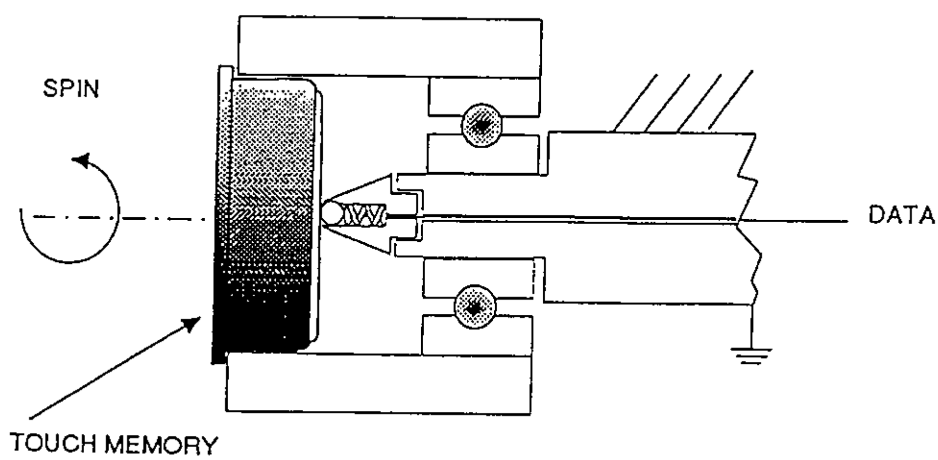
1-Wire technology reduces signalling associated with a nonvolatile static RAM to a single conductor plus ground.

Input/Output Circuit Model



A Touch Memory chip is stimulated by a 5-volt signal from a host and responds by switching the input resistance four orders of magnitude, from 500,000 to 50 ohms. Substantial contact resistance can be tolerated because this 10,000-to-1 off-to-on ratio swamps out the effects of poor contacts.

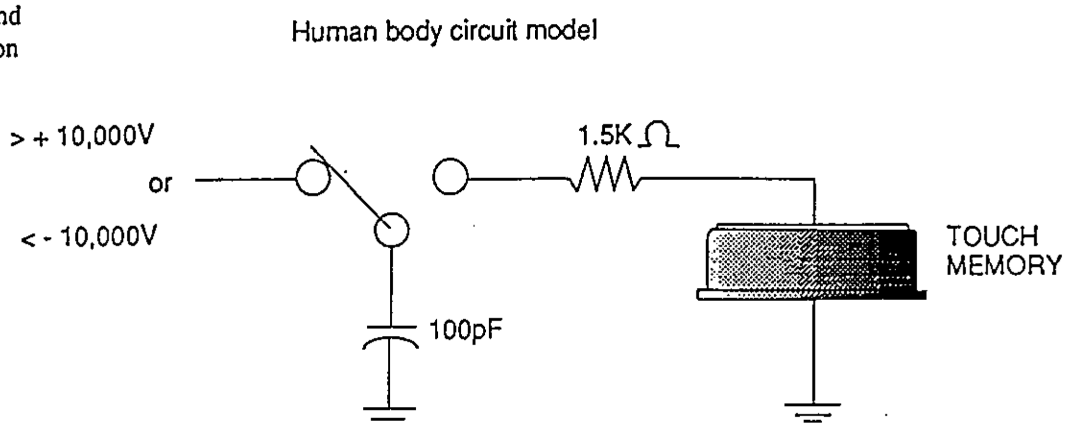
Contact Dwell



Intermittent contact such as encountered on a spinning wheel can be accommodated. Contact dwell for reading the serial number is only 5mS and transferring a 256-bit memory page is just 20 mS. Even though the ball bearing contacts are sliding and intermittent, communication is error-free because data packets are transferred in short intervals, the scratchpad is verified before writing memory, and all data is tagged with a powerful cyclic redundancy check (CRC16).

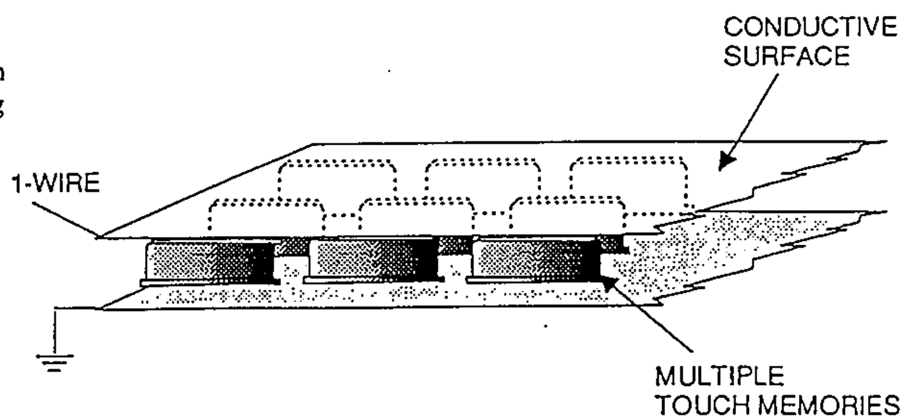
Tolerance to ESD beyond ± 10,000 volts results from reducing pin count to one and including a special protection device in the chip layout.

Static Electricity Testing

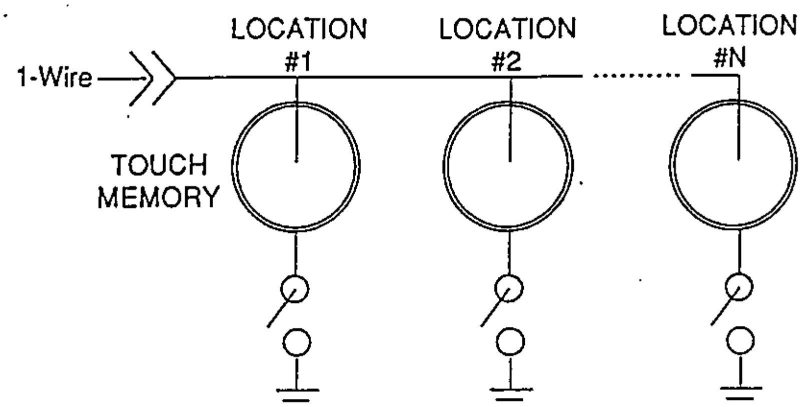


The unique serial number and sorting logic in each Touch Memory allows for discovery at a rate of 72 per second out of a population of 10^{19} devices. Once a specific Touch Memory is selected, communication occurs with one device at a time, taking on the characteristics of a MicroLAN.

Sharing The Same Surface

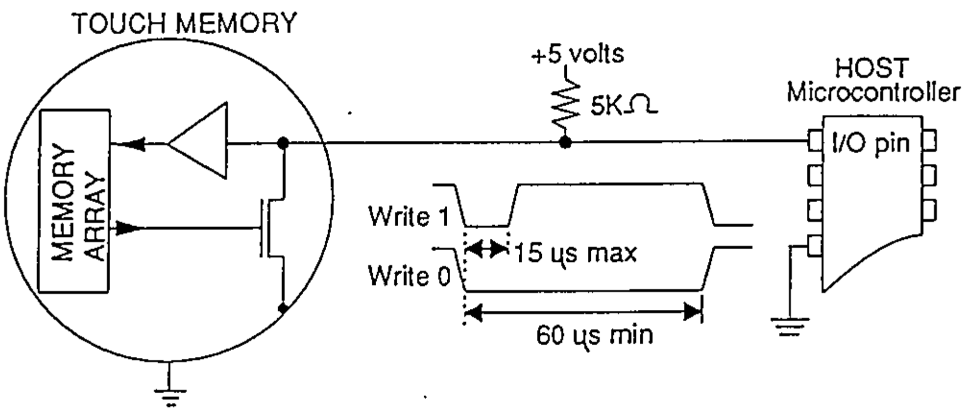


Multidrop Capability



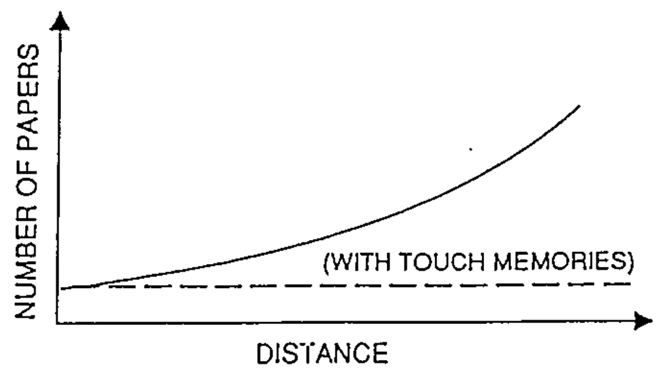
The 1-Wire Touch Protocol forms a MicroLAN at the lowest price point. This powerful protocol can identify the opening or closing of a specific switch by using the unique serial number in each Touch Memory. The host then knows the location by reading the notation stored in the Touch Memory. A closure or opening can be from a reed relay, pressure switch, or bi-metallic temperature switch.

Inexpensive Interface



The 1-Wire Touch Protocol uses long and short pulses to encode binary data, much like Morse Code. A single conductive link (plus ground) is the lowest cost way for two chips to communicate.

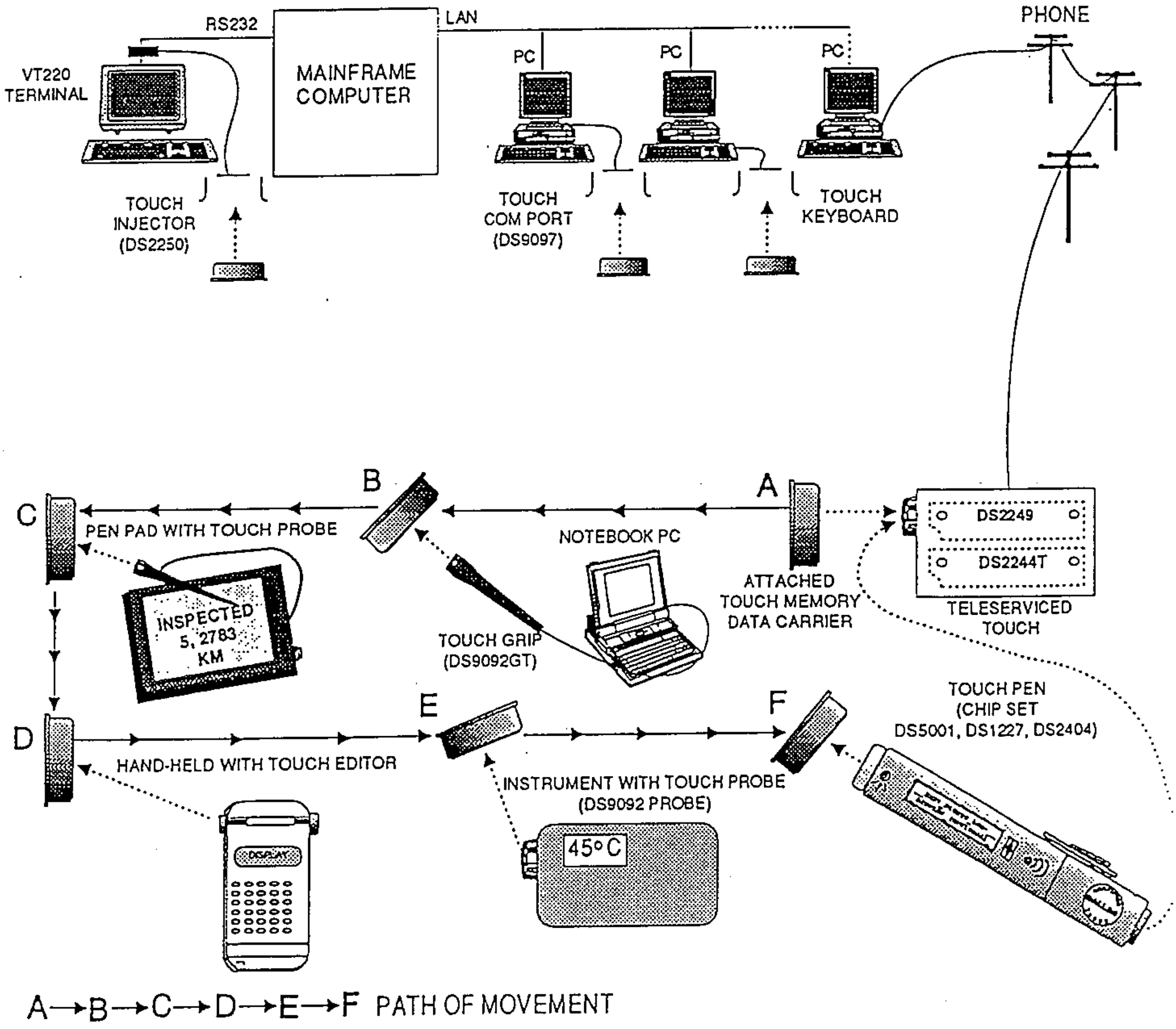
Paperwork vs. Distance From Computer



The amount of paper needed to document an activity increases as work is done away from the computer. However, with Touch Memories the paper-reducing benefits of computers continue even where the network stops.

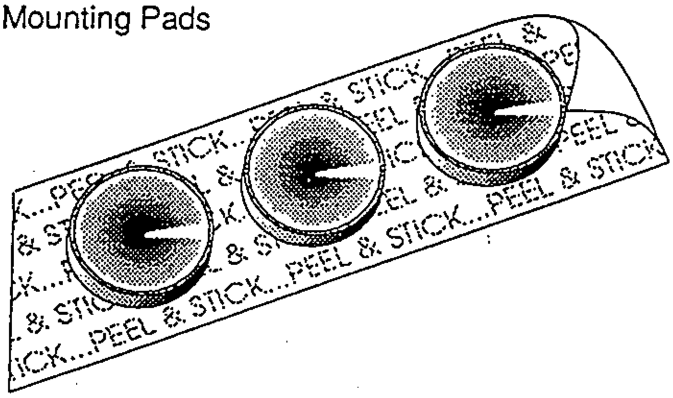
Touch Memory Extends the Reach of Computing

Touch Memories keep information flowing to the hands-on, walking workers. The low interface cost of chip-to-chip communication serves hand-helds as well as networked computers. The movement of Touch Memories from point to point carries information as a network without wires.



ATTACHMENTS

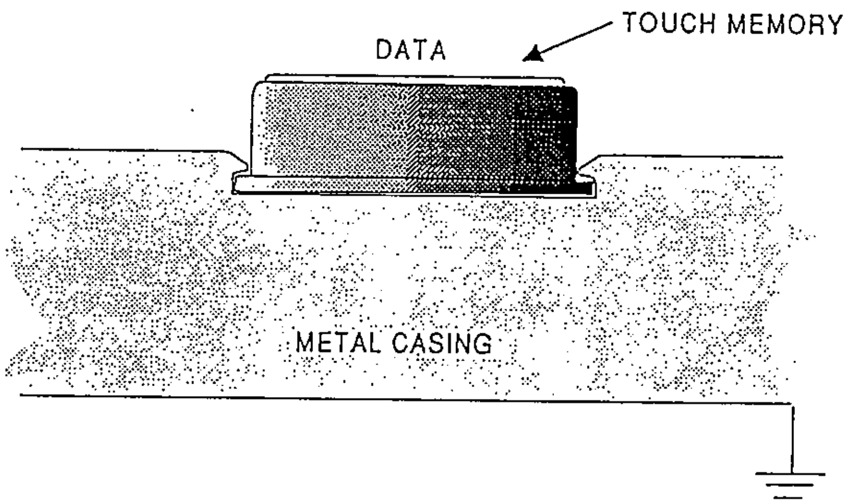
1. DS9096 Mounting Pads



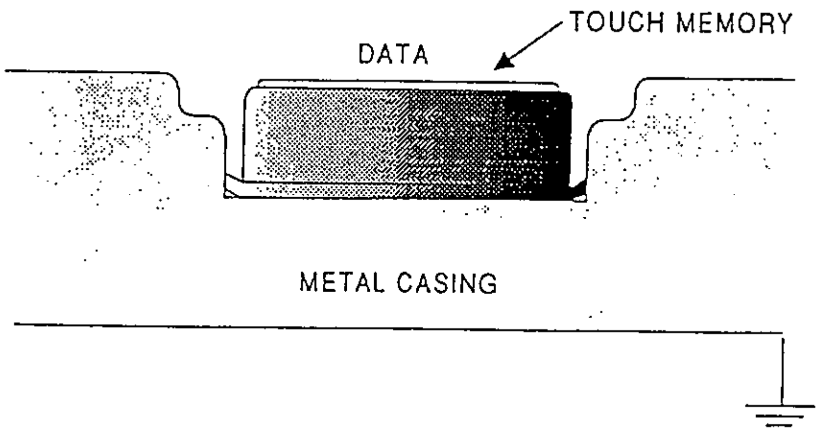
1. The DS9096 double-side foam mounting pads attach Touch Memories to almost any surface with the ease of adhesive tape.

2. Press Fit

2A.



2B.

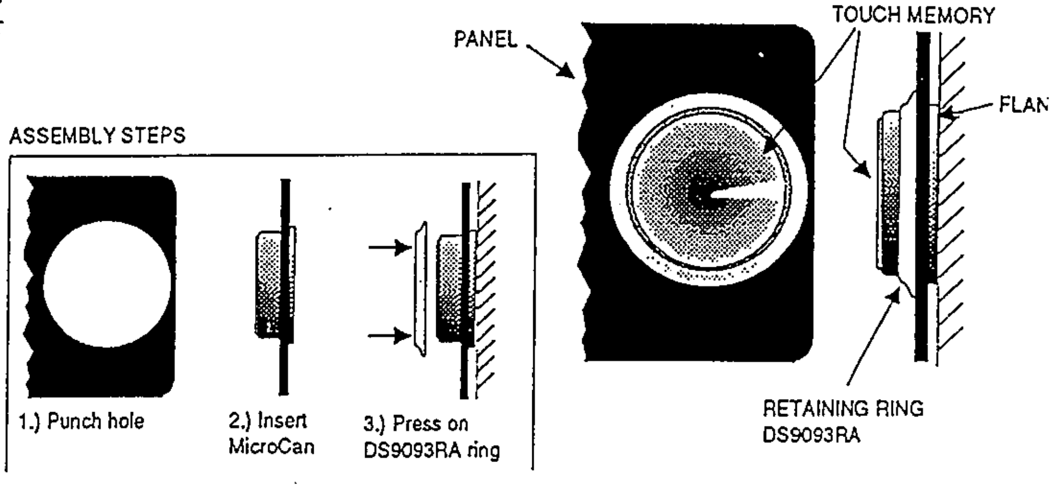


2A. By deforming the metal over the flange, a Touch Memory is locked into place.

2B. An interference fit secures the Touch Memory in an undersize hole.

3. A circular retaining ring DS9093RA is pressed over the Touch Memory, biting into the side wall. The fastener locks the Touch Memory in the panel through hole.

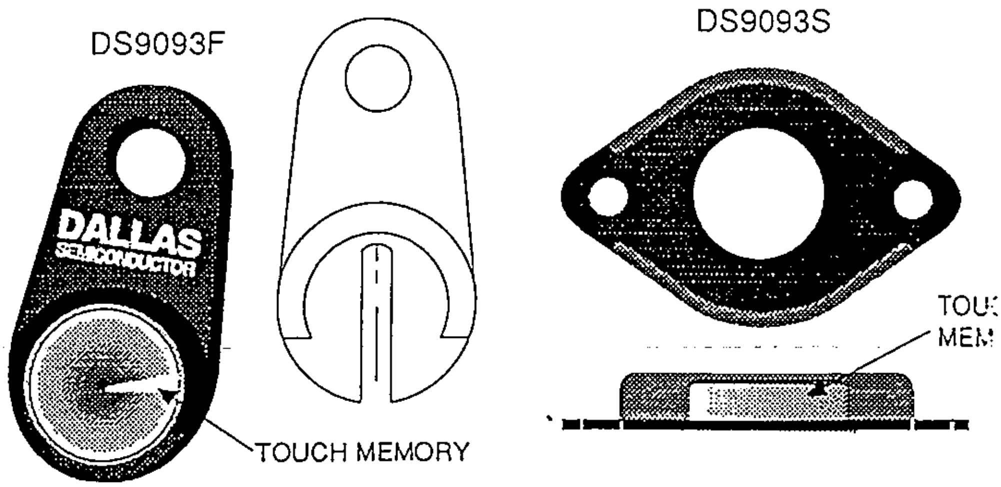
3. Panel Mount



4. A C-clip such as the one molded into the DS9093F mount binds the flange of the MicroCan.

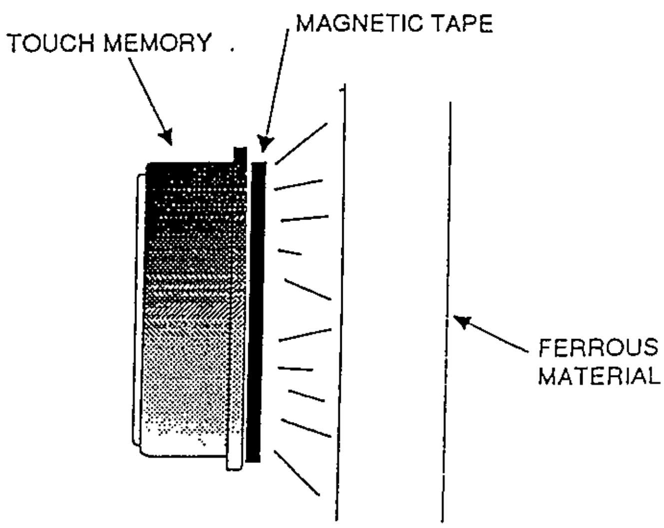
The DS9093S holds the MicroCan captive with screws or rivets.

