IQ²F Metal Detector User Guide

Copyright and acknowledgements

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Safety warnings

Listed below are all the safety warnings that are used in this manual. It is strongly recommended that personnel who are, or will be, responsible for either installing, maintaining or operating the equipment described in this manual should read and understand these warnings.

1. **LETHAL HAZARD – ELECTRICAL SUPPLIES**. A current of 100 milliamps passing through the body for one second can kill. This can occur at voltages as low as 35V ac or 50V dc. The equipment described in this manual uses electrical power which can be lethal. Unless absolutely necessary, cleaning, inspection and maintenance must not be carried out without first isolating the equipment from all electrical supplies.
2. **LETHAL HAZARD – COMPRESSED AIR SUPPLIES**. The equipment described in this manual may be supplied with a compressed air supply operating at a pressure which may be lethal. Unless absolutely necessary, cleaning, inspection and maintenance must not be carried out without first isolating the equipment from all compressed air supplies.
3. **WORKING ON EQUIPMENT**. If it is essential to work on the equipment with electrical and/or compressed air power connected, the work must be undertaken only by qualified personnel who are fully aware of the danger involved and who have taken adequate safety precautions to avoid contact with dangerous voltages and/or compressed air supplies.
4. **REJECT DEVICES**. At no time, with compressed air and/or electrical power applied to an automatic reject device, should any part of the body be placed within the operating area of the reject device.
5. **EXCESSIVE NOISE**. When an air blast reject device operates, the noise emitted may constitute a noise hazard. While short exposure to this noise will not cause permanent damage to hearing, prolonged exposure may cause some damage. It is recommended that ear defenders are worn by personnel who are regularly exposed to the noise.
6. **HEAVY EQUIPMENT**. The equipment described in this manual is extremely heavy and considerable care must be taken when handling it. Sufficient personnel and a suitable fork-lift truck or pallet truck must be used to ensure safe handling.

7. **LIFTING EQUIPMENT**. Use only the correct slings and lifting tackle to move heavy items of equipment described in this manual. Inspect all slings and lifting tackle prior to lifting the equipment to ensure that:
   (a) The safe working load will not be exceeded.
   (b) There are no frayed or broken strands.
   (c) Hooks, rings, etc. are not damaged.

8. **MOVING METAL DETECTORS**. The centre of gravity of some metal detectors is high. Care must be taken when moving such equipment on a slope to ensure that it does not topple over. This could result in death or severe injury to an individual and/or severe damage to the metal detector.

9. **CONTAMINANTS**. Oils and greases must always be handled with care. Prolonged bare skin exposure to certain oils and greases can cause skin problems. Always handle oils and greases in accordance with the manufacturer's instructions.

10. **TRAPPED FINGERS**. Do not place fingers on the underside of the conveyor when the machine is operating. It is possible for fingers to be trapped and subsequently crushed between a moving and fixed component of the machine.

11. **OSHA**. In the USA, the Occupational Safety and Health Administration (OSHA) Acts quite clearly place the burden of compliance on the user of equipment, and the acts are generalised to the extent that determination of adequacy of compliance is a judgement decision on the part of the local inspector. Hence Loma cannot be held responsible for meeting full requirements of OSHA or OHSA with regards to any equipment supplied, nor can Loma be held liable for penalty which may be assessed for failure to meet the requirements of the acts as interpreted by an authorised inspector. Loma, however, does act in a responsible manner with regard to safe design of equipment and will always work with customers to assist where possible in the remedy of any violations at a reasonable cost to the buyer.