4. Mechanical Flange Mount

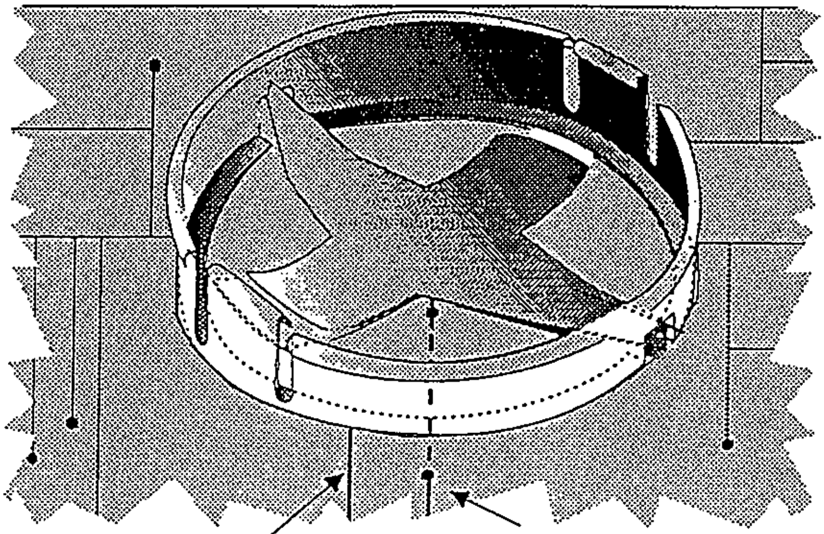


5. Readily available magnetic adhesive tape conveniently adheres to ferrous surfaces for reusable self-stick applications.

5. Adhesive-Backed Magnetic Tape

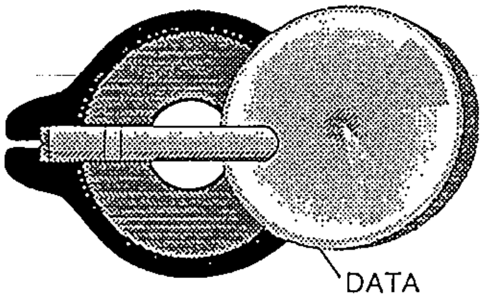


6. DS9098 MicroCan Retainer



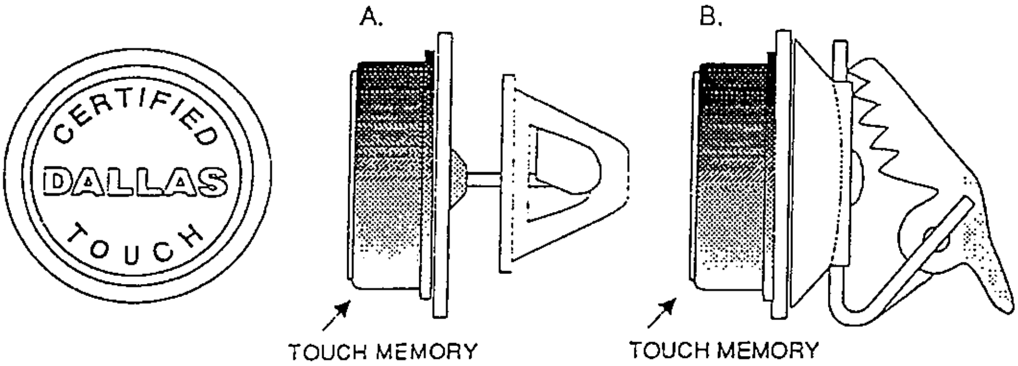
6. The DS9098 Retainer is a single piece, all-metal receptacle for surface mounting a MicroCan to a printed circuit board. The center contact is permanently separated at first insertion. The MicroCan pops up for removal when the side latch is released.

7. DS9094F and DS9094FS MicroCan Clip



7. The DS9094 MicroCan Clip holds and connects a Touch Memory to a printed circuit board.

8. Fabric Mount



8A. Touch Memories fasten to soft, flexible materials such as fabrics using a pin. The surface of the MicroCan can be embossed with an emblem.

8B. Spring-loaded clip.

Vision Abell

APPENDIX H

Thermal Bar Code Printer Brochures

Soabar Systems

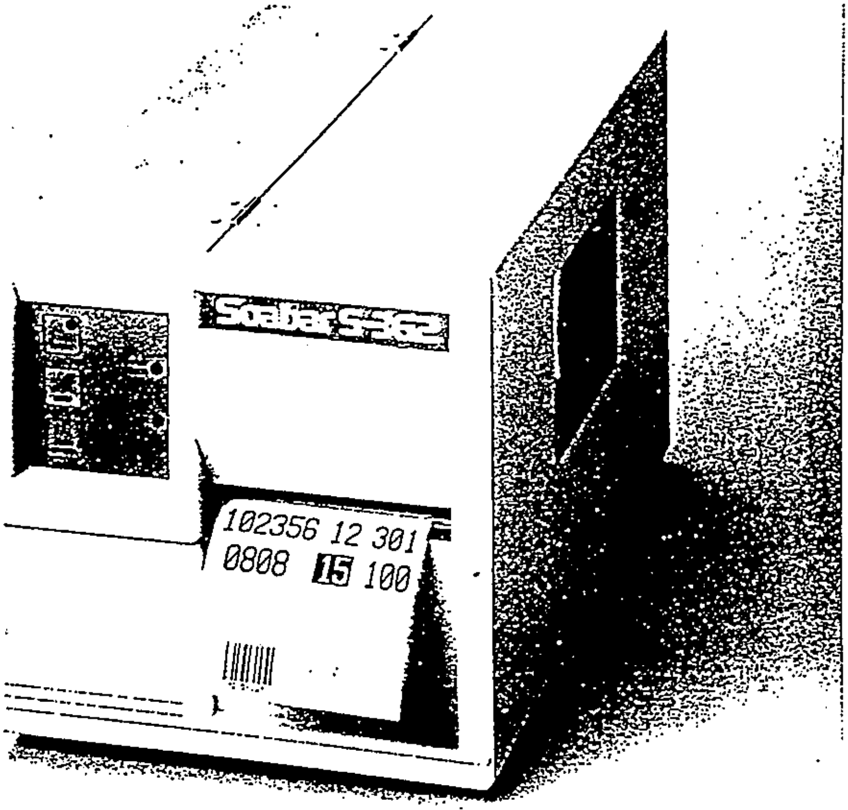
Soabar S-362 High Speed Low-Cost Thermal Transfer Printer

Now you can get the printing speeds you need for high-quality bar code labeling at an affordable price. The Soabar S-362 combines the quality of thermal transfer printing with high print speeds. Yet it costs less than some printers without all its features.

With the S-362, standard formats, including rotated bar codes, print at six inches per second. Type fonts and non-rotated bar codes can be printed at speeds up to eight inches per second. To assure long, dependable service, the S-362 has been engineered with special attention to the durability of mechanical parts. It is ruggedly constructed for demanding industrial applications.

The S-362 is designed to produce the labels you need for shipping container labeling, package or product labeling, inventory control and other applications where bar codes are required. It will run all the standardized industry label formats for just-in-time or Quick Response programs such as AIAG, VICS, TCIF, FASLINC and many others.

The S-362 gives you a practical, easy-to-use system with the versatility to meet your present and future labeling needs. It will print just about every non-proprietory bar code used in industry today. And with its superior history control, it will print in-spec bar codes at six inches per second even if they are rotated 90, 180 or 270 degrees. Think of the formatting flexibility this feature provides.

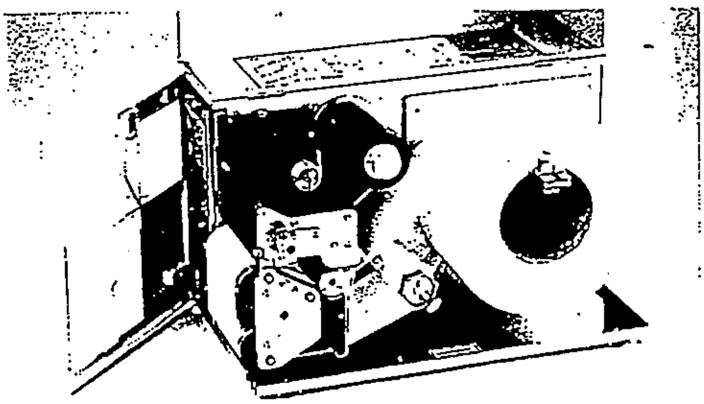


The Soabar S-362 is a sturdy, high-speed printer for easy production of bar-coded labels.

Supply Rolls Visible

The clear window in the cover lets the operator see when labels or ribbon are running low.

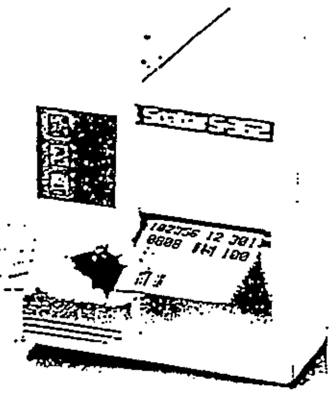
Quick Changes



Short, open feed paths make ribbon and label changes quick and simple.

AVERY DENNISON

Labels Dispensed



Labels may be dispensed singly for easy application with the backing paper neatly rewound inside the printer.

In addition to bar codes, the S-362 will print nine alphanumeric fonts plus OCR-A and OCR-B. Each font is expandable up to eight times its nominal size with the largest reaching a maximum character height of 7.68 inches.

Labels from .75 to 4.65 inches wide and .5 to 10.0 inches long may run with standard print areas up to 4.1 inches wide by 10 inches long. An optional 512K memory module extends the print area to 20 inches long. Print head temperatures are software selectable so they may be stored with each format to eliminate manual adjustments.

The printed labels may be dispensed in pre-determined strips or rewound inside the printer. With an optional sensor, single labels can be dispensed as the backing paper is rewound inside the printer.

The S-362 can be controlled by virturally any computer— PC or mainframe. A variety of Soabar PC-based TGX off-the-shelf or custom software is available to simplify label formatting, data management and printer operation.

Printing Specifications

Bar Codes: Code 39, Interleaved 2 of 5, Code 128, Codabar, Logmars, EAN-8, EAN-13, EAN 2 and 5 digit addendums, UPC-A, UPC-E, UPC 2 and 5 digit addendums, UPC random weights, Code 93, MSI Plessey, Universal Shipping Container Symbology (fixed or random weight codes)

Type Fonts: Nine alphanumeric fonts from .035"H to .32" H plus OCR-A, OCR-B.
All fonts are expandable up to 8 times, maximum character size 7.68"H.

Character Rotation: 0, 90, 180 and 270 degrees

Print Area: 4.1" x 10.0", optional 20.0" (41 to 81 square inches)

Print Speeds: 6" per second for full range of type fonts, bar codes (including rotated) and high-density graphics.
8" per second for type fonts and non-rotated bar codes.

Communications

Interface: RS-232C, RS-422 at 300-9600 baud

Label Sizes

Width: .75 inches to 4.65 inches
Length: .5 inches to 99.99 inches

Physical Specifications

Supply Roll Capacity: 8 inch O.D., 4 inch core
Rewind Capacity: 5 inches on 1.5 inch core
Electrical: 115V, 60Hz, 2 amp
Dimensions: 10"H x 10"W x 18"D
Weight: 35 pounds

Soabar Systems Division
7722 Dungan Road
Philadelphia, PA 19111
215 725-4700 800 233-4177

AVERY DENNISON

Printed in U.S.A. 4929

APPENDIX I

Bar Code Standards

Individual codes for individual applications

Requirements vary for the code on a product. It may be always the same number, or have a progressive or special numerical sequence.

Bar code

The term "bar code" covers a variety of code types. The codes differ according to their field of application.

"Industrial 2/5" code

The "Industrial 2 of 5" code is only suitable for figures. Each character consists of two wide and three narrow bars. The spaces contain no information.

Advantage: wide tolerance (± 15 %), so that it can be produced by extremely simple printing methods

Disadvantage: low information density

Applications: storage systems, envelopes, air tickets.

"Interleaved 2/5" code

The "Interleaved 2 of 5" code is only suitable for figures. Each character consists of two wide and three narrow bars (or two wide and three narrow spaces).

Advantage: high information density, self-checking

Disadvantage: low tolerance range (± 10 %)

Applications: storage systems, heavy industry (car industry)

Labels

The code can be applied to paper, plastic foil or even plastic plates. Metal plates resistant to temperatures of up to 540°C are also recommended for special applications.

Suitable methods of applying codes include laser printers, dot-matrix printers, thermal printers and heat-transfer printers (ideal). The printers can work either independently – as an independent unit – or in on-line mode, linked to the house computer.

2/5 INDUSTRIAL

0123456789

2/5 INTERLEAVED

0123456789

Code 39

Code 39 is an alphanumeric code which, in addition to figures and 26 letters, also contains 7 special characters. Each character consists of 9 elements: 5 bars and 4 spaces. 3 elements are wide; 6 are narrow.

Advantage: alphanumeric representation

Disadvantage: low information density, low tolerance range (± 10%)

Application: widely used industrial code

CODE 39

SICK0123456

EAN code

The EAN code (European Article Numbering) is a numeric code and has a fixed number of 13 (8) digits. The code consists of two halves, each with 6 (4) characters, an edge character and dividing gap.

Advantage: high information density

Disadvantage: very low tolerance range

Application: widely used commercial code

EAN CODE

4 012345 360004

Codabar

Codabar is a self-checking numeric code with an additional 14 special characters. Each character consists of 7 elements: 4 bars and 3 spaces. 2 or 3 elements are wide.

Advantage: no information in space

Disadvantage: low information density

Applications: this code is used by libraries and the Health Service, e.g. marking stored blood, and by the photographic industry.

CODABAR

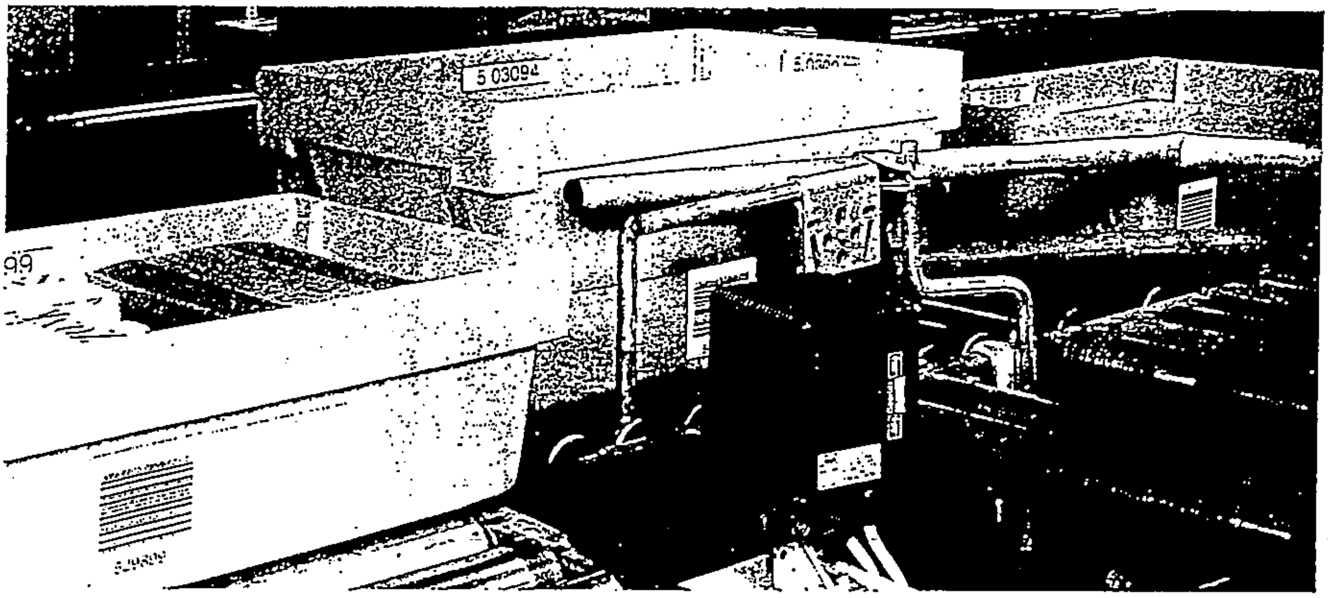
a0123456789b

Vision Abell

APPENDIX J

Bar Code Reader Brochures

OPTIC
ELECTRONIC



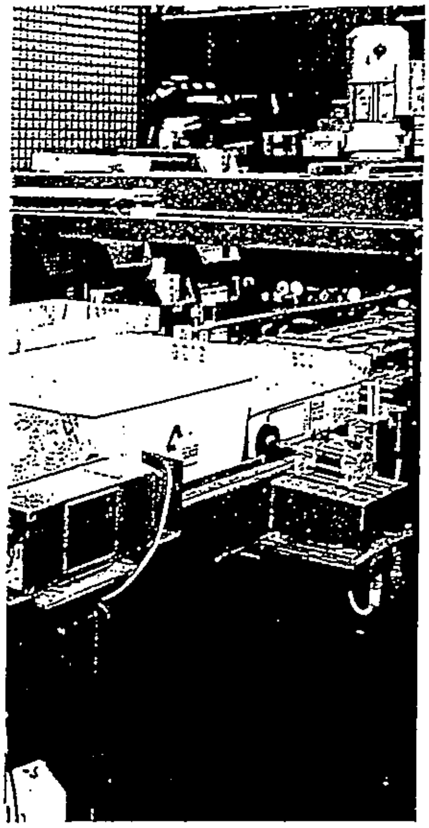
OPTIC

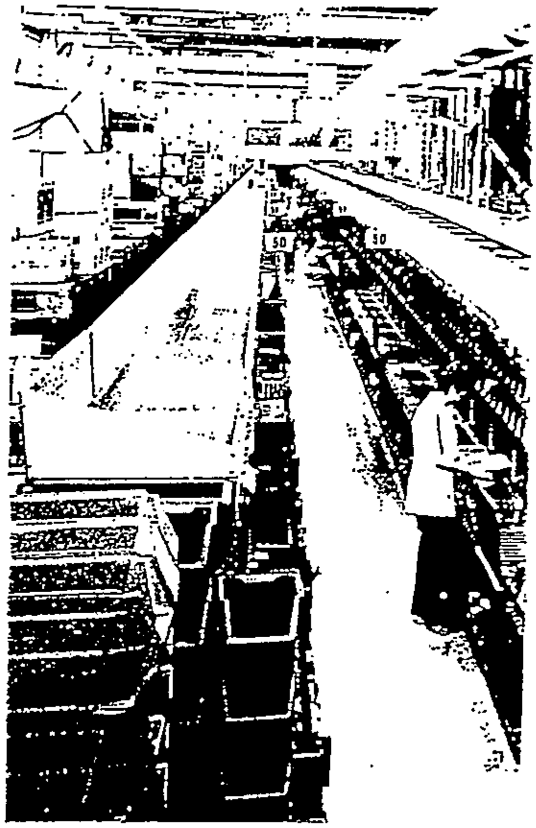
Bar Code Identification Systems

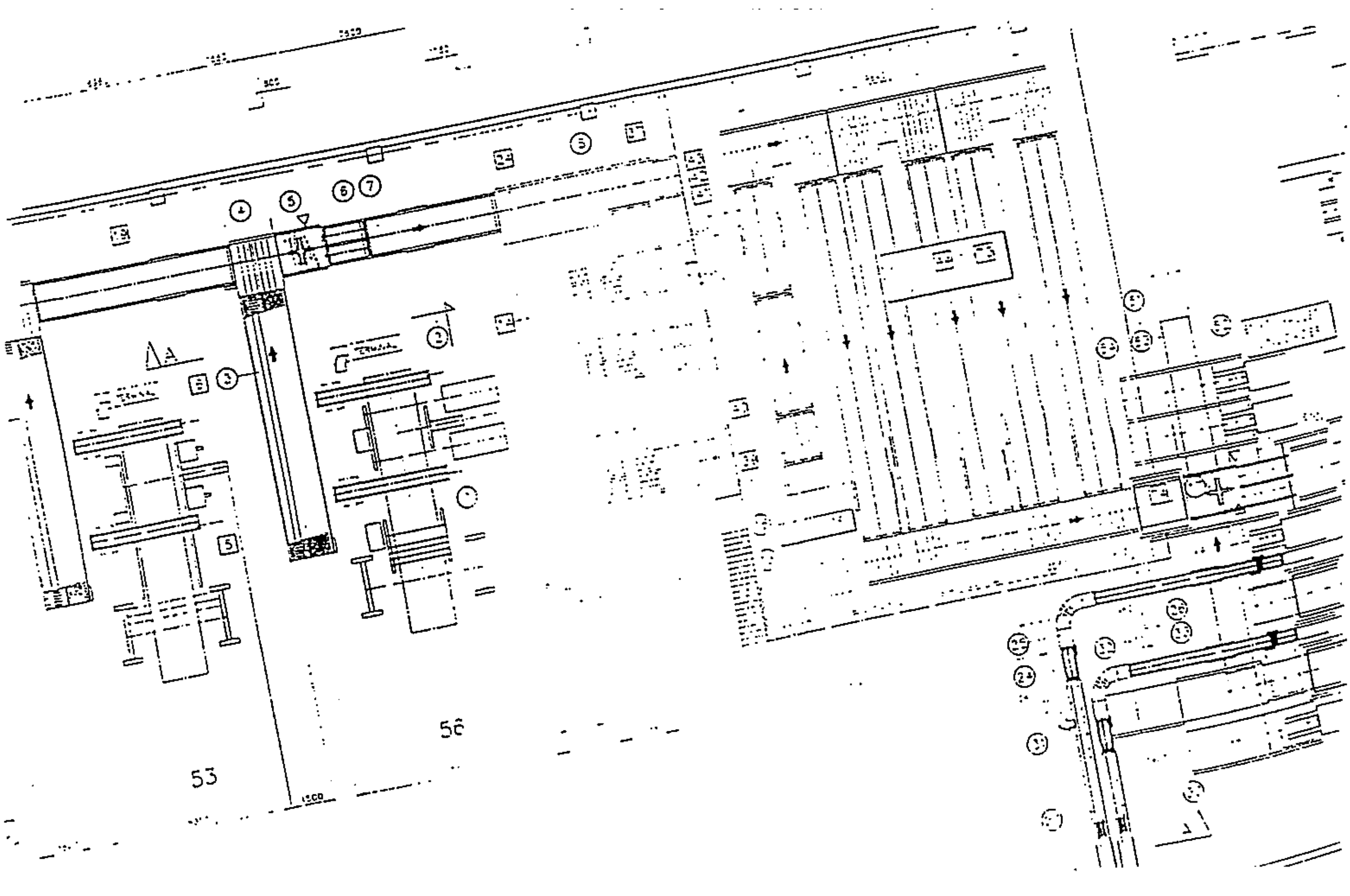
ELECTRONIC

SICK
optic
electronic

Contents **Page**

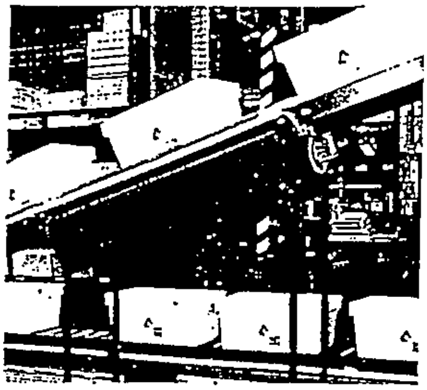

Identification on conveyor system


Order-picking store



Identification. Automation. Rationalization.

Identification in production control



Identification on conveyor system

Data acquisition and data transmission are fundamental prerequisites of modern production methods. The right items have to be at the right place at the right time. Only when a company has a grip on both materials flow and data flow can economic production be guaranteed.

Bar codes enable data to be acquired quickly and by simple mechanical means. Used in almost every field of industry, in commerce and by the authorities, bar codes can be reliably identified using precision optics and modern electronics.

Bar code scanning systems from SICK offer major advantages over the human eye: they are more reliable and can react more quickly than even the most attentive employee.

SICK's 40 years' experience of optoelectronic sensors yields impressive advantages.

Models to meet customer needs

- Planning support to meet specific requirements
- Hardware and software from a single source
- "Turnkey" systems available

With the advantages of SICK design

- Robust design suitable for industrial duties
- High reliability
- Decades of experience
- Advice and service available world-wide

There is a basic need to differentiate between on-line data acquisition for instantaneous process decision making and data collection as a by-product of on-line processing.

No product-flow control without instant decision making resulting from on-line data acquisition

Time is a decisive factor in "process-synchronous", and thereby "time-critical" data acquisition (process-controlling data acquisition). Data has to be collected and evaluated at high clock-rates before a new operation begins. In such optimal-time procedures, manual involvement implies delay and waste. This costs money.

No automation without production-control data acquisition

Data collection as a by-product of production processing, i.e. "non-time-critical" data acquisition, e.g. production data acquisition (PDA), involves saving data for it to be available at some later time. "Attendance recording" and "Stock level management" are familiar examples.

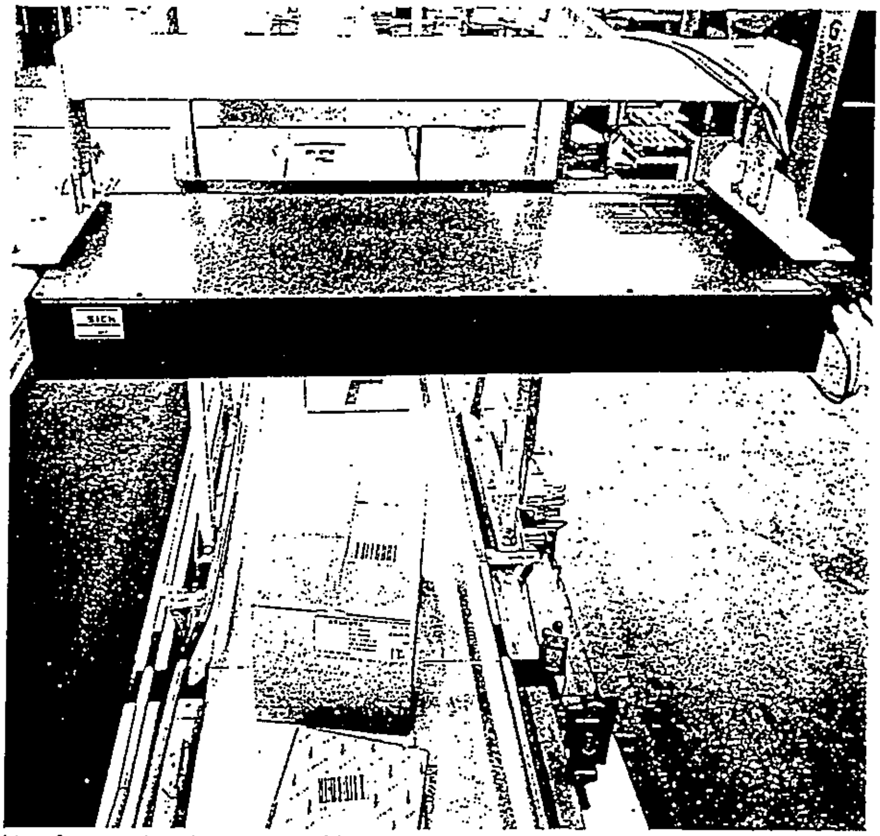
Meeting all applications, the SICK code reader is the optimum solution for modern process control and production-data acquisition.

On-line data acquisition

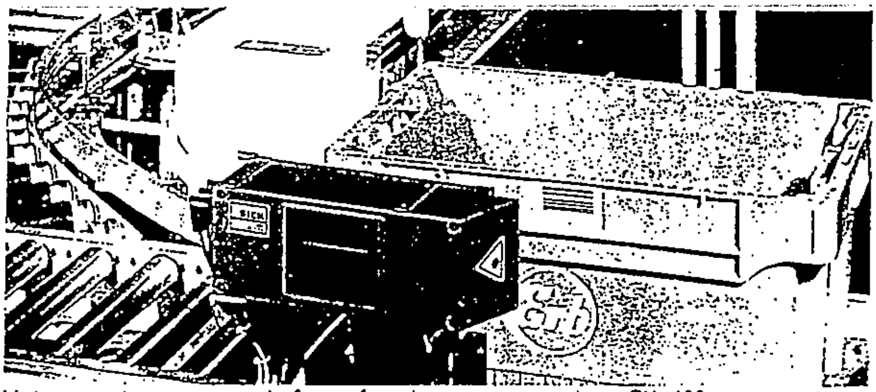
On-line data acquisition for instantaneous process decision making

In production, materials management, storage and conveyor systems – in fact, wherever objects have to be identified quickly and reliably – the solution is to use a bar code. For automatic control of material flow, all the relevant data has to be read and evaluated at high speed as an integral part of the process: for example, in conveyor systems in which laser scanners are used as the reading devices. They detect the bar codes on the rapidly moving goods being conveyed and pass the codes error-free to a host computer. The computer controls further events, such as the position of direction-switching points, marking or ejection. The next stage in production does not take place until the data from the preceding stage is available without errors – at conveyor speeds in excess of 2 metres/second.

Since the system transit time of an identification chain is governed by the slowest unit, the conveyor speed, reading speed, signal transmission and evaluation have to match each other.

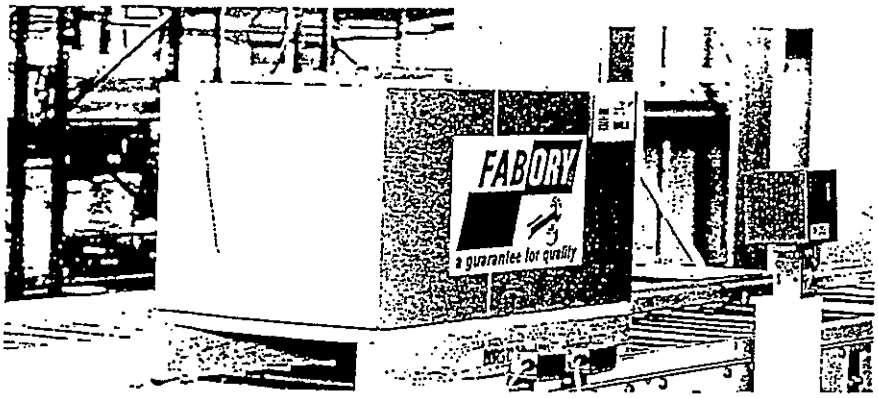


Identification with a large depth of field, using a CL 1000 in a goods distribution center

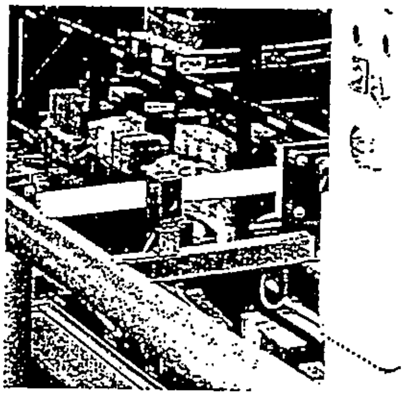


High-speed data acquisition in front of an ejection station, using a CLV 100

Label [illegible] detection by CLK [illegible]
[illegible]



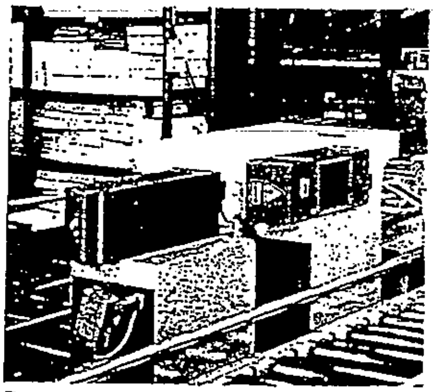
Automatic warehouse control using a CLV 200



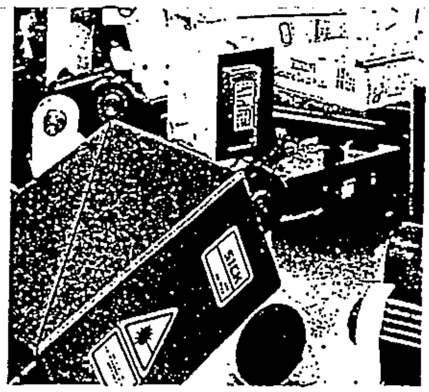
Wireless data transmission to a storage unit using the ISD 100

Automatic sorting in a package distribution installation, using a CLK 150

Bar code for hot area, using stamped metal sheet and parallax-free code reading by CLK 150



Double-track identification using CLV 100 before a direction-switching point

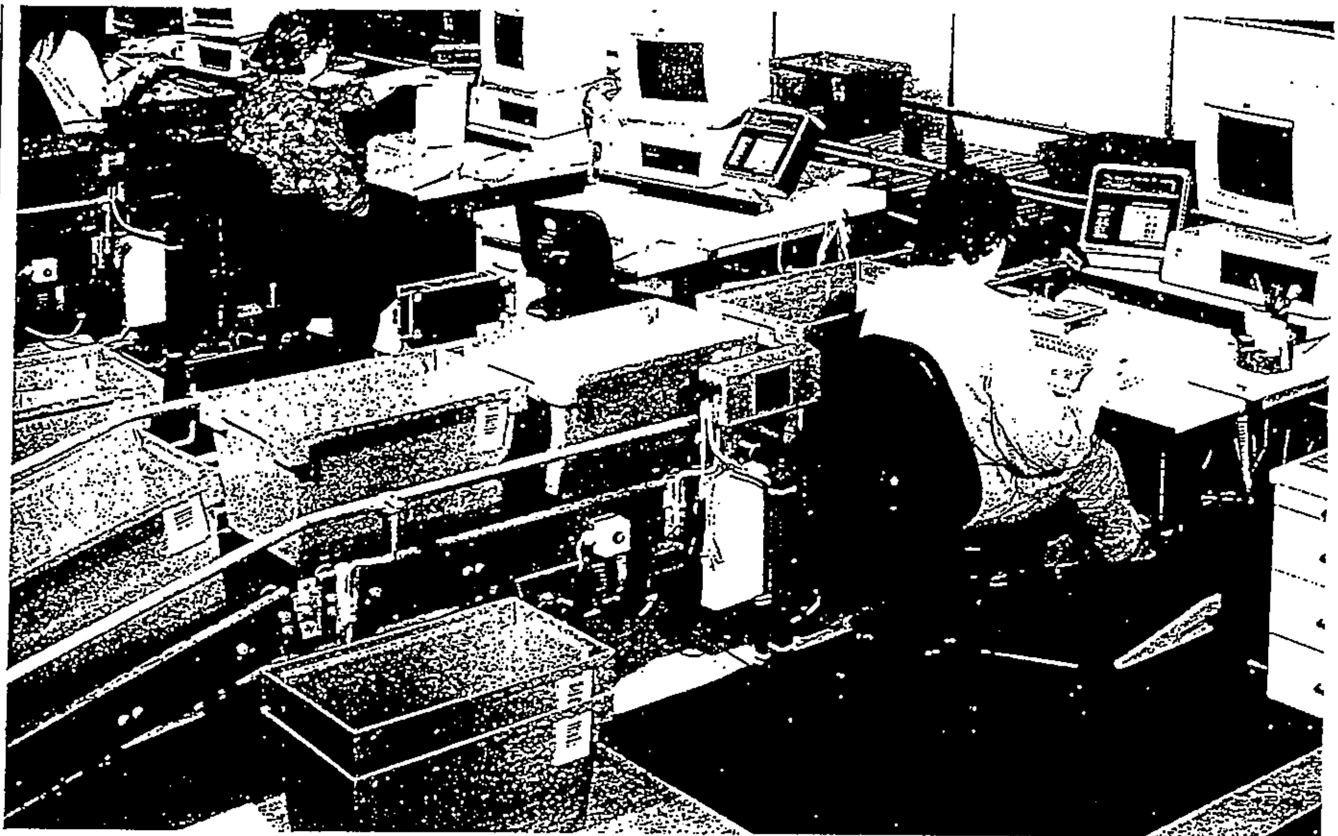


Monitoring non-mix-up of packages, using CLK 150

SICK products are suitable for every application. Devices are available both with a long reading range for large-area labels and a high resolution for short distances.

Networking, as well as software and hardware links to host computers, combined with practical know-how, always make SICK identification systems a reliable solution.

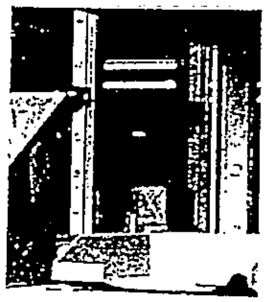
Data collection as a by-product of on-line processing

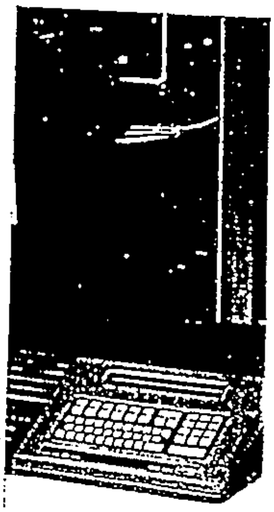


Manual and automatic data acquisition at Incoming Goods

In addition to data for production control, which is processed in synchronism with the production process, data accompanying the process also has to be collected. It does not have to be processed at the same time as the operation, since a direct reaction is not required. Attendance recording is one example out of many. This is not generally done at speed, as this is in production. The same goes for production planning, repair control, acceptance of goods and distribution of goods.

The detection of large quantities of goods at different storage locations, the short-term management of hundreds or thousands of orders, the involvement of a large number of employees, or the monitoring and control of a multiplicity of work stations, places great demands on the organisation of a company. Reliability problems arise; incorrect inputs can have fatal consequences and result in considerable l...





Vision Abell

APPENDIX K

Identification System Costing Analysis Spreadsheets

Hide Identification System Costing

System 1 -Transponder Tagging System

Summary

Abattoirs - Large identification cost ($/hide)	0.51
Abattoirs - Small identification cost ($/hide)	0.84
Average Abattoir identification cost ($/hide)	0.58
Tannery - Wet Blue identification cost ($/hide)	0.29
Tannery - Finished Leather identification cost ($/hide)	0.68
Total identification cost ($/hide)	1.54

Abattoirs - Large

Number cattle slaughtered (per yr)	5,600,000
Number of Abattoirs	48
Cattle per Abattoir (per yr)	116,667
Fixed Costs	
Fixed cost depreciation period (yr)	8
Transponder read write equipment cost ($)	5000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Transponder attachment device cost ($)	500
Number of devices per abattoir	2
Total per abattoir ($)	1,000
Transponder cost ($/transponder)	7
Number of devices per abattoir (recycled every 6 mths)	60,000
Total per abattoir ($)	420,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach transponder (sec)	5
Number times each transponder attached or removed	1
Attachment Cost ($/hide)	0.035
Cheap tag cost (export hides) ($/tag)	0.03
Total Large Abattoir Cost ($/hide)	0.51
(includes fixed and variable costs)	

Abattoirs - Small

Number cattle slaughtered (per yr)	1,400,000
Number of Abattoirs	192
Cattle per Abattoir (per yr)	7,292
Fixed Costs	
Fixed cost depreciation period (yr)	8
Transponder read write equipment cost ($)	5000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Transponder attachment device cost ($)	500
Number of devices per abattoir	2
Total per abattoir ($)	1,000
Transponder cost ($/transponder)	7
Number of devices per abattoir (recycled every 6 mths)	5,000
Total per abattoir ($)	35,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach transponder (sec)	5
Number times each transponder attached or removed	1
Attachment Cost ($/hide)	0.035
Cheap tag cost (export hides) ($/tag)	0.03
Total Small Abattoir Cost ($/hide)	0.84
(includes fixed and variable costs)	

Tannery - Wet Blue

Hides processed in Australia	3,150,000
Number of Tanneries	12
Hides per Tannery (per yr)	262,500
Fixed Costs	
Fixed cost depreciation period (yr)	8
Transponder read write equipment cost ($)	5000
Number of devices per tannery	3
Total per tannery ($)	15,000
Transponder attachment device cost ($)	500
Number of devices per tannery	10
Total per tannery ($)	5,000
Transponder cost ($/transponder)	7
Number of devices per tannery (recycled every 2 wks)	10,000
Total per tannery ($)	70,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach/remove transponder (sec)	5
Number times each transponder attached or removed	7
Attachment Cost ($/hide)	0.226
Cheap tag cost (export hides) ($/tag)	0.030
Total Wet Blue Tannery Cost ($/hide)	0.29
(includes fixed and variable costs)	

Tannery - Finished Leather

Hides processed in Australia	1,260,000
Number of Tanneries	6
Hides per Tannery (per yr)	210,000
Fixed Costs	
Fixed cost depreciation period (yr)	8
Transponder read write equipment cost ($)	5000
Number of devices per tannery	4
Total per tannery ($)	20,000
Transponder attachment device cost ($)	500
Number of devices per tannery	20
Total per tannery ($)	10,000
Transponder cost ($/transponder)	7
Number of devices per tannery (recycled every 2 wks)	10,000
Total per tannery ($)	70,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach transponder (sec)	5
Number times each transponder attached or removed	17
Attachment Cost ($/hide)	0.590
Cheap tag cost ($/tag) (all hides)	0.030
Total Finished Leather Tannery Cost ($/hide)	0.68
(includes fixed and variable costs)	

Hide Identification System Costing

System 2 -Disposable Bar code Tagging System

Summary

Abattoirs - Large identification cost ($/hide)	0.11
Abattoirs - Small identification cost ($/hide)	0.51
Average Abattoir identification cost ($/hide)	0.19
Tannery - Wet Blue identification cost ($/hide)	0.30
Tannery - Finished Leather identification cost ($/hide)	0.25
Total identification cost ($/hide)	0.74

Abattoirs - Large

Number cattle slaughtered (per yr)	5,600,000
Number of Abattoirs	48
Cattle per Abattoir (per yr)	116,667
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader and printer cost ($)	7500
Number of devices per abattoir	2
Total per abattoir ($)	15,000
Bar code attachment device cost ($)	5,000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Variable Costs	
Bar code tag cost ($/hide)	0.05
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Total Large Abattoir Cost ($/hide) (includes fixed and variable costs)	0.11

Abattoirs - Small

Number cattle slaughtered (per yr)	1,400,000
Number of Abattoirs	192
Cattle per Abattoir (per yr)	7,292
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader and printer equipment cost ($)	7500
Number of devices per abattoir	2
Total per abattoir ($)	15,000
Bar code attachment device cost ($)	5,000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Variable Costs	
Bar code tag cost ($/hide)	0.05
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Total Small Abattoir Cost ($/hide) (includes fixed and variable costs)	0.51

Tannery - Wet Blue

Hides processed in Australia	3,150,000
Number of Tanneries	12
Hides per Tannery (per yr)	262,500
Fixed Costs	
Fixed cost depreciation period (yr)	8
Automatic bar code reader equipment cost ($)	30000
Number of devices per tannery	2
Total per tannery ($)	60,000
Hand held bar code reader equipment cost ($)	5,000
Number of devices per tannery	3
Total per tannery ($)	15,000
Bar code attachment device cost ($)	5,000
Number of devices per tannery	2
Total per tannery ($)	10,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach/remove tag (sec)	5
Number times each tag attached or removed	7
Attachment Cost ($/hide)	0.226
Cheap tag cost ($/tag)	0.030
Number of additional tags required (per hide)	0.4
Additional tagging cost due to hide splitting	0.030
Total Wet Blue Tannery Cost ($/hide) (includes fixed and variable costs)	0.30

Tannery - Finished Leather

Hides processed in Australia	1,260,000
Number of Tanneries	6
Hides per Tannery (per yr)	210,000
Fixed Costs	
Fixed cost depreciation period (yr)	8
Hand held bar code reader equipment cost ($)	5000
Number of devices per tannery	4
Total per tannery ($)	20,000
Bar code attachment device cost ($)	5,000
Number of devices per tannery	3
Total per tannery ($)	15,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	6
Attachment Cost ($/hide)	0.208
Cheap tag cost ($/tag)	0.020
Total Finished Leather Tannery Cost ($/hide) (includes fixed and variable costs)	0.25

Hide Identification System Costing

System 3 -Laser Marked Bar Code Tags and Punched Hole Identification System

(Tags removed before samming)