Emergency procedures

1. **EMERGENCY SHUTDOWN OF CONVEYORS**. This equipment is fitted with an emergency ‘Stop’ button. This is mounted on the front panel and is coloured red. In the event of an emergency, which requires the metal detector to be immediately stopped, press the ‘Stop’ button.
2. **DEALING WITH FIRE**. In the unlikely event of fire occurring in an item of equipment manufactured by Loma Systems, it is important that a fire extinguisher containing the correct type of extinguishing material is used. Fire on electrical equipment must be extinguished using a dry powder extinguisher (Blue label).
3. **AUDIBLE WARNINGS**. A conveyor may be fitted with an indicator lamp and an alarm which operates when a metallic contaminant is detected in the product. The maximum volume of the alarm is type dependent and lies in the range of 110dB(A) to 125dB(A) at 1 metre.

Quality assurance

By your selection of a Loma metal detector system you have demonstrated your intention to assure the quality of your products, and thereby protect your customers.

The following points are recommended:

1. Once your Loma metal detector system is installed you should contact your local Loma Service Department to have the system commissioned.
2. Regularly check the operation of the metal detector (once an hour is recommended). Keep accurate records of those tests and the metal samples being used, along with the product details.
3. If the detector fails the test, quarantine the product from the last test and re-introduce through the metal detector once the equipment is fit for use.
4. Have the equipment supported by a Planned Preventative Maintenance Contract. Details can be obtained from your local Loma Service Department.
5. If you have or intend to have BS EN 9000 accreditation, write a section into your Operating Procedures Manual covering metal detection procedures and have each detector regularly calibrated with a certificate issued.

6. Finally, at least on a yearly basis, have your operators, QA and maintenance personnel trained in the use of the equipment. Details of available training can be obtained from your local Loma Service Department.

About this guide

This guide provides complete instructions for setting up and operating the Loma IQ²F Metal Detector range. It consists of the following chapters:

About the IQ²F Metal Detector range

Provides a general introduction to the IQ²F Metal Detector range, describing how it operates and its typical applications.

Using the IQ²F Metal Detector

Provides general information about using the IQ²F Metal Detector, including a simple discussion of the principles of operation.

Setting up a new product

Gives step-by-step instructions for setting up a new product code and calibrating the metal detector for that product.

Displaying and printing reports

Provides information about displaying and printing batch results and contaminant, error and fault reports.

Setting up the IQ²F Metal Detector

Explains how to calibrate the metal detector and set up parameters including time and data, and machine ID.

Using Performance Validation

Describes the benefits of the performance validation procedure and explains how to set up the metal detector for PV testing.

Installing the IQ²F Metal Detector

Gives general instructions for installing the IQ²F Metal Detector conveyor, together with general rules about positioning for correct operation.

Maintenance
Gives detailed maintenance instructions for the IQ²F Metal Detector.

Appendices
Give information about special purpose options included in the Loma IQ²F Metal Detector.

Conventions

For clarity this guide uses the following typographical conventions:

Style	***Used for***
	Keys that you press on the IQ²F Metal Detector control panel.
BOLD	Names of menus and parameters that appear on the metal detector display.
reference	A cross-reference to another part of this guide, or to another guide.

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Contents

About the metal detector range

This chapter provides a general overview of the product range, explaining its operation and giving examples of typical applications. It also describes the key features.

Introduction

To cater for the requirements of different types of product the IQ²F Metal Detector is provided in a range of different configurations. These share the same search head and control unit, but differ in the conveyor used to pass the product through the search head.

The IQ²F uses a belt conveyor, with either a flat or plastic modular belt.

The differences between each of these versions are described in the subsequent sections of this chapter.

Search head and control unit

The search head and control unit have been designed for use with continuous motion conveyor systems.

A second search head may be fitted when product is packaged in both non-foil and foil packaging; this is called an IQ² Metal Detector.

As standard, the control unit is secured at the end of the search head. This unit allows the setup and calibration of the system through a menu-driven user interface.