Summary

Abattoirs - Large identification cost ($/hide)	0.11
Abattoirs - Small identification cost ($/hide)	0.27
Average Abattoir identification cost ($/hide)	0.14
Tannery - Wet Blue identification cost ($/hide)	0.28
Tannery - Finished Leather identification cost ($/hide)	0.04
Total identification cost ($/hide)	0.46

Abattoirs - Large

Number cattle slaughtered (per yr)	5,600,000
Number of Abattoirs	48
Cattle per Abattoir (per yr)	116,667
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader equipment cost ($)	5000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Bar code attachment device cost ($)	200
Number of devices per abattoir	2
Total per abattoir ($)	400
Bar code tag and rope cost ($)	1.10
Number of devices per abattoir (recycled every 6 mths)	40,000
Total per abattoir ($)	44000.00
Variable Costs	
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Cheap tag cost (export hides) ($/tag)	0.03
Total Large Abattoir Cost ($/hide)	0.11
(includes fixed and variable costs)	

Abattoirs - Small

Number cattle slaughtered (per yr)	1,400,000
Number of Abattoirs	192
Cattle per Abattoir (per yr)	7,292
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader equipment cost ($)	5000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Bar code attachment device cost ($)	200
Number of devices per abattoir	2
Total per abattoir ($)	400
Bar code tag and rope cost ($)	1.10
Number of devices per abattoir (recycled every 6 mths)	2,000
Total per abattoir ($)	2200.00
Variable Costs	
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Cheap tag cost (export hides) ($/tag)	0.03
Total Small Abattoir Cost ($/hide)	0.27
(includes fixed and variable costs)	

Tannery - Wet Blue

Hides processed in Australia	3,150,000
Number of Tanneries	12
Hides per Tannery (per yr)	262,500
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader equipment cost ($)	5000
Number of devices per tannery	3
Total per tannery ($)	15,000
Additional bar code tag cost ($)	1.10
Number of devices per tannery	5,000
Total per tannery ($)	5500.00
Hole punching equipment cost ($)	30,000
Number of devices per tannery	2
Total per tannery ($)	60,000
Hole pattern reading equipment cost (1 station) ($)	50,000
Number of devices per tannery	1
Total per tannery ($)	50,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach/remove tag (sec)	5
Number times each tag attached or removed	4
Time to punch holes (sec)	12
Number of times holes punched	1
Attachment/hole punch Cost ($/hide)	0.222
Total Wet Blue Tannery Cost ($/hide)	0.28
(includes fixed and variable costs)	

Tannery - Finished Leather

Hides processed in Australia	1,260,000
Number of Tanneries	6
Hides per Tannery (per yr)	210,000
Fixed Costs	
Fixed cost depreciation period (yr)	8
Hole pattern reading equipment cost (3 stations)($)	60,000
Number of devices per tannery	1
Total per tannery ($)	60,000
Total Finished Leather Tannery Cost ($/hide)	0.04
(includes fixed and variable costs)	

Hide Identification System Costing

System 4.1 -Laser Marked Bar Code Tags and Punched Hole Identification System

(Tags removed before fleshing)

Summary

Abattoirs - Large identification cost ($/hide)	0.11
Abattoirs - Small identification cost ($/hide)	0.27
Average Abattoir identification cost ($/hide)	0.14
Tannery - Wet Blue identification cost ($/hide)	0.18
Tannery - Finished Leather identification cost ($/hide)	0.04
Total identification cost ($/hide)	0.35

Abattoirs - Large

Number cattle slaughtered (per yr)	5,600,000
Number of Abattoirs	48
Cattle per Abattoir (per yr)	116,667
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader equipment cost ($)	5000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Bar code attachment device cost ($)	200
Number of devices per abattoir	2
Total per abattoir ($)	400
Bar code tag and rope cost ($)	1.10
Number of devices per abattoir (recycled every 6 mths)	40,000
Total per abattoir ($)	44000.00
Variable Costs	
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Cheap tag cost (export hides) ($/tag)	0.03
Total Large Abattoir Cost ($/hide)	0.11
(includes fixed and variable costs)	

Abattoirs - Small

Number cattle slaughtered (per yr)	1,400,000
Number of Abattoirs	192
Cattle per Abattoir (per yr)	7,292
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader cost ($)	5000
Number of devices per abattoir	2
Total per abattoir ($)	10,000
Bar code attachment device cost ($)	200
Number of devices per abattoir	2
Total per abattoir ($)	400
Bar code tag and rope cost ($)	1.10
Number of devices per abattoir (recycled every 6 mths)	2,000
Total per abattoir ($)	2200.00
Variable Costs	
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Cheap tag cost (export hides) ($/tag)	0.03
Total Small Abattoir Cost ($/hide)	0.27
(includes fixed and variable costs)	

Tannery - Wet Blue

Hides processed in Australia	3,150,000
Number of Tanneries	12
Hides per Tannery (per yr)	262,500
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader equipment cost ($)	5000
Number of devices per tannery	2
Total per tannery ($)	10,000
Additional bar code tag cost ($)	1.10
Number of devices per tannery	5,000
Total per tannery ($)	5500.00
Hole punching equipment cost ($)	30,000
Number of devices per tannery	2
Total per tannery ($)	60,000
Hole pattern reading equipment cost (2 stations)($)	55,000
Number of devices per tannery	1
Total per tannery ($)	55,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach/remove tag (sec)	5
Number times each tag attached or removed	1
Time to punch holes (sec)	12
Number of times holes punched	1
Attachment/hole punch Cost ($/hide)	0.118
Total Wet Blue Tannery Cost ($/hide)	0.18
(includes fixed and variable costs)	

Tannery - Finished Leather

Hides processed in Australia	1,260,000
Number of Tanneries	6
Hides per Tannery (per yr)	210,000
Fixed Costs	
Fixed cost depreciation period (yr)	8
Hole pattern reading equipment cost (3 stations)($)	60,000
Number of devices per tannery	1
Total per tannery ($)	60,000
Total Finished Leather Tannery Cost ($/hide)	0.04
(includes fixed and variable costs)	

Hide Identification System Costing

System 4.2 -Disposable Bar Code Tags and Punched Hole Identification System

(Tags removed before fleshing)

Summary

Abattoirs - Large identification cost ($/hide)	0.08
Abattoirs - Small identification cost ($/hide)	0.34
Average Abattoir identification cost ($/hide)	0.13
Tannery - Wet Blue identification cost ($/hide)	0.18
Tannery - Finished Leather identification cost ($/hide)	0.04
Total identification cost ($/hide)	**0.35**

Abattoirs - Large

Number cattle slaughtered (per yr)	5,600,000
Number of Abattoirs	48
Cattle per Abattoir (per yr)	116,667
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader and printer equipment cost ($)	7500
Number of devices per abattoir	2
Total per abattoir ($)	15,000
Bar code attachment device cost ($)	500
Number of devices per abattoir	2
Total per abattoir ($)	1,000
Variable Costs	
Bar code tag	0.03
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Total Large Abattoir Cost ($/hide)	**0.08**
(includes fixed and variable costs)	

Abattoirs - Small

Number cattle slaughtered (per yr)	1,400,000
Number of Abattoirs	192
Cattle per Abattoir (per yr)	7,292
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader and printer equipment cost ($)	7500
Number of devices per abattoir	2
Total per abattoir ($)	15,000
Bar code attachment device cost ($)	500
Number of devices per abattoir	2
Total per abattoir ($)	1,000
Variable Costs	
Bar code tag	0.03
Labour Cost ($/hr)	25
Time to attach tag (sec)	5
Number times each tag attached or removed	1
Attachment Cost ($/hide)	0.035
Total Small Abattoir Cost ($/hide)	**0.34**
(includes fixed and variable costs)	

Tannery - Wet Blue

Hides processed in Australia	3,150,000
Number of Tanneries	12
Hides per Tannery (per yr)	262,500
Fixed Costs	
Fixed cost depreciation period (yr)	8
Bar code reader equipment cost ($)	5000
Number of devices per tannery	2
Total per tannery ($)	10,000
Additional bar code tag cost ($)	1.10
Number of devices per tannery	5,000
Total per tannery ($)	5500.00
Hole punching equipment cost ($)	30,000
Number of devices per tannery	2
Total per tannery ($)	60,000
Hole pattern reading equipment cost (2 stations)($)	55,000
Number of devices per tannery	1
Total per tannery ($)	55,000
Variable Costs	
Labour Cost ($/hr)	25
Time to attach/remove tag (sec)	5
Number times each tag attached or removed	1
Time to punch holes (sec)	12
Number of times holes punched	1
Attachment/hole punch Cost ($/hide)	0.118
Total Wet Blue Tannery Cost ($/hide)	**0.18**
(includes fixed and variable costs)	

Tannery - Finished Leather

Hides processed in Australia	1,260,000
Number of Tanneries	6
Hides per Tannery (per yr)	210,000
Fixed Costs	
Fixed cost depreciation period (yr)	8
Hole pattern reading equipment cost (3 stations)($)	60,000
Number of devices per tannery	1
Total per tannery ($)	60,000
Total Finished Leather Tannery Cost ($/hide)	**0.04**
(includes fixed and variable costs)	

Hide Identification System Costing

System 5.2 -Tattoo Identification System

High Definition Tattooing Device - Standard "off the shelf" OCR Vision System

Summary

Abattoirs - Large identification cost ($/hide)	0.19
Abattoirs - Small identification cost ($/hide)	1.80
Average Abattoir identification cost ($/hide)	0.51
Tannery - Wet Blue identification cost ($/hide)	0.09
Tannery - Finished Leather identification cost ($/hide)	0.18
Total identification cost ($/hide)	0.77

Abattoirs - Large

Number cattle slaughtered (per yr)	5,600,000
Number of Abattoirs	48
Cattle per Abattoir (per yr)	116,667
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	50,000
Number of devices per abattoir	2
Total per abattoir ($)	100,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	1
Tattoo Cost ($/hide)	0.083
Total Large Abattoir Cost ($/hide) (includes fixed and variable costs)	0.19

Abattoirs - Small

Number cattle slaughtered (per yr)	1,400,000
Number of Abattoirs	192
Cattle per Abattoir (per yr)	7,292
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	50,000
Number of devices per abattoir	2
Total per abattoir ($)	100,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	1
Tattoo Cost ($/hide)	0.083
Total Small Abattoir Cost ($/hide) (includes fixed and variable costs)	1.80

Tannery - Wet Blue

Hides processed in Australia (45% of total)	3,150,000
Number of Tanneries	12
Hides per Tannery (per yr)	262,500
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	50,000
Number of devices per tannery	2
Total per tannery ($)	100,000
OCR reading equipment cost (3 stations)($)	55,000
Number of devices per tannery	1
Total per tannery ($)	55,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	0.4
Tattoo Cost ($/hide)	0.033
Total Wet Blue Tannery Cost ($/hide) (includes fixed and variable costs)	0.09

Tannery - Finished Leather

Hides processed in Australia (40% of wet blue)	1,260,000
Number of Tanneries	6
Hides per Tannery (per yr)	210,000
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	50,000
Number of devices per tannery	2
Total per tannery ($)	100,000
OCR reading equipment cost (3 stations)($)	55,000
Number of devices per tannery	1
Total per tannery ($)	55,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	1.0
Tattoo Cost ($/hide)	0.083
Total Finished Leather Tannery Cost ($/hide) (includes fixed and variable costs)	0.18

Hide Identification System Costing

System 5.1 -Tattoo Identification System

Pig Striker Marking Device - Custom Built OCR Vision System

Summary

Abattoirs - Large identification cost ($/hide)	0.15
Abattoirs - Small identification cost ($/hide)	1.11
Average Abattoir identification cost ($/hide)	0.34
Tannery - Wet Blue identification cost ($/hide)	0.11
Tannery - Finished Leather identification cost ($/hide)	0.18
Total identification cost ($/hide)	0.63

Abattoirs - Large

Number cattle slaughtered (per yr)	5,600,000
Number of Abattoirs	48
Cattle per Abattoir (per yr)	116,667
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	30,000
Number of devices per abattoir	2
Total per abattoir ($)	60,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	1
Tattoo Cost ($/hide)	0.083
Total Large Abattoir Cost ($/hide) (includes fixed and variable costs)	0.15

Abattoirs - Small

Number cattle slaughtered (per yr)	1,400,000
Number of Abattoirs	192
Cattle per Abattoir (per yr)	7,292
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	30,000
Number of devices per abattoir	2
Total per abattoir ($)	60,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	1
Tattoo Cost ($/hide)	0.083
Total Small Abattoir Cost ($/hide) (includes fixed and variable costs)	1.11

Tannery - Wet Blue

Hides processed in Australia (45% of total)	3,150,000
Number of Tanneries	12
Hides per Tannery (per yr)	262,500
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	30,000
Number of devices per tannery	2
Total per tannery ($)	60,000
OCR reading equipment cost (3 stations)($)	100,000
Number of devices per tannery	1
Total per tannery ($)	100,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	0.4
Tattoo Cost ($/hide)	0.033
Total Wet Blue Tannery Cost ($/hide) (includes fixed and variable costs)	0.11

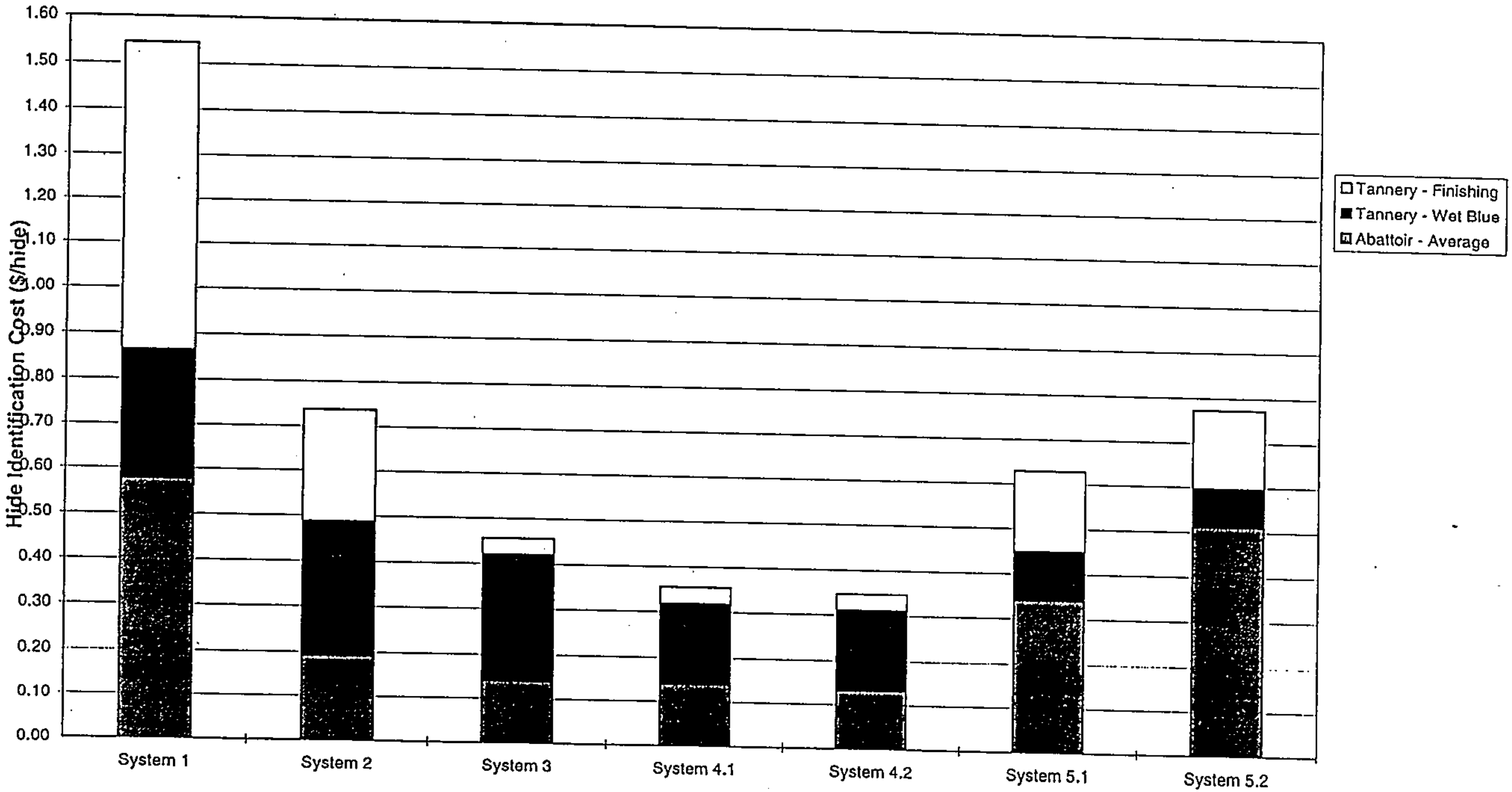
Tannery - Finished Leather

Hides processed in Australia (40% of wet blue)	1,260,000
Number of Tanneries	6
Hides per Tannery (per yr)	210,000
Fixed Costs	
Fixed cost depreciation period (yr)	8
Tattooing equipment cost ($)	30,000
Number of devices per tannery	2
Total per tannery ($)	60,000
OCR reading equipment cost (3 stations)($)	100,000
Number of devices per tannery	1
Total per tannery ($)	100,000
Variable Costs	
Labour Cost ($/hr)	25
Time to tattoo hide (sec)	12
Number of times each hide tattooed	1.0
Tattoo Cost ($/hide)	0.083
Total Finished Leather Tannery Cost ($/hide) (includes fixed and variable costs)	0.18

Identification Cost ($/hide)

	System 1	System 2	System 3	System 4.1	System 4.2	System 5.1	System 5.2
Abattoir - Large	0.51	0.11	0.11	0.11	0.08	0.15	0.19
Abattoir - Small	0.84	0.51	0.27	0.27	0.34	1.11	1.80
Abattoir - Average	0.58	0.19	0.14	0.14	0.13	0.34	0.51
Tannery - Wet Blue	0.29	0.30	0.28	0.18	0.18	0.11	0.09
Tannery - Finishing	0.68	0.25	0.04	0.04	0.04	0.18	0.18
Total	1.54	0.74	0.46	0.35	0.35	0.63	0.77

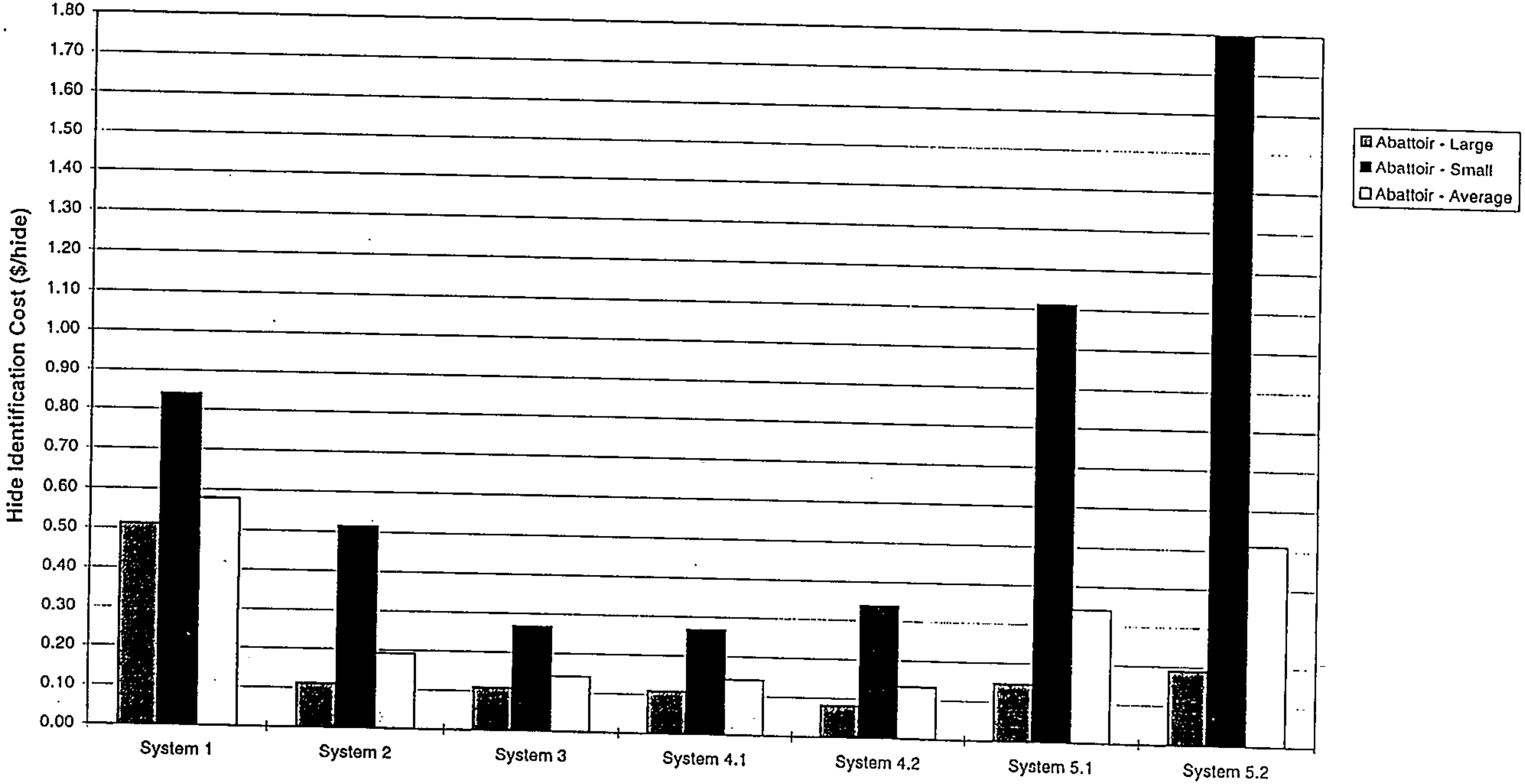
Total Hide Identification Cost - Comparison between Systems



Vision Abell

2/03/95

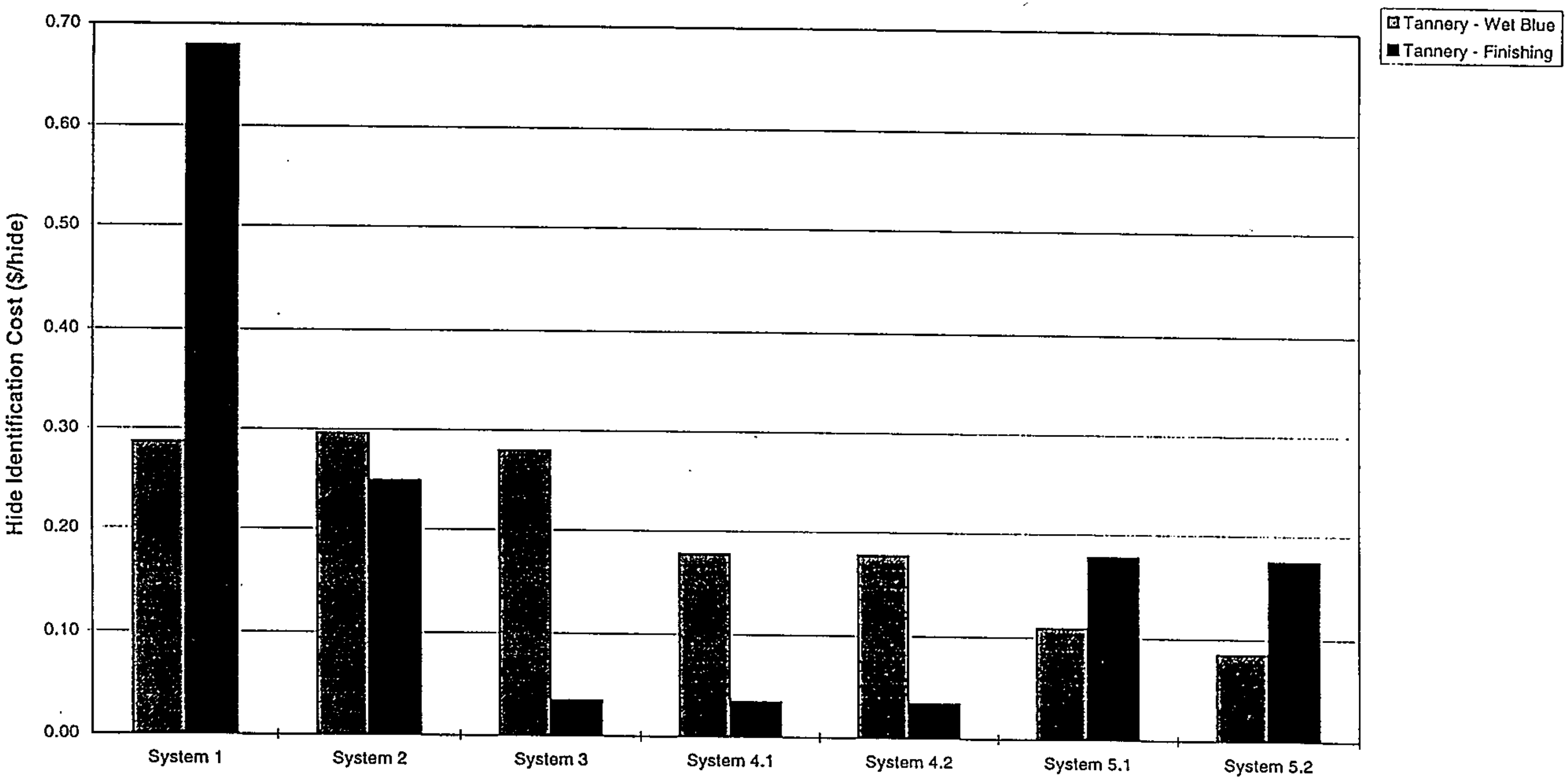
Abattoir Costs for Hide Identification - Comparison between Systems



Vision Abell

2/03/95

Tannery Costs for Hide Identification - Comparison between Systems



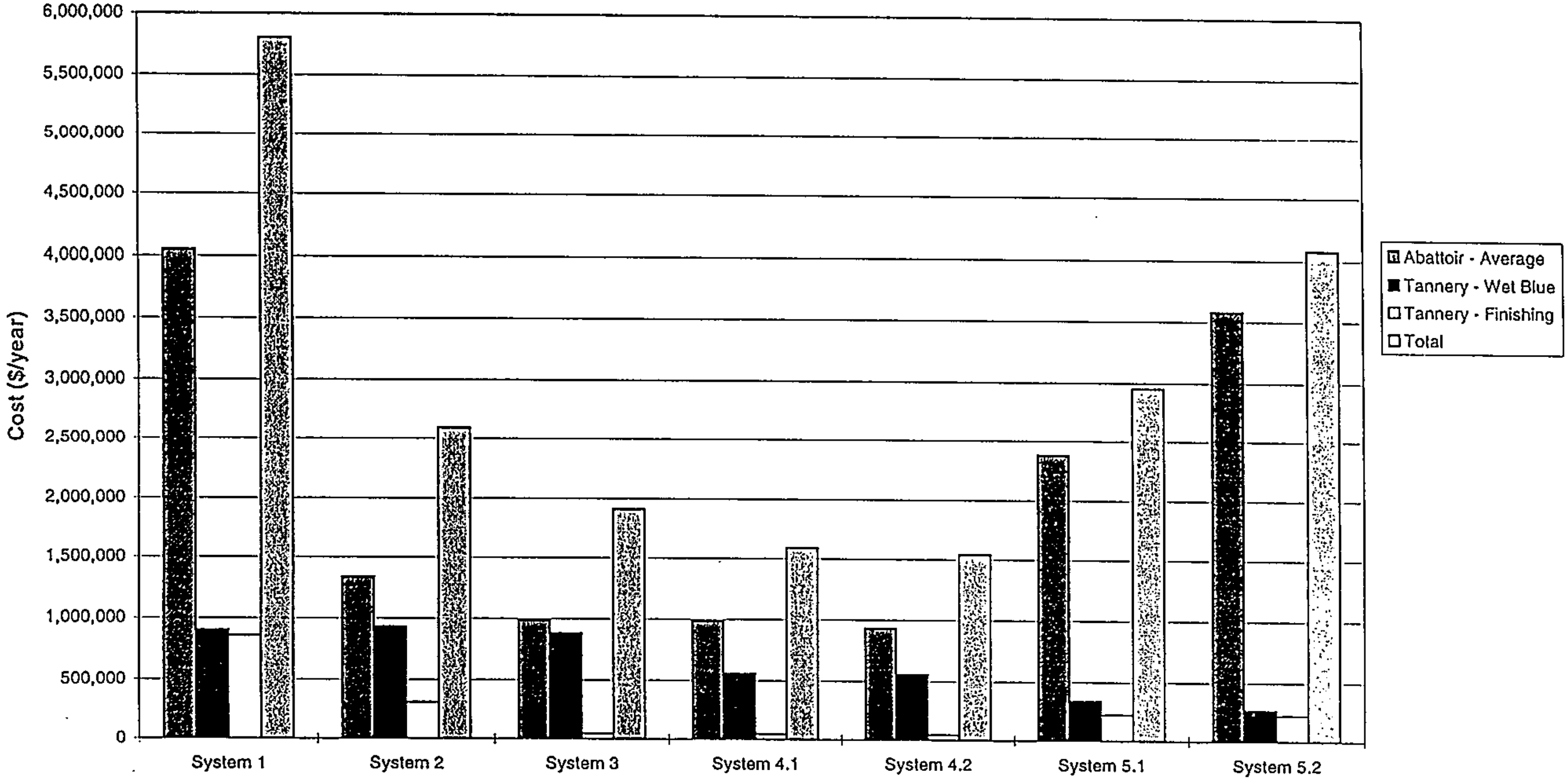
Vision Abell

2/03/95

Hide Identification - Cost to Industry ($/year)

	System 1	System 2	System 3	System 4.1	System 4.2	System 5.1	System 5.2
Abattoir - Large	2,872,844	624,444	613,244	613,244	458,444	826,667	1,066,667
Abattoir - Small	1,175,711	718,611	374,111	374,111	474,611	1,556,667	2,516,667
Abattoir - Average	4,048,556	1,343,056	987,356	987,356	933,056	2,383,333	3,583,333
Tannery - Wet Blue	902,638	932,938	880,750	560,125	560,125	345,000	270,000
Tannery - Finishing	856,550	313,950	45,000	45,000	45,000	225,000	221,250
Total	5,807,743	2,589,943	1,913,106	1,592,481	1,538,181	2,953,333	4,074,583

Hide Identification - Cost to Industry ($/year) - Comparison between Systems



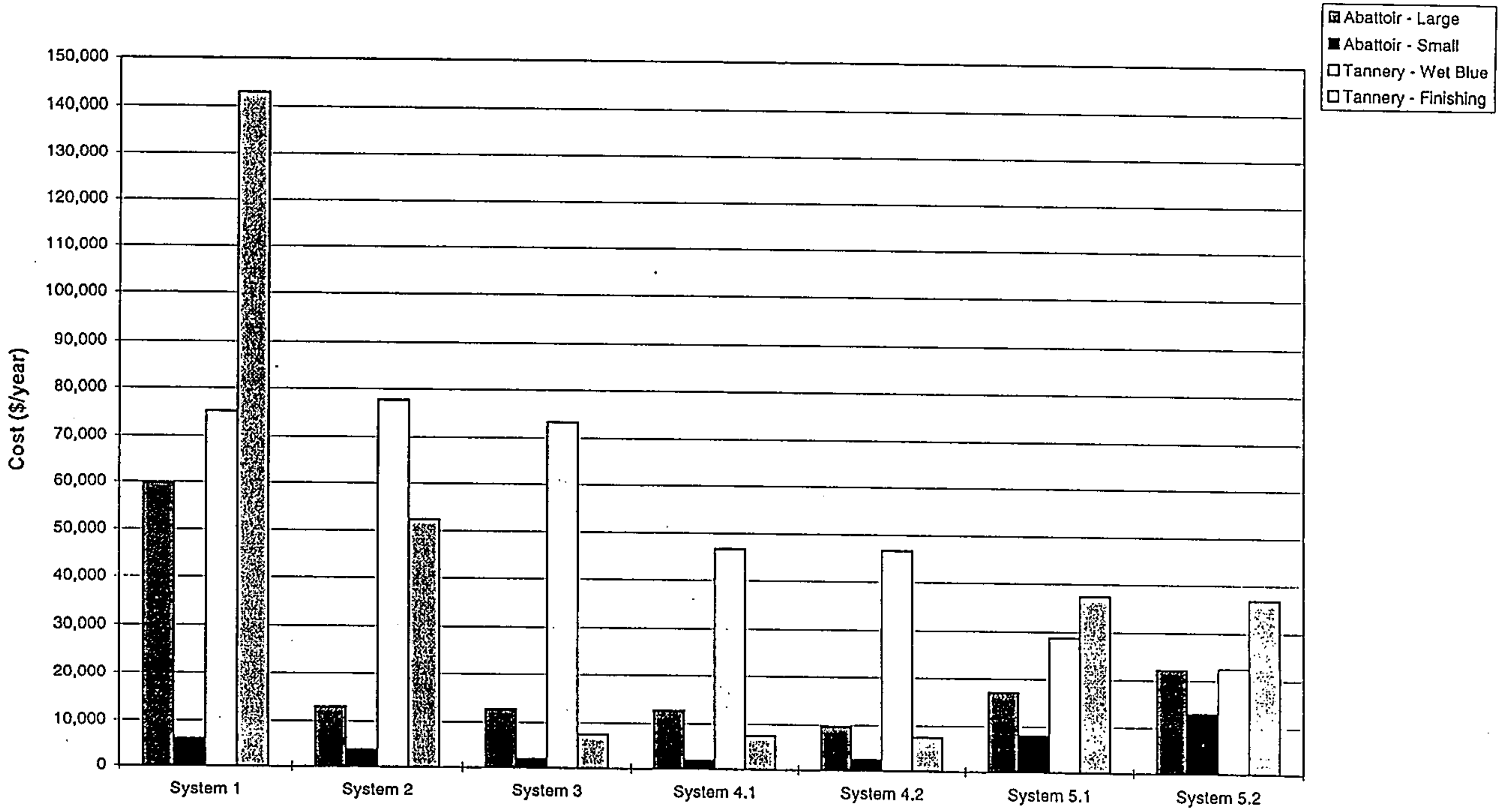
Vision Abell

2/03/95

Hide Identification - Cost to Companies ($/year)

	System 1	System 2	System 3	System 4.1	System 4.2	System 5.1	System 5.2
Abattoir - Large	59,851	13,009	12,776	12,776	9,551	17,222	22,222
Abattoir - Small	6,123	3,743	1,948	1,948	2,472	8,108	13,108
Abattoir - Average	16,869	5,596	4,114	4,114	3,888	9,931	14,931
Tannery - Wet Blue	75,220	77,745	73,396	46,677	46,677	28,750	22,500
Tannery - Finishing	142,758	52,325	7,500	7,500	7,500	37,500	36,875

Hide Identification - Cost to Companies ($/year) - Comparison between Systems



Vision Abell

2/03/95

Hide Identification - Estimated Equipment Development Cost ($/year)

System 1	
Transponder Equipment	50,000
System Integration	80,000
Total	130,000

System 2	
Bar Coding Equipment	50,000
Tag Attachment Device	60,000
System Integration	80,000
Total	190,000

System 3	
Bar Code Tag System	50,000
Hole Punching Equipment	140,000
Hole Pattern Reading Equiupment	110,000
System Integration	80,000
Total	380,000

System 4.1	
Bar Code Tag System	50,000
Hole Punching Equipment	140,000
Hole Pattern Reading Equiupment	110,000
System Integration	80,000
Total	380,000

System 4.2	
Bar Coding Equipment	50,000
Hole Punching Equipment	140,000
Hole Pattern Reading Equiupment	110,000
System Integration	80,000
Total	380,000

System 5.1	
Pig Striker StyleTattoo Equipment	140,000
Custom OCR Vision Equipment	300,000
System Integration	80,000
Total	520,000

System 5.2	
High Definiton Tattoo Equipment	180,000
Stardard OCR Vision Equipment	100,000
System Integration	80,000
Total	360,000

Promotion and Commercial Implementation

of the Hide Improvement Concept

Milestone 3

Final Report for M.854

The report for Milestone 3 is the final report for this project. This follows reports for December, February, April and May.

Demonstration Sites

Project work undertaken during the last month has included work on the demonstration sites as follows.

New England Leather

On Friday 14th June I visited Michell Leather in Adelaide, at their request, for a meeting on hide improvement strategies and resulting actions. The meeting was with

John Morley	General Manager Trading
Geoff Keynes	General Manager Development
Rod Meldrum	General Manager Technical
Andrew Ramsay	Trading Manager

The Michell group handle around 30,000 to 40,000 hides per week, both in wet blue and in finished leather, including around 15,000 - 20,000 through New England Leather at Gunnedah, one of the demonstration sites..

They want to use hide improvement to build alliances with hide suppliers. They see the end in sight for the green tender system, and want to develop relationships based on hide improvement, paying premiums and securing long term hide supplies.

We discussed options with the major pastoral companies, including Elders and Kidman, and with major retailers they have approached, eg Woolworths and Coles. They are well aware of the potential benefits and are considering strategies to take advantage of them.

Geoff Keynes is the executive with responsibility, and he will make the approaches to the companies. They were considering a premium system which was phased on over a period of time in perhaps 3 month stages :

- Firstly the information is fed back to the abattoir and to the producer with Michell collecting data on the hide qualities. This gives the opportunity for benchmarking quality and assessing what can be expected in the future.

- Secondly, based on the data collected in stage 1, Michell calculate the amount of premium and discount they could apply to pass back the appropriate market signal for each hide quality. The appropriate signal would come from the market place, being linked to the price they could sell the various grades at.

During stage 2 they pass back not only quality information, but also dollar values which would apply, although no money changes hands at this time.

- In stage three the money actually flows. The proposed method is to give each abattoir a running balance in premiums. For example in one week if the hide quality was poor, (ie below the benchmark) they would get a negative entry in their account. If in the next week the quality was better than the benchmark, they may wipe out the deficit and get a small payment. This method allows the discount premium system to work without asking the abattoir to take a lesser price, and without exposing the tannery to too much risk.

At the time of writing Michell are formulating plans to proceed with this strategy.

Murgon

As reported last month, the significant event here was the decision by South Burnett Meatworks board to continue the payment of premiums as a permanent feature of their operation. **Appendix 1** contains a copy of their Newsletter in which this commitment is made public.

Pastoral Houses

In the last month several pastoral houses have taken further steps in the commercialisation of hide improvement. AA Co for example have had discussions on the methods of marketing their hides with one of the newer agencies in Australia, Tradeskins Australia Pty Ltd. This company has as part of its marketing strategy, a plan in place to provide marketing advice to pastoral houses and to sell their hides in wet blue on a commission basis.

Tradeskins have had discussions with at least two of the majors, and have submitted proposals.

In addition during the month, one of the pastoral houses had some hides tanned at Dixon Wet Blue in Toowoomba. Dixon have been slow to enter the hide improvement arena, but are now feeling the pinch. A significant proportion of their hides have been 'poached' by other tanners who are offering a hide improvement service (ie grading and feedback).

To counter this, Dixons have decided to investigate the installation of the Hide Grading and feedback software developed during this project.

Achievement of the Objectives of the Project

If they decide to proceed, and all indications are that they will, they will fulfil one of the objectives of this project which was to :

"Have the Hide Improvement software and hardware in use in at least three other tanneries in addition to the four industry demonstration sites." The other two are Austanners new plant at Geelong and the new ALH plant at Rosedale, Rosedale Leather Pty Ltd.

One of the other objectives was to :

"Have 5 of the top 8 pastoral houses participating in the hide improvement program"

Those at present participating are :

AA Co
Stanbroke
Napco
Consolidated Pastoral
Qld & Northern Territory Pastoral Co
Heytesbury Pastoral.

In addition, the major retailers, Coles and Woolworths are both involved in the program.

The most demanding of the objectives was to have 10% of Australia's hides traded on a value based system by the end of the project. This will be achieved will not come about until several hide stampers which have been ordered, are manufactured and installed at participating meatworks.

When this is completed, and the completion date is expected to be only a few weeks away, the number of hides will be as detailed below.

Based on a kill of 7,500,000, we have a weekly production of around 144,000 hides per week. To achieve 10% we need therefore 14,400 per week traded on a value based system. The following has been achieved (with figures in hides per week) :

South Burnett Meatworks		3,800	
ACC		4,000	
Nolans		1,100	
Heytesbury		300	
Sub Total		**9,200**	
Austanners/Herds	}		
Austanners/Mulligans	}	5,000	(Estimated)
Total		**14,200**	

APPENDIX 1

AID IN HIDE PREMIUMS $60,000 PAID

South Burnett will pay about $60,000 in hide premiums during the six month trial which ends in mid June.

Under the trial, conducted in conjunction with Murgon Leather Leather Company, the AMLC and the Meat Research Corporation, a premium of $7.50 is paid for a hide with no brand on the useable area, $3.50 for a small size brand on the edge of the area, and $1 for a medium size brand on the edge.

First time in the world

This is the first time such a system had been tried anywhere in the world.

South Burnett Livestock Operations Manager Rick Beasley said the premiums had been paid to more than 500 suppliers.

During the trial, hides from cattle killed at South Burnett have been graded at Murgon Leather, with feedback sheets being created and sent out by the meatworks.

After tanning, the hides are graded from 5 (the best) to 1 (the worst). Each hide is given a separate score for brands, scratches and parasites/disease.

Only the brand score is included in the premium scheme. Other information such as scratches and parasites/disease is included on the hide feedback sheet for the benefit of the supplier.

The hide premium payment scheme under trial at South Burnett created an enormous amount of paperwork, causing a delay in the mail-out of cheques. Gayle Adcock has the job of working through the returns.

Brand scores of 5,4, and 3 have received a premium, but scores of 2 and 1 have not.

The cost of the trial has been underwritten by the MRC.

MRC consultant Joe Gibson said that despite some early teething troubles with hide identification and retrieval, the system was working well with 95-97 per cent retrieval.

He said South Burnett was in the vanguard in hide improvement in Australia. It had been a leader for the past three to four years.

"However, we've noticed a keen interest in the exercise from other members of the industry," he said.

For example, six different abattoirs had just ordered stampers similar to those in use in hide identification at South Burnett.

"They all want to be involved in this exercise of feeding back information and premiums to their producers.

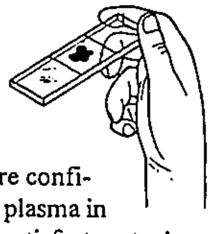
"It will take a while for these units to be manufactured and installed, so South Burnett had a significant advantage at this stage.

"I hope that after the MRC concludes its involvement, South Burnett will be able to continue to maintain the advantage it has created," he said.

At its May meeting the board agreed to continue the hide incentive program.

There will be some modifications including supplying the hide reports incorporating the payment within the cattle cheque. Also, the bonus will only be paid to shareholders.

Beef plasma study tour in Europe



Two members of the South Burnett staff spent 10 days in Europe last month researching commercial beef plasma production and evaluating market potential.

By-products Manager Paul Stenzel and Microbiologist Mark Stokes visited Sweden, Germany and France to inspect meatworks operations, and discuss marketing operations.

Their tour was part of a four-stage project aimed at the development of a commercial beef plasma venture at South Burnett.

The Co-operative believes that plasma will have an important role in the value added food market and the manufacture of pharmaceuticals in the future.

During the tour Paul concentrated on production, marketing and food safety, while Mark studied collection, processing and hygiene practices.