The control unit is compatible with the following communication packages:

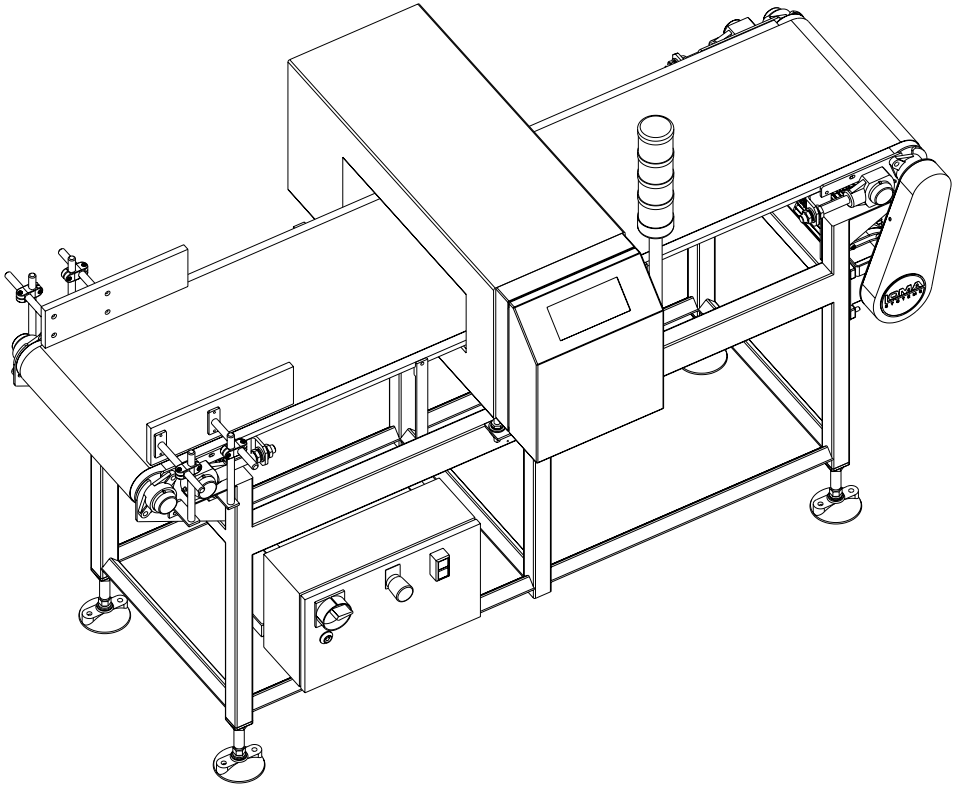
- LomaNet (optional reports/logs and serial link board required).
- LomaLink (optional reports/logs and serial link board required).

The control unit can be fitted with a number of external sensors; an optional sensor board is required for this.

In addition, the control unit can be connected to a number of visual warning lamps.

Belt conveyor versions

This section describes Loma conveyors that are fitted with flat belts and plastic modular belts. Flat belt conveyors are suitable for use with lighter products; plastic modular belt conveyors are suitable for use with heavier products in a harsher environment.



Flat belts

The flat belt conveyors use a belt constructed from polyurethane belting.

Plastic modular belts

The plastic modular belt conveyors use a belt constructed from injected-moulded plastic modules, assembled into an interlocked unit and joined by plastic hinge rods. The belt is positively driven from a central drive sprocket that is secured on a square-section drive shaft. This means that no slippage and no deviation in tracking can occur.

The following table gives details of the three different plastic modular belt types supplied by Loma:

Belt type	***Design***	***Applications***
Flat top	Smooth, closed surface.	Wrapped or loose products.
Flush grid	Open grid pattern with a smooth surface.	Boxed or wrapped products.
Lightweight flush grid	Open grid pattern with a smooth surface.	Boxed or wrapped products.

All the belt types are constructed from white polyethylene and can support a maximum weight of 60kg spread along the belt.

Reject mechanisms

Belt conveyors can be supplied with the following types of reject device:

- Stop-On-Detect (SOD)
- Air blast
- Pusher
- Retracting band (available on flat belt and lightweight flush grid belt only).