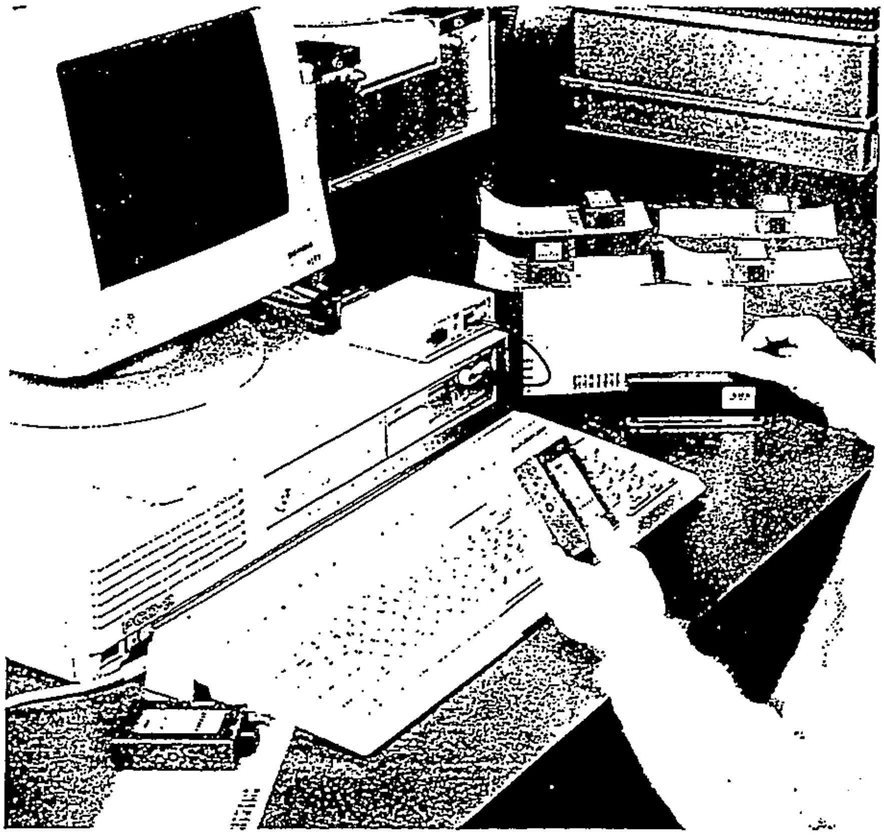
"On return, we are confident we can produce plasma in a manner that will be satisfactory to Australian requirements," Paul said.

"We will now place a great deal of emphasis on developing our marketing connections."

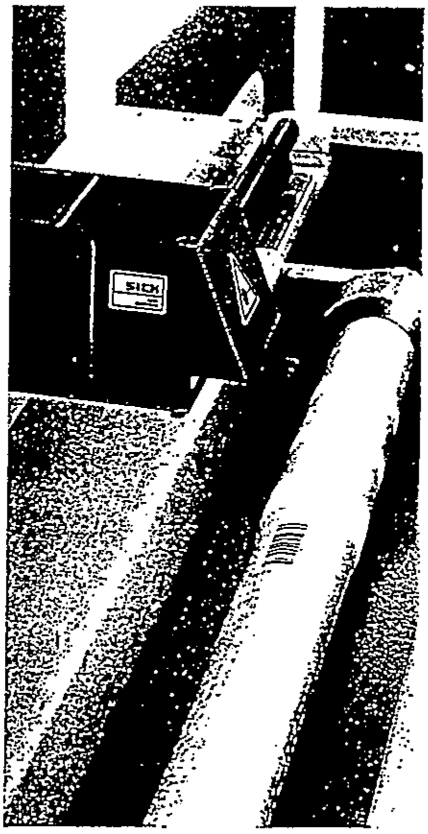
In Sweden they visited plants in Gotenberg and Malmo, including a Co-operative which controlled 85 per cent of the country's beef processing.

In Germany the inspections involved four plants which Paul described as very attractive structurally, but were on a par with Australia in terms of production procedures.

The tour in France centred on St Etienne where they visited another attractive plant where operations involving value adding of some of the less attractive items were observed.



Production data acquisition in Repair Acceptance Department, using CLS Slot Reader and CLI 100 Decoder



Product identification in automatic routine testing, using CLV 100 Laser Scanner

Manual inputs are always a problem with regard to reliability and speed. Deadlines increase errors. Fluctuating requirements make organization difficult. Customers demand great flexibility. Planners need to be kept reliably informed of the state of processing. Materials management should be highly automated. A permanent inventory is demanded.

SICK offer solutions to organizational problems through a wide range of devices, detailed solutions, software and practical know-how.

Identification of circuit boards in Quality C[illegible]
Handheld W[illegible] CLD 350 Data Ter[illegible]

SICK. Know-how at your service

Present-day bar code systems are so varied and comprehensive that detailed knowledge and experience are called for to adapt them appropriately to customers' applications. With SICK, the user always gets good advice.

Before buying

Before purchase, advice is offered from SICK experts, in the form of:

- Neutral system analysis
- Meaningful cost/benefit analysis

SICK offer alternative solutions, project-specific advice and practical support.

The aim: a customer-specific made-to-measure solution, including functional and performance tests.

During development of the project

SICK experts support the development of the project by punctual delivery, erection and commissioning, with functional proving of hardware and software.

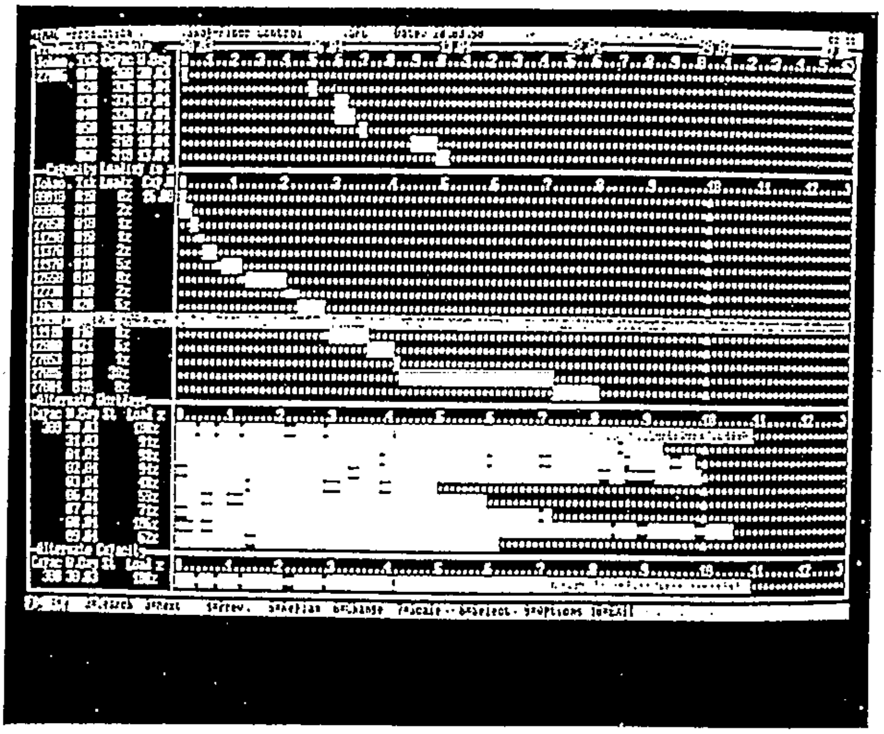
After purchase

SICK offer assurance even after purchase.

Advantages for SICK users:

- Erection/installation by our own experts
- Commissioning on site
- Training operators
- Maintenance of installation
- Individual servicing by our own international service organization
- Prompt delivery of spare parts at home and abroad
- Modifications for different requirements, even long after purchase

Advising customer at planning stage

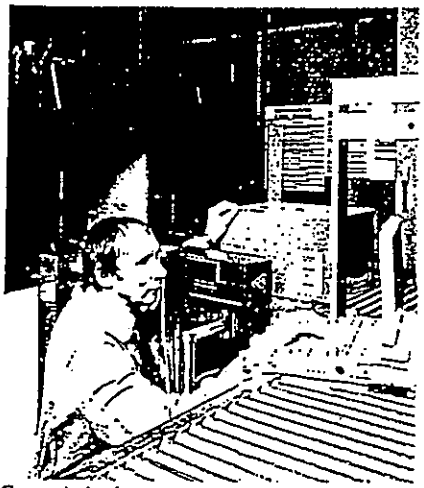


Integrated software solution in area of production data acquisition

SICK develop and produce more than just individual optoelectronic system components for the automatic identification of bar codes. SICK design and produce complex reading and data-acquisition systems, as well as systems linked to host computers and control units.

Complete solutions from a single source

Efficient hardware calls for practically oriented software. By cooperating with a leading software house, SICK are able to offer complete solutions from a single source.



Commissioning

A modular software concept with tested programs proven in practice permits systems to be introduced in stages, according to the level of training of employees.

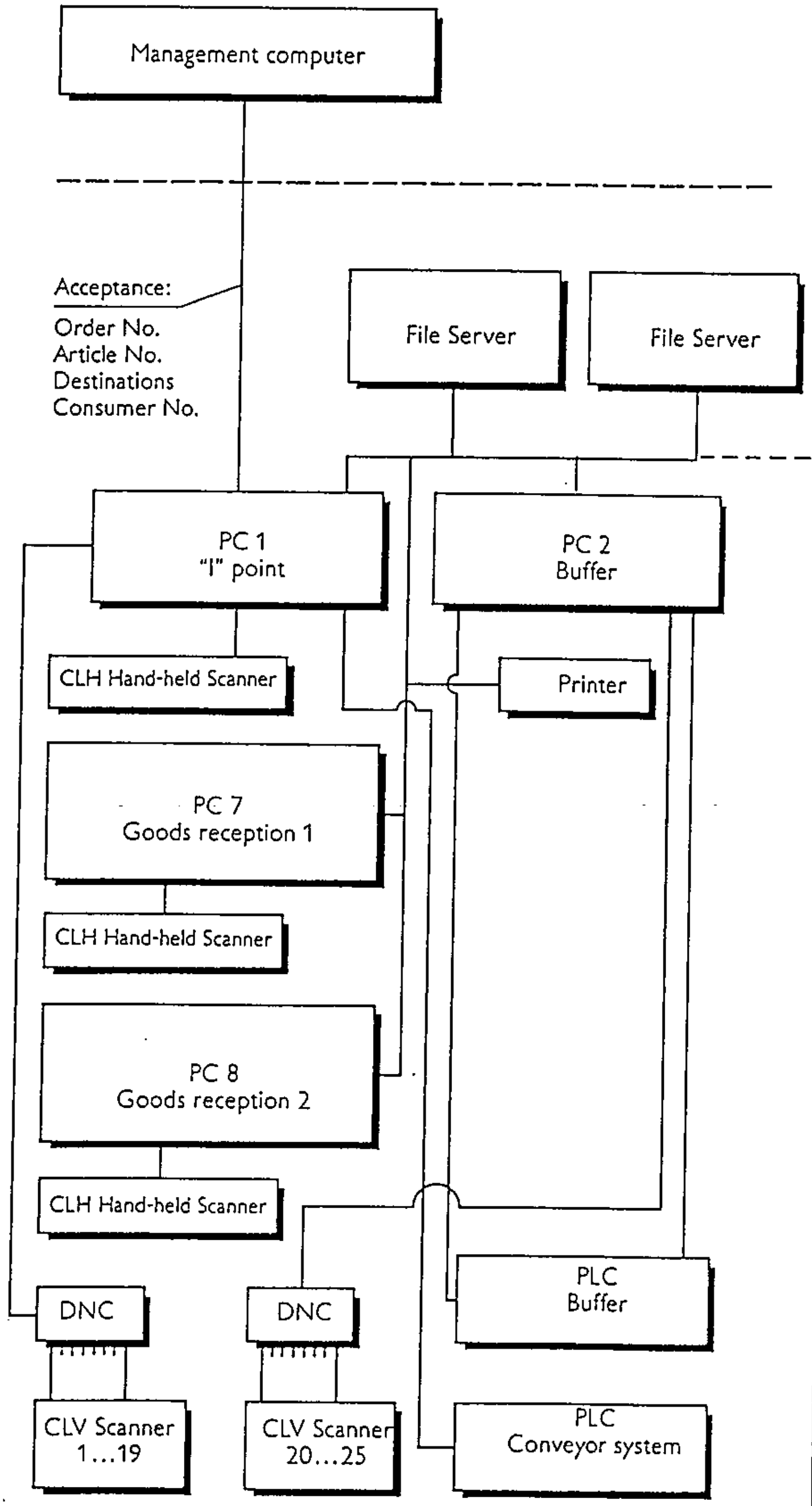
Software packages (modules) are available in connection with PDA terminals, for example for

- Recording, processing and evaluating staff hours
- Recording, processing and evaluating order times
- Workshop control

These modules can be run as stand-alone systems or linked up to the PPS (production planning system) on the computer.

Master intelligent VDU terminals with planning and control functions permit requisite transparency in the production process.

The service offered naturally includes training, initial support and software adaptation.



Part of a networking concept for production data acquisition and material flow control

Bar code reading systems

Static and dynamic reading devices are available for code reading in different applications.

Static reading devices

Depending on the type, readers are designed for moving and stationary operation. They are also available with an infrared light source, with which codes can be read through special black masking tape.

Hand-held wands are passed manually across the coded surface.

Slot readers are fixed. A code card, for example, can be passed through it manually.

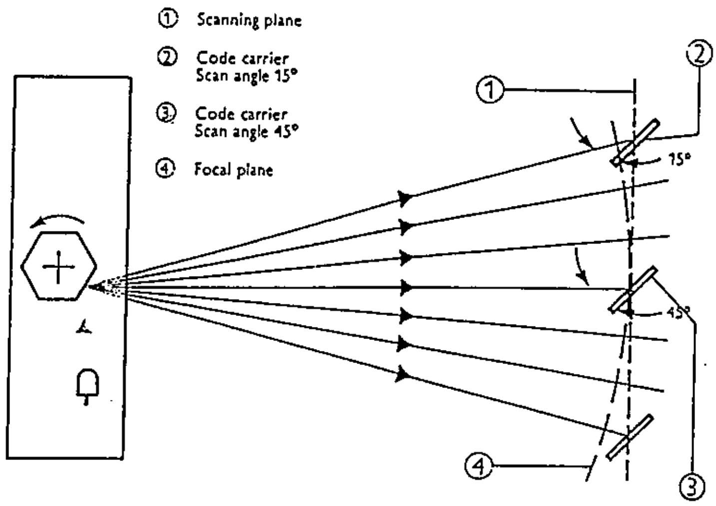
Machine mount scanners are designed for stationary operation on machines and detect moving and positively-driven objects.

Dynamic reading devices

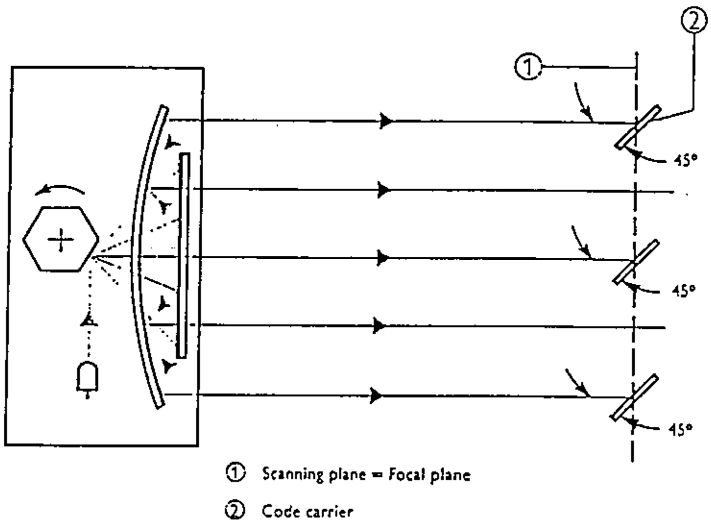
In dynamic reading devices (scanners), lasers generate a thin laser beam which is deflected via a polygon mirror (mirror wheel).

Scanners should be selected on the V or parallel principle, according to the shape, motion and position of the code. The parallel method has the advantage of constant scanning-resolution and allows the code carrier to be inclined up to a max. of 45°.

Line scanners are used when the bars of the code are parallel to the conveyor direction ("ladder" shape) and the reading direction is at right angles to the conveyor direction. The position of the code is not critical, since it passes the beam in any case due to the movement of the conveyor.



Operating principle of V scanner



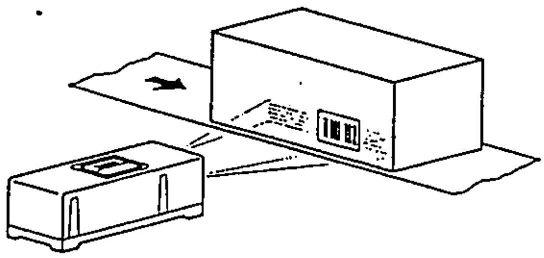
Operating principle of parallel scanner

Raster scanners have a rotating mirror which is not arranged axially parallel. This produces a multiple beam of variable height. It is used when the bars of the code can only be presented at right angles to the conveyor direction ("picket fence" shape). The codes can exhibit tolerances in location.

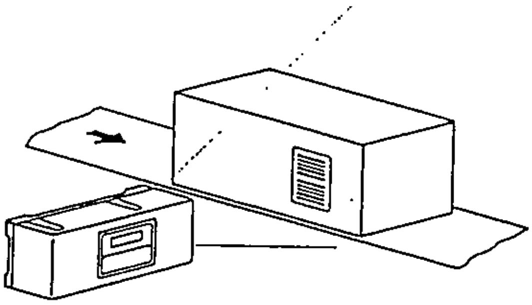
Fan scanners are single-beam scanners equipped with an oscillating mirror. The mirror moves the beam at right angles to the scanning beam. By virtue of the large-area scanning, positioning of the code is not critical.

Features of dynamic code-readers

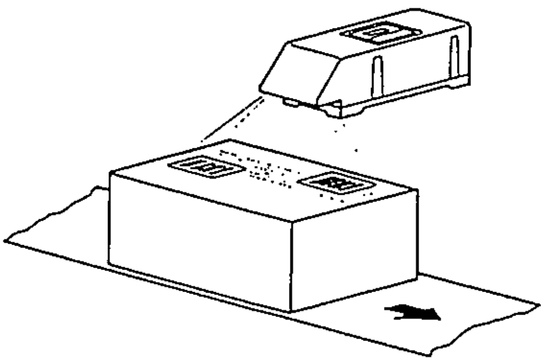
- Laser light source
- Moving-beam scanners on V or parallel principle
- Non-contact reading
- Capable of reading codes on variety of materials
- Fully automatic reading process
- Detection of all common bar codes
- Suitable for industrial use
- External read-timing



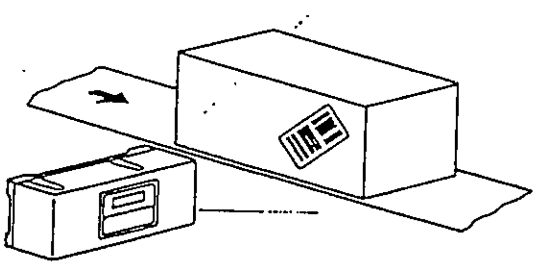
V-shaped raster scanner for "picket fence" code



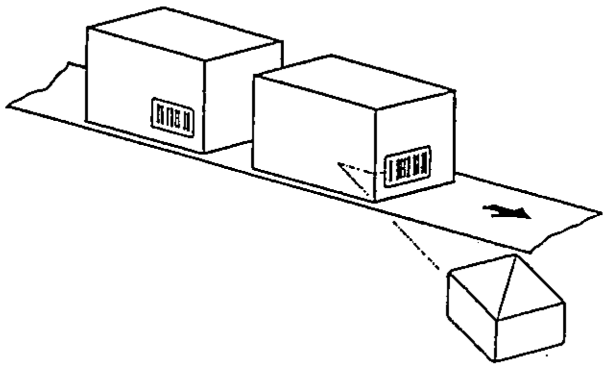
Lateral reading by V-scanner



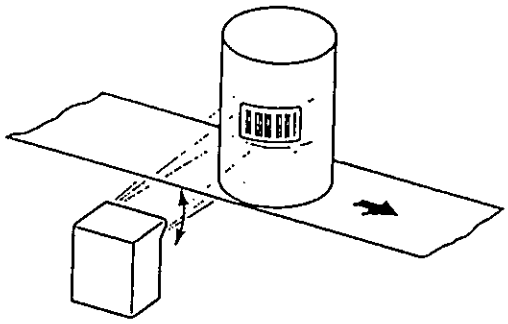
V-shaped raster scanner for offset labels



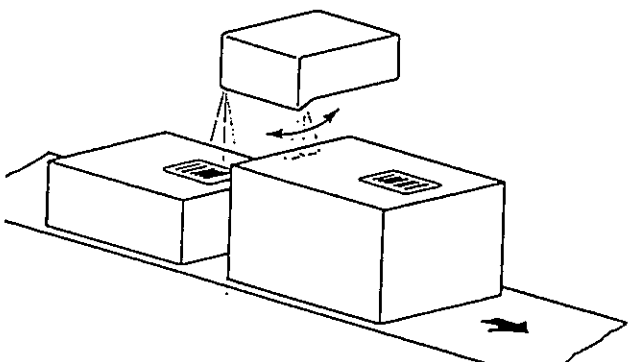
Omni-directional code reading with V-scanner (T-code)



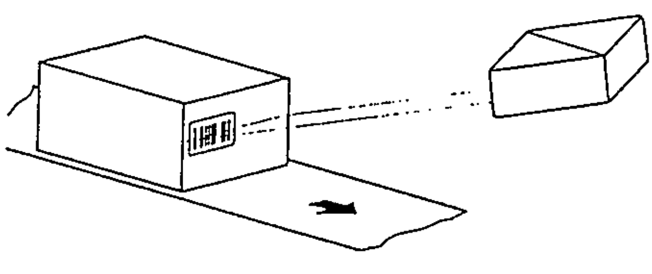
Two-sided detection by parallel scanner



Code reading on cylindrical object by parallel scanner with oscillating mirror



Reading with high depth of field and great conveyor tolerance, using parallel scanner and oscillating mirror



Front-sided code detection by parallel scanner

Dynamic parallel scanners
CL 1000 Bar Code Reading Sy...

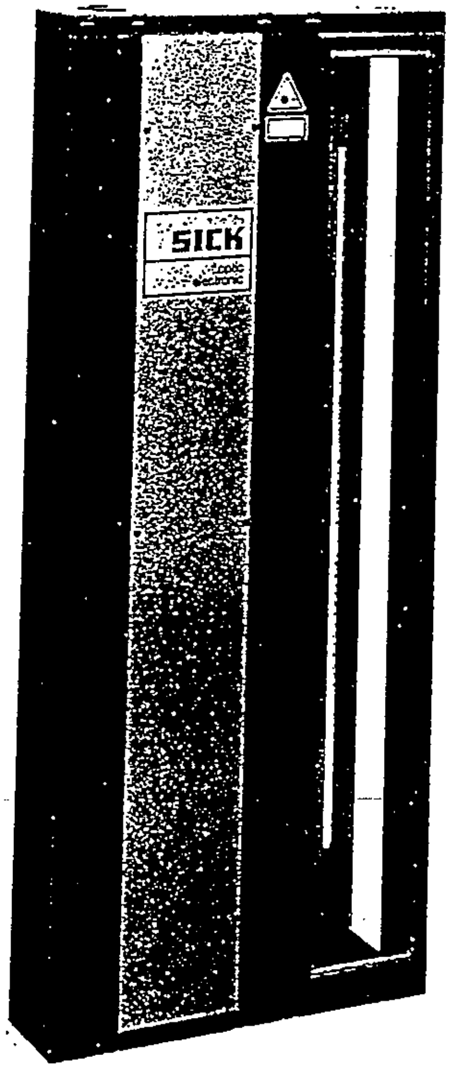
The CL 1000 Bar Code Reading System consists of the CLK 1000 Reading Head – a high-performance reader with an extremely high first-read rate – and the CLE 1000 Decoder. The reading head works on the parallel-beam principle and uses a HeNe laser as its light source. By virtue of its large depth-of-field and reading height, together with angle-independent beam scanning, the reading system ensures full-area detection of bar codes over the entire reading range. It is consequently suitable for the installation of multi-read stations for applications such as high-speed parcel distribution or air-freight package distribution.

Options

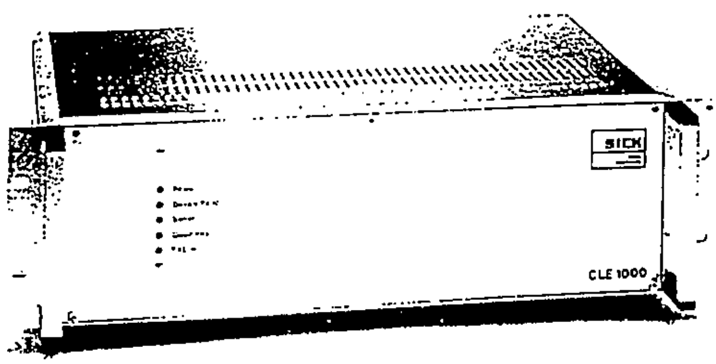
- Line scanners for reading "ladder" bar codes
- Fan scanners for reading "picket fence" bar codes with different locations and at a standstill

Features

- Fully automatic reading process
- High first-read rate
- Parallel-beam principle: 970-mm reading height, independent of reading distance
- Large depth-of-field
- Insensitive to glare
- Extremely insensitive to ambient light
- Networking capability



CLK 1000 Reading Head



CLE 1000 Decoder

Technical data

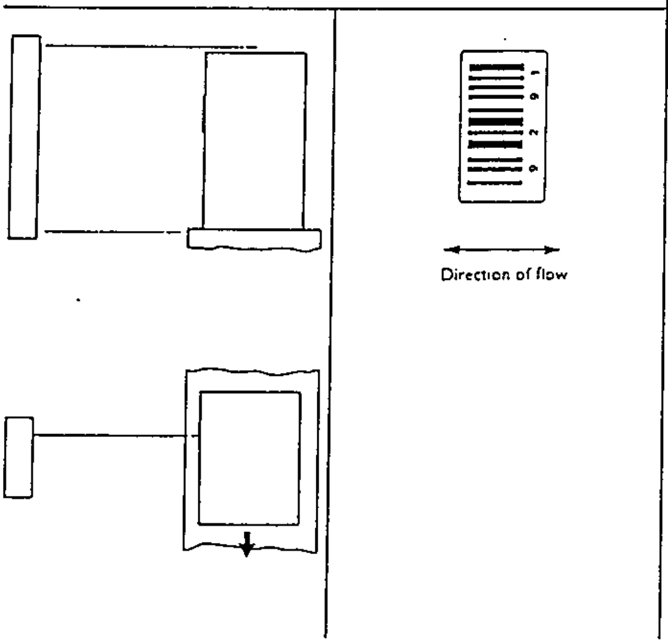
CLK 1000 Reading Head

Scanning rate	700 to 1200 scans/sec. (adjustable)
Resolution	Bar width ≧ 0.35 mm
Reading distance	0 to 1300 mm
Reading height	970 mm
Light source	HeNe laser, 5 mW, protection class III a
Wavelength	633 nm
Supply voltage	110/120/220/240 VAC (+10%, −15%)
Dimensions (W x H x D)	470 mm x 1150 mm x 135 mm
Weight	Approx. 30 kg
Enclosure rating	IP 65

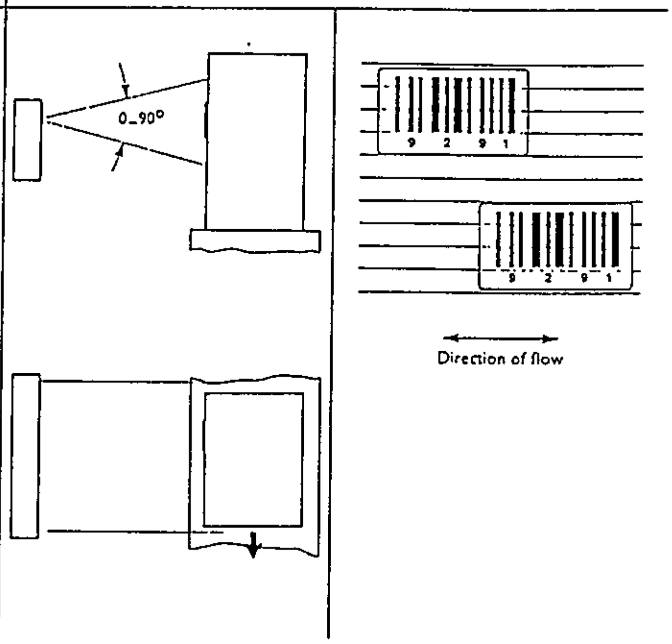
CLE 1000 Decoder

Display	Via external display
Inputs	Drive for read port, shutter, deflection mirror
Interfaces	Host: RS-232-C, RS-422 Network: RS-485, RS-232, RS-422 Auxiliary port: RS-232-C, RS-422
Parametrization	Via auxiliary port
Supply voltage	110/120/220/240 VAC (+10%, −15%)
Dimensions (W x H x D)	440 mm x 135 mm x 290 mm
Weight	Approx. 9 kg
Enclosure rating	IP 22

CLK 1000 – 0.. Line scanner



CLK 1000 – 1.. Fan scanner



E13.05

SICK optic electronic

Erwin Sick GmbH
Optik-Elektronik
Automation of Material Handling
Gundelfinger Straße 2
D-7800 Freiburg
☎ (07 61) 51 58-0
Fax: (07 61) 5 22 84
Tx 7 72 314

Australia
Erwin Sick Optic-Electronic Pty. Ltd.
P. O. Box 214
899 Heidelberg Road
Ivanhoe, Vic. 3079
☎ (03) 4 97 41 00
(008) 33 48 02 – toll free
Fax: (03) 4 97 11 87
Tx AA 35 225 SICK A

Belgium
Sick Optic-Electronic N.V./S.A.
Industriezone »Doornveld« 6
B-1731 Asse (Relegem)
☎ (02) 4 66 55 66
Fax: (02) 4 66 60 26

Denmark
Sick Optic-Electronic A/S
Rosenkæret 22 B
DK-2860 Søborg
☎ (31) 67 64 00
Fax: (31) 67 71 40

Finland
Sick Optic-Elektronic Oy
Asesepänkuja 2
SF-00620 Helsinki
☎ (90) 75 72 788
Fax: (90) 75 72 311

France
Sick Optique Electronique
B. P. 42
F-77312 Marne la Vallée Cédex 2
☎ (1) 64.62.35.00
Fax: (1) 64.62.35.77
Tx 692 855 SICK FRA F

Great Britain
Erwin Sick Optic-Electronic Ltd.
Waldkirch House
39 Hedley Road
St. Albans
Hertfordshire AL1 5BN
☎ (07 27) 83 11 21
Fax: (07 27) 5 67 67
Tx 263 631 SICK UK G

Japan
Sick Optic-Electronic K.K.
5-8-8 Shinjuku, Shinjuku-ku
Tokyo 160
☎ (03) 33 58-13 41
Fax: (03) 33 58-05 86

Netherlands
Erwin Sick B.V.
Optik-Elektronik
Leijenseweg 111
NL-3721 BC Bilthoven
☎ (0 30) 29 25 44
Fax: (0 30) 29 39 94
Tx 47 586 SICK NL

Singapore
SICK Optic-Electronic Pte. Ltd.
No. 22, Kallang Avenue
07-05
Hong Aik Ind. Bldg.
Singapore 1233
☎ 2 99 23 08
Fax: 2 99 27 92

Spain
SICK Optic-Electronic S. A.
Apartado Postal 52
Constitución, 3, local 4
E-08960 Sant Just Desvern
☎ (3) 473.49.77
Fax: (3) 473.44.69

Switzerland
Erwin Sick AG
Optik-Elektronik
Gewerbegebäude Breiten
CH-6370 Stans
☎ (0 41) 61 51 71
Fax: (0 41) 61 31 36
Tx 866 254 SICK CH

USA
SICK Optic-Electronic, Inc.
7694 Golden Triangle Drive
Post Office Box 444-240
Eden Prairie, MN 55344
☎ (612) 941-6780
Fax: (612) 941-9287
WATS: 1-800-325-7425 (U.S. only)

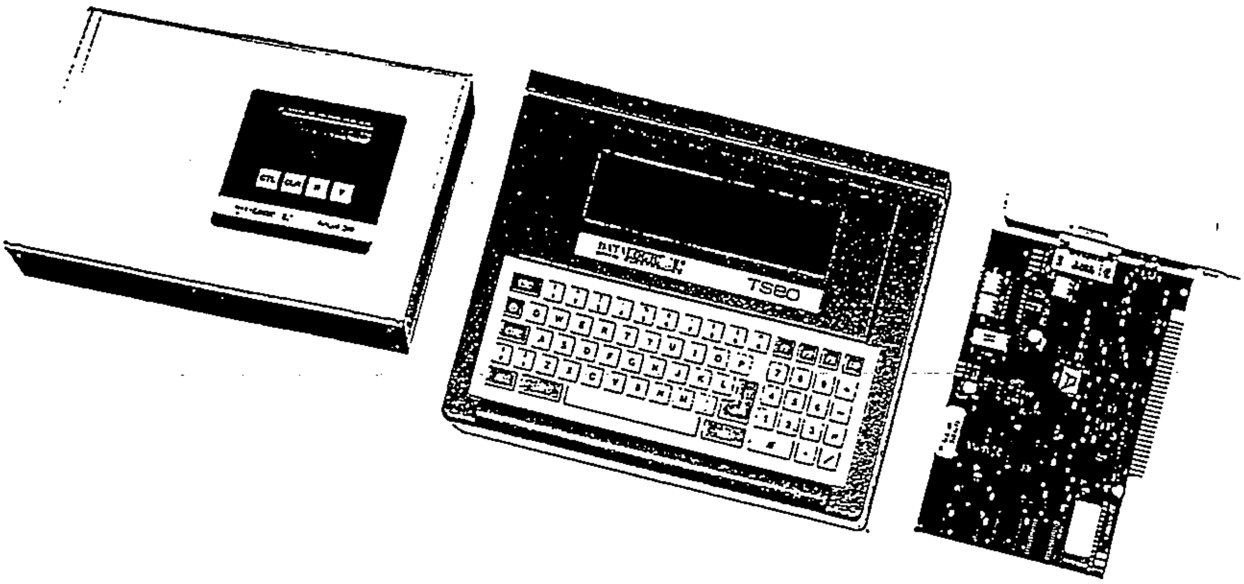
Further representatives and agents in all major industrial nations.

8006276.0492 KF Printed in the Federal Republic of Germany · Subject to change without prior notice

DATALOGIC DL

Nextdata

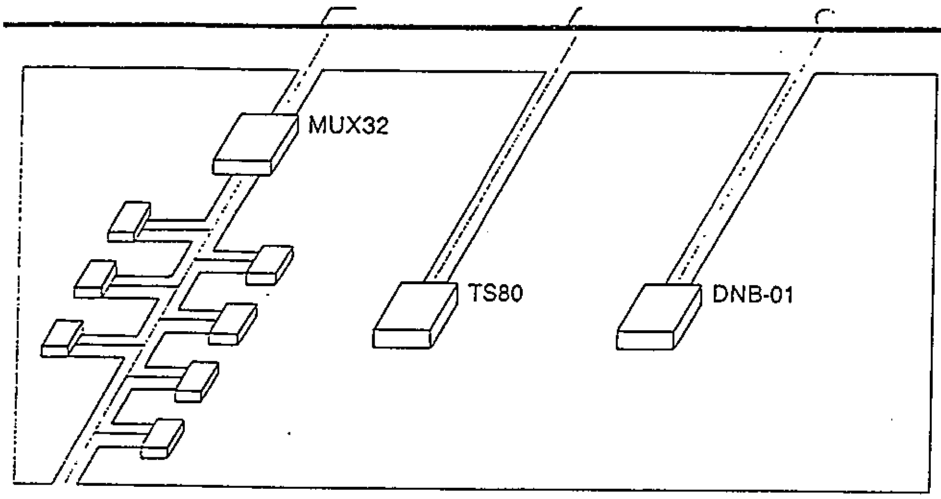
Industrial data collection system



COMWARE
137 RUNDLE STREET
KENT TOWN SA 5067
PH(08)3629230 FAX(08)3632842

Nextdata

Datalogic's answer to industrial needs



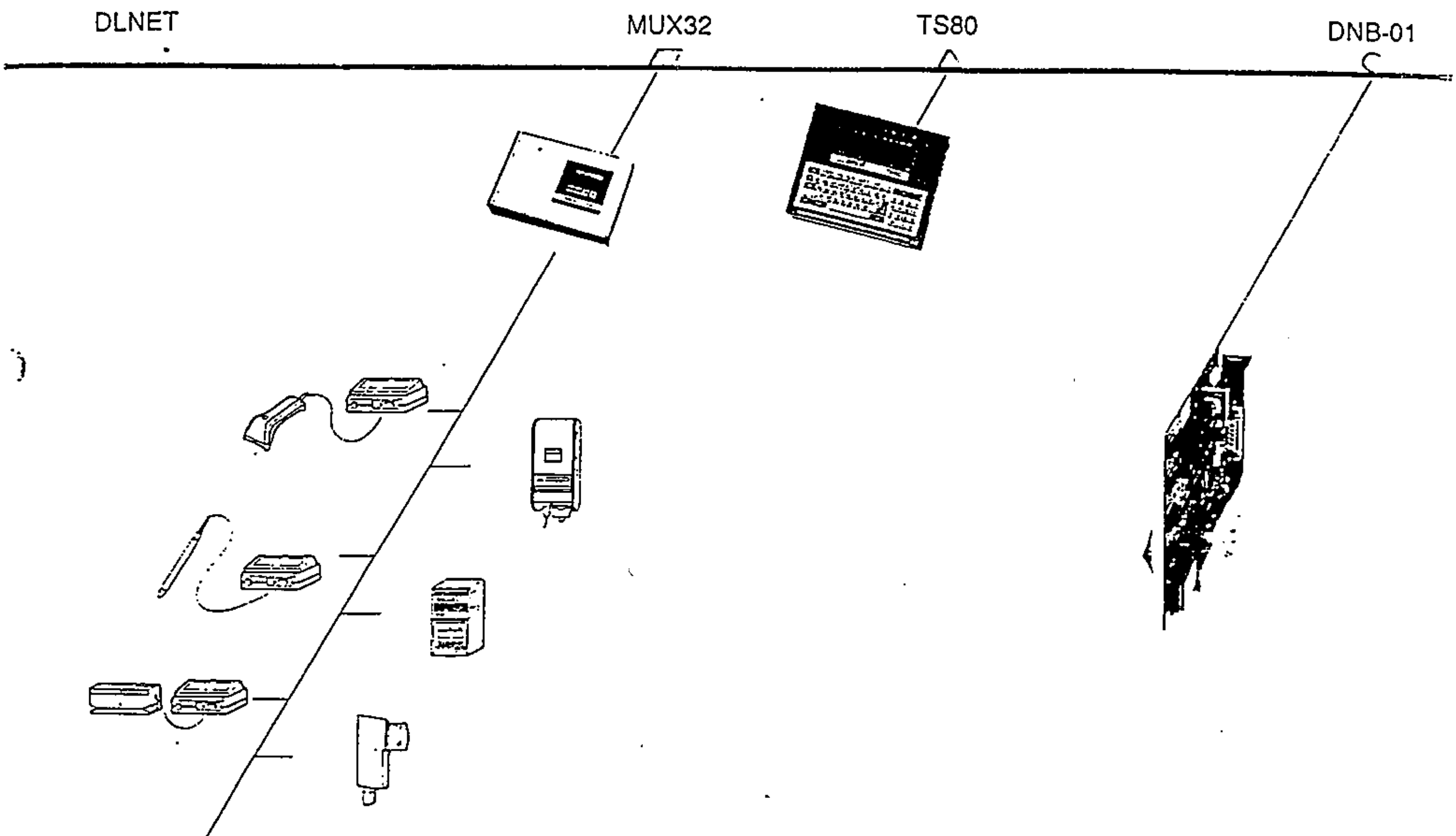
More intelligence more communication.

A new era of distributed intelligence is evolving in the world of industrial automation. Traditionally, data collection systems were based around a single central computer with the task of managing numerous peripherals without any processing capabilities. The drawbacks: uncontrollable reply times, total shutdown of the system in the case of central processor failure, poor flexibility/adaptability.

To increase productivity and reduce costs, industry today needs data collection systems without these drawbacks and equipped with new functions. All parts of the system must be able to communicate between themselves and with the outside world, be capable of rapidly processing collected data and guarantee high reliability.

The principle of distributed intelligence utilises the great advances in electronic technology to satisfy all these needs. All the devices in a distributed intelligence system are equipped with processing capability and communicate between themselves via a local network; the failure of a single element of the system does not stop the others performing their functions, guided by their own resident programmes. The central computer, freed from these burdensome tasks, can now be dedicated to optimising and supervising functions.

Distributed intelligence architecture for automatic data collection systems



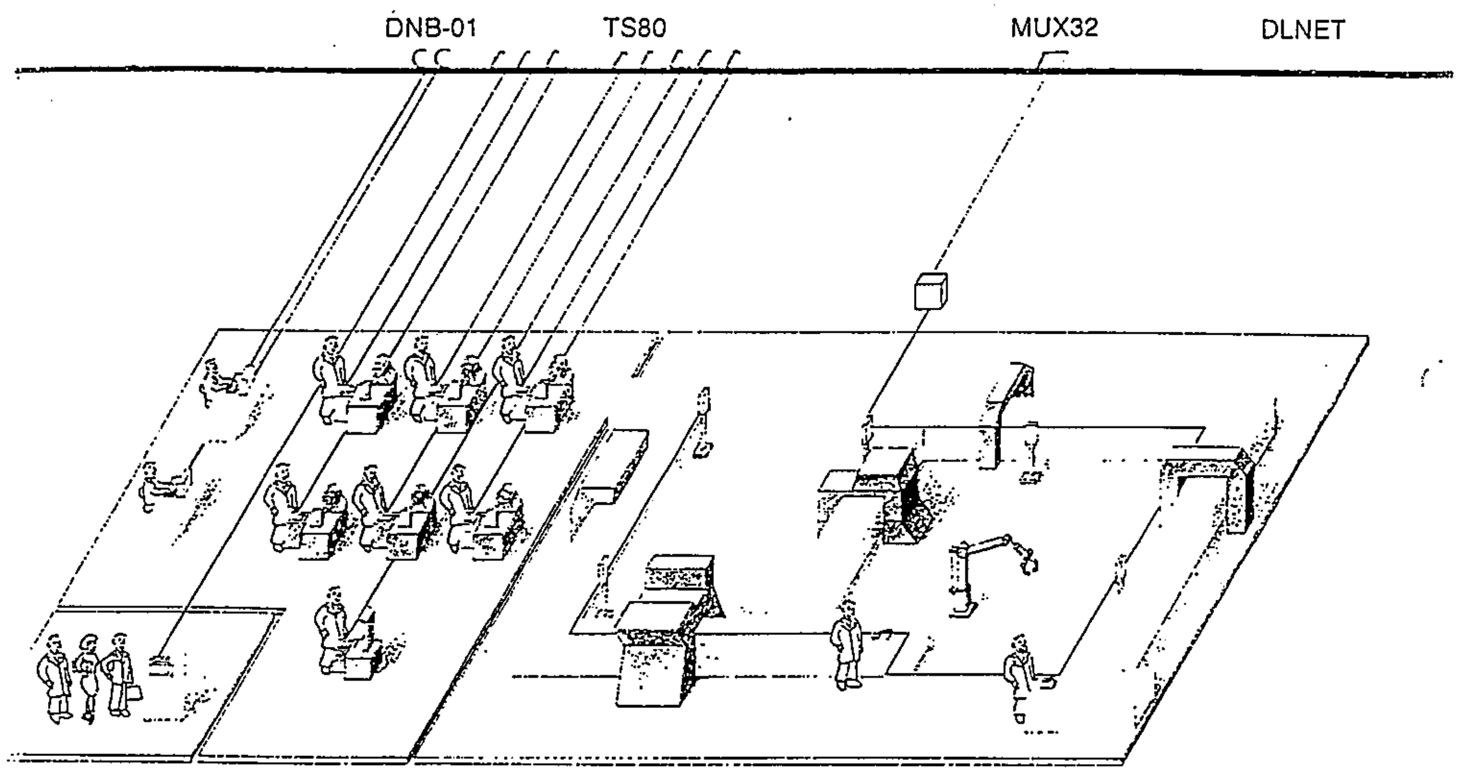
Nextdata, the new Datalogic data collection and processing system, represents a turning point in the new era of distributed intelligence. Nextdata, in fact, is the first distributed intelligence data collection system developed on the basis of users needs: an open system, completely programmable and compatible with well-known standards.