Alternatively, a conveyor can be supplied without a reject device but with ‘Signal Only’ output. On detection of metallic contaminant in the product, the control unit provides an output signal only. This conveyor can be used in conjunction with the customer’s choice of equipment.

As standard, a reject cover is fitted over the outfeed part of the belt and the reject device. This protective device is intended to stop any part of a person’s body from being placed within the operating area of the reject device. The Stop-On-Detect reject is not fitted with a reject cover.

Two sizes of reject bins are available with pneumatic reject mechanisms – small and large. The size of the bin is determined by the conveyor length and the product to be rejected. The reject bin is fitted with a hood as standard.

Stop-On-Detect reject
The Stop-On-Detect reject causes the conveyor to stop moving and an alarm to sound indicating that a contaminant has been detected. The maximum volume of the alarm lies in the range of 110 to 125 decibels (dB) at 1 metre, but the level can be adjusted.

After removal of the contaminated product, the conveyor has to be manually restarted.

Air blast reject
The air blast reject uses a high pressure blast of compressed air to push a contaminated product off the belt into the reject bin.

Pusher reject
The pusher reject pushes the contaminated product off the belt into the reject bin.

Retracting band reject
The retracting band reject device uses compressed air to activate the carriage retracting mechanism. The contaminated product falls through the gap in the belt into the reject bin, which is mounted on the underside of the conveyor.

Other standard equipment

Electrical services box
Electrical supplies to the conveyor are connected inside the electrical services box. The box is generally mounted at the front of the conveyor frame but can be overhead mounted. Supplies are connected via the isolator. The internal components may be mounted on a printed circuit board or on din rails if a PLC version is supplied. The door of the box is fitted with the isolator handle, ‘Stop’ and ‘Start’ buttons and the emergency ‘Stop’ button.

The isolator is used for isolating the electrical power to the machine. The ‘Start’ pushbutton is used to start movement of the conveyor and the ‘Stop’ pushbutton stops the conveyor.

Emergency stop button (Farnborough manufactured)
Each conveyor is fitted with an emergency ‘Stop’ button. This is mounted on the door of the electrical services box and is coloured red. In the event of an emergency occurring, pressing the button stops the conveyor and exhausts air out of the pneumatic actuator of the reject device where applicable.

Air pressure switch

An air pressure failure switch is fitted if the conveyor is supplied with either a pusher reject or a retracting band reject. The switch is set by Loma to operate if the pressure of the compressed air supply to the reject falls below 40psi (2.8 bar). The conveyor then stops.

Optional equipment

The following options are available, depending on the type of reject mechanism fitted:

Option	Stop-On-Detect reject	Air blast reject	Pusher reject	Retracting band reject
Audible alarm	S	O	O	O
'Bin Full' photo-eye	–	O	O	O
Indicator beacons	O	O	O	O
Overhead electrical services	O	O	O	O
Product guides	O	O	O	O
Reject registration photo-eye	–	O	S	O
PVS indicator lamp	O	O	O	O
Reject actuation confirmation	–	–	O	O
Reject confirmation with photo-eye	–	O	O	O

S = Standard fitting, O = Optional fitting.

The options are described in the following sections:

Audible alarm

The alarm sounds when a contaminated product is detected. The maximum volume of the alarm lies in the range of 110 to 125 decibels (dB) at 1 metre but the level can be adjusted.

'Bin Full' photo-eye

Warns when the reject bin is full.

Indicator beacons
Four mixable options are available; illuminating when a PVS test is requested or a system fault or contaminated product is detected or as an in Run indicator.

Overhead electrical services
The electrical services box may be mounted overhead instead of at the front of the conveyor as is standard.

Product guides
Three types are available. One type is situated at the infeed to the conveyor only, the second is fitted through the search head, and the third is fitted along the full length of the conveyor. The guides can easily be adjusted to suit the width of a specific product.

Reject registration photo-eye
A photo-eye registers the position of products on the conveyor.