The back-bone of Nextdata is formed by DLNET. Datalogic's local network developed with the particular demands of industrial environments in mind. Other Nextdata components can be connected to DLNET, which uses a network operating system compatible with NetBIOS: the TS80 industrial computer, the MUX32 concentrator and the DNB-01 card which allows a personal computer to be inserted into the network. The power and programmability of the TS80 industrial computer allows a massive amount of intelligence to be transferred "on site"; this can be used for operator interaction (via a full QWERTY keyboard and graphic display) or for complex processing.

TS80 does not require that the programmer uses new operating systems or learns new languages; it can be programmed in "C" and its multi-tasking operating system is MS-DOS compatible at a single task level. The MUX32 concentrator is also MS-DOS compatible and programmable in "C"; its processing capacity can handle up to 32 data collection peripherals (bar code readers for example) and take independent decisions. Nextdata resources do not end here: in fact, one or more personal computers can be introduced into the network via the DNB-01 card, both to perform supervisory tasks and to act as server; an absolute novelty for industrial data collection networks.

Nextdata

The global solution for shop floor data collection



The evolution of data collection systems

:ne flexibility of Nextdata allows ɔmplete data collection systems for ıustry to be developed very simply. :om the input of personnel to ᵔ͌ output of finished products, .NET local network reaches into ·very corner of the company to llect and sort out the data cessary to efficiently manage the :oduction process.
ıe task of time and attendance ‑ntrol can be given to one TS80; :her computers of the same type n control single automatic :achines, such as allowing various ımerical control programs to be ·wnloaded and/or activating ·lectro/mechanical parts, thanks to ᵔ͌ incorporation of eight I/O.

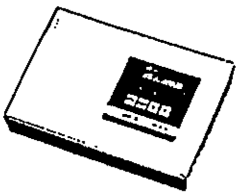
MUX32 concentrators can manage the bar code readers and other identification devices distributed over the entire production line; one or more personal computers can be connected to the network via the DNB-01 card to supply supplementary resources (distributed databases for example) or to supervise activities. The perfect adaption of the system to company requirements is guaranteed by the flexible programmability of all the components. The flexibility of Nextdata does not compromise the system predictability: Datalogic has developed two software packages to allow the behaviour of the RS485 lines connected to the MUX32 concentrators and those of the DLNET network, complete with all the components, to be simulated.

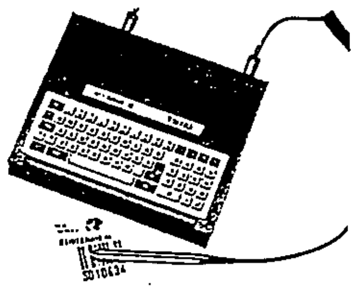
The designer utilising these packages can verify the correct operation of the whole system before passing it on for practical implementation.

A system open towards the future.

The flexibility of Nextdata opens the road towards a future of applications that go far beyond bar code reading: users will be able to realize integrated systems taking advantage of other products developed by Datalogic in the field of artificial vision and radio frequency identification.
Nextdata can also be used to intervene in the production process through machine management and transport systems.

The complete range of components for automatic data collection systems





MUX32

MUX32 is an intelligent device capable of handling bi-directional communication with up to 32 Datalogic data collection peripherals through an RS485 multi-drop port. The information collected can be processed locally and transmitted via an asynchronous serial port or via the DLNET network. MUX32 is based on a V40 microprocessor and is programmable in 'C'.

BAR CODE READERS

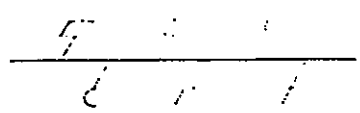
Datalogic manufactures a complete range of bar code readers.

TS80

The TS80 industrial computer is enclosed in a waterproof housing. Dual processor architecture is used to simultaneously handle operator interaction, processing and network communications. It has a mass RAM-DISK memory and a RAM, expandible to 2 Mbyte and 576 Kbytes respectively. TS80 is equipped with a 66 key QWERTY keyboard and graphic 64x256 pixel LCD display, and uses the DLX80 multi-tasking operating system (MS-DOS compatible at single task level). Application programmes can be written in 'C' using the DSD04 development system.

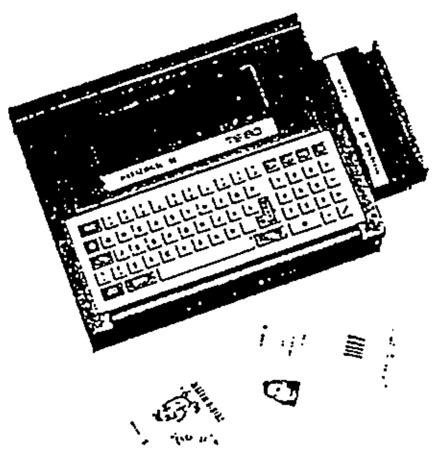
DNB-01

A personal IBM computer, or compatible, can be interfaced to the DLNET network using the DNB-01 card and its relative software. The architecture of the card is based upon the Z80 microprocessor; the software supplied includes packages that allow the PC to operate as a disk server, printer spooler, etc.



DLNET

The DLNET local network uses a bus topology and token passing entry method. Each bus, of up to 1500 meters length, can connect up to 255 devices; the expandibility of the network is practically limitless with the addition of further buses. DLNET uses a NetBIOS compatible operating system and a transmission speed of 250 kBaud on a twisted pair cable.



Nextdata

Not only Bar Code

RFID

Datalogic produces a complete range of devices for radio frequency identification (RFID), a technology with complementary applications in respect to barcoding. The Datalogic systems are "read/write" and "read only", they operate at low frequency and use active or passive tags with 64 byte, 8 kbyte and 32 kbyte memory capacities. The distance between tag and antenna is from a few centimeters to over one meter for long range applications. Each antenna is connected to a controller by a cable of up to 1200 meters long; each controller can handle up to four antennae. Four types of controllers are available in Eurocard format, either programmable or not programmable; each can communicate with a host through an RS232 or RS422 connection.

VISION

Datalogic also supplies complete artificial vision systems. The nucleus of these systems is the DVS1000 processing unit that allows images to be acquired from up to four Datalogic TC1000 industrial cameras. The images, composed of 256x256 pixels at 64 grey levels, are processed by a digital signal processor (DSP). System applications include quality control, character recognition and object identification.

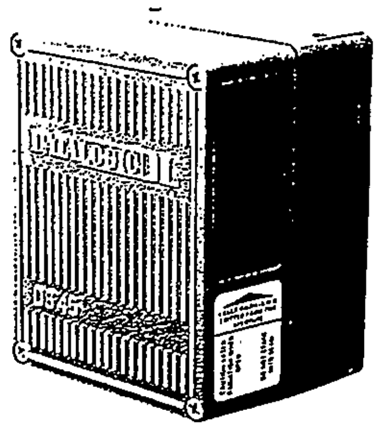
CONTROLLERS

Particular devices can also be connected to the network to allow inputs and outputs relative to machines or transport systems to be managed, consequently Nextdata can interact directly with the production process. This possibility represents the key in Nextdata evolution towards computer integrated manufacturing (CIM).

The high performance, the complete programmability and compatibility with well-known standards, puts Nextdata ahead of distributed intelligence data collection systems. Nextdata represents an important step in the evolution of the Company; Datalogic can today propose itself as the ideal partner in the realization of data collection and processing systems for industrial environments.

Datalogic S.p.A • Via Candini, 2 • 40012 Lippo di Calderara di Reno • Bologna • Italy
Tel 051/726565 a.r. • Tlx. 511021 DALOG I • Fax. 051/726562

DATALOGIC



DS45

VISIBLE LASER DIODE SCANNER

- Solid state laser diode light source
- Compact IP64 ruggedized industrial enclosure
- Up to 550 mm reading distance
- Single wide-range supply voltage
- Built-in decoder
- EIA RS232, RS485, 20mA C.L. communication
- Easily connected to Local Area Network

TECHNICAL FEATURES

DS45, the latest series of Datalogic laser scanner with built-in decoder, is designed for applications in which relatively short reading distances (up to 50 cm) and small physical dimensions are the keypoints.

In such applications, traditional scanners are often overspecified, while DS45 provides the ideal price/performance ratio.

Even though very compact, the DS45 incorporates all the most important features traditionally reserved for very high performance scanners: the optics are available in both high and low resolutions with the options of multiple and oscillating beam patterns. The built-in decoder includes several standard operating modes, allowing the DS45 to be easily configured to suit the majority of applications. Code autodiscrimination between up to five codes comes also as standard.

Programming of all the parameters is made remotely, downloading software commands from a terminal or host computer connected to the serial port. These parameters can be stored in a non volatile EEPROM. A user friendly menu driven program is also available to simplify configuration of the DS45 using a standard PC.

DS45 serial line may be configured as RS232, 20mA C.L. or RS485 half duplex. The RS485 interface is provided for direct connection to the Datalogic MUX32 intelligent multiplexer. This in turn, may be connected to DLNET local area network where the number of input devices is virtually unlimited.

APPLICATIONS

- Identification on conveyor belts
- Packaging machines
- Automated warehouses
- Work-in-Process control
- Automatic medical equipment
- Electronics manufacturing
- Automatic Document Handling

DATALOGIC

MODELS AND ACCESSORIES

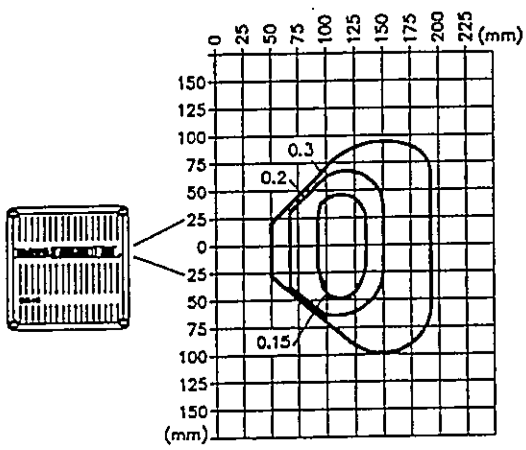
Type	Description	Order Number
DS45H	Visible laser diode scanner (high resolution)	B9762050
DS45L	Visible laser diode scanner (low resolution)	B9762051
ACCESSORIES		
PG110/DVE-1212A	Power block (110 Vac)	B9751057
PG220/DVE-1212A	Power block (220 Vac)	B9751027
PG240/DVE-1212A	Power block (240 Vac)	B9751058
GFC-50	90° reading mirror attachment	B9751067

All models are available with multi-beam (raster configuration) versions.

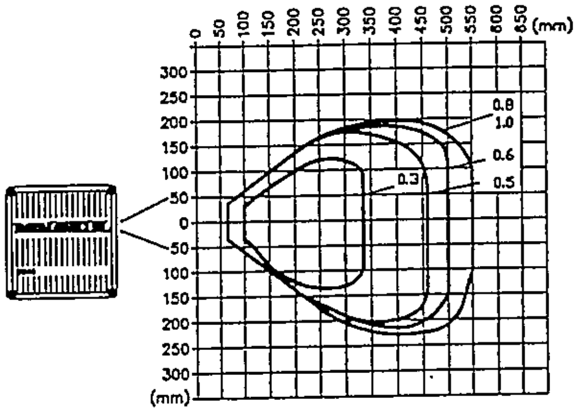
SPECIFICATIONS

POWER SUPPLY	11 to 30 Vdc
POWER CONSUMPTION	3.6 W
LIGHT SOURCE	Visible Laser Diode (670 nm)
MAX. RESOLUTION	
DS45H	6 mils (0.15 mm)
DS45L	12 mils (0.30 mm)
SCAN RATE	300 scans per second
MAX. READING DISTANCE	
DS45H	190 mm (7.48 in.) (0.3 mm narrow bar)
DS45L	550 mm (21.65 in.) (0.8 mm narrow bar)
MAX. READING FIELD	
DS45H	195 mm (7.68 in.) (0.3 mm narrow bar)
DS45L	430 mm (16.93 in.) (0.8 mm narrow bar)
MAX. DEPTH OF FIELD	490 mm (19.29 in.) (0.8 mm narrow bar)
APERTURE ANGLE	65 degrees (typical)
READABLE CODES	15 types incl. 2/5, code 39, code 93, code 128, EAN/UPC, codabar
CODE AUTODISCRIMINATION	Up to 5 different codes
INTERFACES	RS232 / RS485 Multidrop / 20 mA CL
BAUD RATE	300 to 19200 bauds
INPUT SIGNAL	'Presence sensor' (NPN/PNP transistor)
OUTPUT SIGNAL	'No read' (NPN transistor open collector and emitter)
PROGRAMMING METHOD	Via serial port
OPERATING MODES	'On line', 'Automatic', 'Serial', 'Test'
LED INDICATORS	'Power on', 'Reading phase active', 'Label present', 'Data transmit'
LASER CLASSIFICATION	IEC 825 Class 2
LASER CONTROL	Double security system to turn laser Off in case of motor slow down or failure
DIMENSIONS	101 x 83.5 x 66 mm (3.98 x 3.29 x 2.60 in.)
WEIGHT	700 g (24.70 oz.) approx.
CASE MATERIAL	Cast aluminium
OPERATING TEMPERATURE	0 to 45 °C (32 to 113 °F)
STORAGE TEMPERATURE	-20 to 70 °C (-4 to 158 °F)
HUMIDITY	90% non condensing
VIBRATION RESISTANCE	IEC 68-2-6 test FC 1.5 mm; 10 to 55 Hz; 2 hours on each axis
SHOCK RESISTANCE	IEC 68-2-27 test EA 30 G; 11 ms; 3 shocks on each axis
PROTECTION CLASS	IP64

OPTICAL RESPONSE CURVES



DS45H

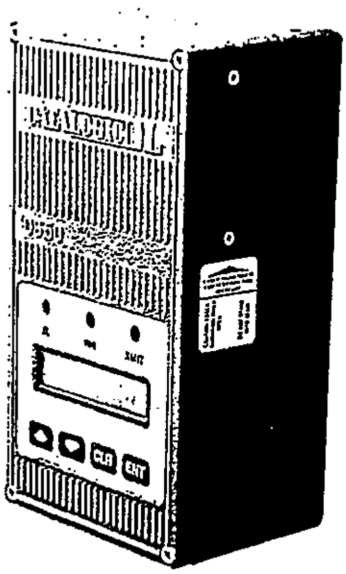


DS45L

We reserve the right to make modifications and improvements

Datalogic S.p.A. - Via Candini, 2 - 40012 Lippo di Calderara di Reno - Bologna - Italy
Tel. 051 726565-725276 a.r. - Tlx. 511021 DALOG I - Fax 051/726562

DATALOGIC



DS50

LASER DIODE SCANNER

- Solid state laser diode light source
- Over 1 meter reading distance
- Compact and ruggedized industrial enclosure
- Incorporated LCD display and keypad
- Built-in decoder with menu driven set up
- RS232, RS485, 20mA C.L. communication
- Connection to Local Area Network

TECHNICAL FEATURES

Integrating quality together with the most modern design and production techniques, Datalogic introduces the new DS50 compact and ruggedized fixed position laser scanner.

To provide an effective and reliable solution to virtually all scanning requirements three resolutions of optics are available which, along with the options of multiple and oscillating beam patterns, ensure the optical parameters of the reader exactly match the bar code dimensions.

An advanced built-in decoder ensures maximum flexibility both in operation and interfacing. Six operating modes are resident, allowing the DS50 to work with or without a presence sensor, to send code diagnostics along with the bar code number read for system analysis and checks, or even to work as on-line verifier. Code autodiscrimination between up to five codes comes as standard.

Programming of all the parameters may be carried out locally, using the menu driven integral display and keypad, or remotely by downloading software commands from a terminal or host computer connected to one of the serial ports. All operating parameters may be stored in a non volatile EEPROM.

Two serial ports are provided on the DS50, the main supporting all standard industrial interfaces, the second RS232C to allow easy pass-through configuration and consequent installation of small multipoint reading systems.

For larger installations, up to 32 DS50 units can be directly connected to a MUX32 intelligent multiplexer via the RS485 interface. This in turn, may be connected to DLNET local area network where the number of input devices is virtually illimited.

APPLICATIONS

- Identification of products on conveyors
- Automatic machinery and robots
- Automated warehouses
- Work-in-Process control
- Quality control

MODELS AND ACCESSORIES

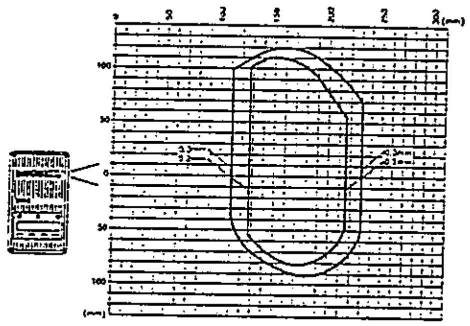
Type	Description	Order Number
DS50H	Visible laser diode scanner (high resolution)	B9762070
DS50M	Visible laser diode scanner (medium resolution)	B9762071
DS50L	Visible laser diode scanner (low resolution)	B9762072
ACCESSORIES		
PG110/50	Power block (110 Vac)	B9751094
PG220/50	Power block (220 Vac)	B9751095
PG240/50	Power block (240 Vac)	B9751096
GFC-50	90° reading device	B9751067

All models are available with multi-beam (raster configuration) versions.

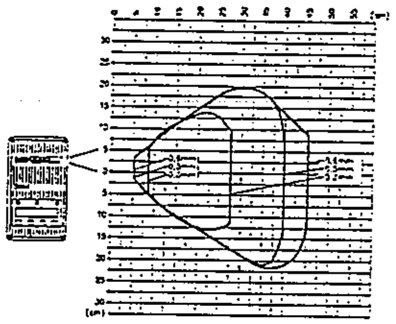
SPECIFICATIONS

POWER SUPPLY	10 to 30 Vdc
POWER CONSUMPTION	3.5 W (DS50H/L) 4 W (DS50M)
LIGHT SOURCE	Visible Laser Diode (670 nm)
MAX. RESOLUTION	
DS50H	6 mils (0.15 mm)
DS50M	12 mils (0.30 mm)
DS50L	20 mils (0.50 mm)
SCAN RATE	500 scans per second
MAX. READING DISTANCE	
DS50H	230 mm (9.05 in.) (0.3 mm narrow bar)
DS50M	450 mm (17.72 in.) (0.6 mm narrow bar)
DS50L	1050 mm (41.34 in.) (1.0 mm narrow bar)
MAX. READING FIELD	
DS50H	210 mm (8.27 in.) (0.3 mm narrow bar)
DS50M	400 mm (16.53 in.) (0.6 mm narrow bar)
DS50L	800 mm (33.46 in.) (1.0 mm narrow bar)
MAX. DEPTH OF FIELD	900 mm (35.43 in.) (1.0 mm narrow bar)
APERTURE ANGLE	65 degrees (typical)
READABLE CODES	15 types incl. 2/5, code 39, code 93 code 128, EAN/UPC, codabar
CODE AUTODISCRIMINATION	Up to 5 different codes
MAIN INTERFACES	RS232 / RS485 Multidrop / 20 mA CL
AUX. INTERFACE	RS232
BAUD RATES	300 to 19200 bauds
INPUT SIGNALS	'Presence sensor' plus 1 auxiliary (NPN/PNP transistor)
OUTPUT SIGNALS	'No read', 'Right code', 'Wrong code' (NPN transistor open collector and emitter)
PROGRAMMING METHOD	Using built in keypad and menu driven display / Via serial port
OPERATING MODES	'On line', 'Automatic', 'Verifier', 'Serial on line', 'Serial verifier', 'Test'
DISPLAY	2 line 16 char. LCD
KEYBOARD	4 keys
LED INDICATORS	'Laser on', 'Reading phase active', 'Label present', 'Data transmit'
LASER CLASSIFICATION	IEC 825 Class 2
LASER CONTROL	Double security system to turn laser Off in case of motor slow down or failure
DIMENSIONS	180 x 100 x 72 mm (7.09 x 3.94 x 2.83 in.)
WEIGHT	1.3 Kg (2.87 lbs) approx.
CASE MATERIAL	Cast aluminium
OPERATING TEMPERATURE	-5 to 45 °C (23 to 113 °F)
STORAGE TEMPERATURE	-20 to 70 °C (-4 to 158 °F)
HUMIDITY	90% non condensing
VIBRATION RESISTANCE	IEC 68-2-6 test FC 1.5 mm 10 to 55 Hz; 2 hours on each axis
SHOCK RESISTANCE	IEC 68-2-27 test EA 30 G 11 ms; 3 shocks on each axis
PROTECTION CLASS	IP64

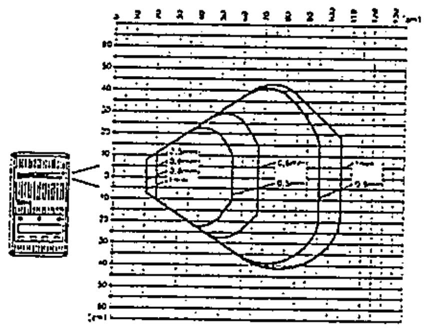
OPTICAL RESPONSE CURVES



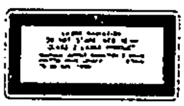
DS50H



DS50M



DS50L



We reserve the right to make modifications and improvements

Datalogic S.p.A. - Via Candini, 2 - 40012 Lippo di Calderara di Reno - Bologna - Italy
Tel. 051.726565 a.r. - Tlx. 511021 DALOG I - Fax 051.726562

BC-210 8110101 - Printed in Italy in May 1992 - Datalogic Communication Division