PVS indicator lamp
Illuminates when a pre-programmed Performance Validation System test is required. The normal colour is blue but it can be white if the system uses two search heads.

Reject actuation confirmation
Stops the conveyor when a contaminated product is detected and the reject solenoid fails to trigger.

Reject confirmation with photo-eye
PECs across the reject collection device confirm that a pack has been rejected.

Technical specification (All European belt conveyors)

Dimensions	Each machine is designed to suit a customer's requirements.
Weight	Displayed on identification plate mounted on frame.
Power requirements	
Standard option	380/400/440V 3-phase, 50Hz, neutral and earth 380/400/440V 3-phase, 50Hz, earth but no neutral 220/230/240V, 1-phase, 50Hz, neutral and earth 220/230/240V, 1-phase, 50Hz, earth but no neutral
Control voltage	24V ac, 50Hz
Current consumption	350VA
Air supply (Pusher and retracting reject)	
Optimum pressure	5.5 bar (80psi)
Minimum pressure	4.5 bar (65psi)
Maximum pressure	6.0 bar (90psi)
Capacity (litre/second at 100psi)	10
Air supply (Air blast reject per nozzle)	
Optimum pressure	6.9 bar (100psi)
Minimum pressure	6.9 bar (100psi)
Maximum pressure	8.0 bar (120psi)
Capacity (litres/second at 100psi)	27
Environment	
Operating temperature	-10°C to 40°C
Relative humidity	80% up to 31˚C (86˚F) reducing to 50% @ 40˚C (104˚F)

Using the metal detector

This chapter provides general information about using the metal detector, including a simple discussion of the principles of operation to explain how it works.

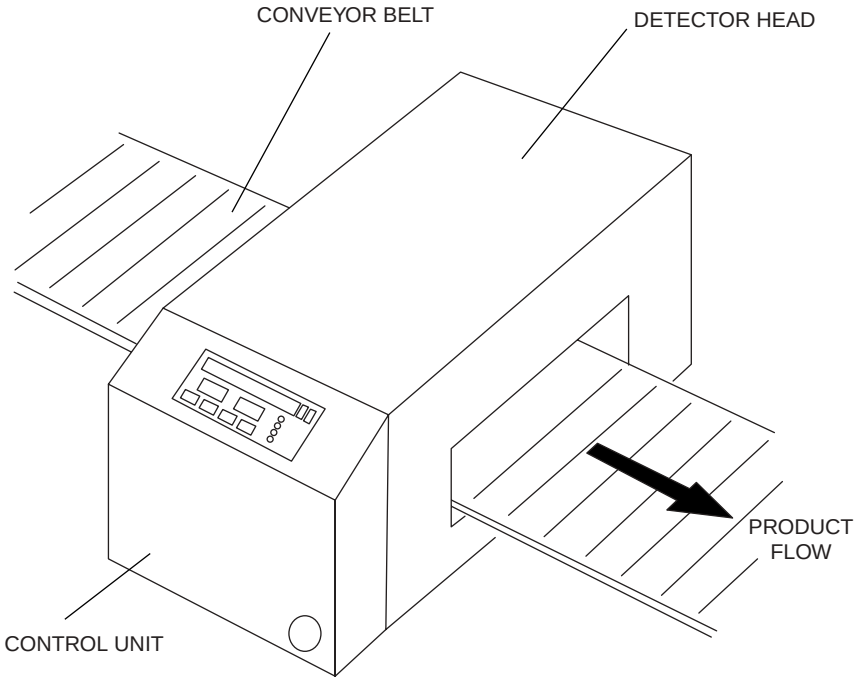
It also describes the general procedures for entering a keycode, moving between the menus, adjusting parameters, and adjusting the sensitivity.

Principles of operation

The IQ²F Metal Detector has been specifically designed to check foil wrapped articles, products contained in foil trays or products with foil lids. It is highly sensitive to ferrous materials, but unlike the general purpose range of metal detectors it is not directly sensitive to aluminium foils.

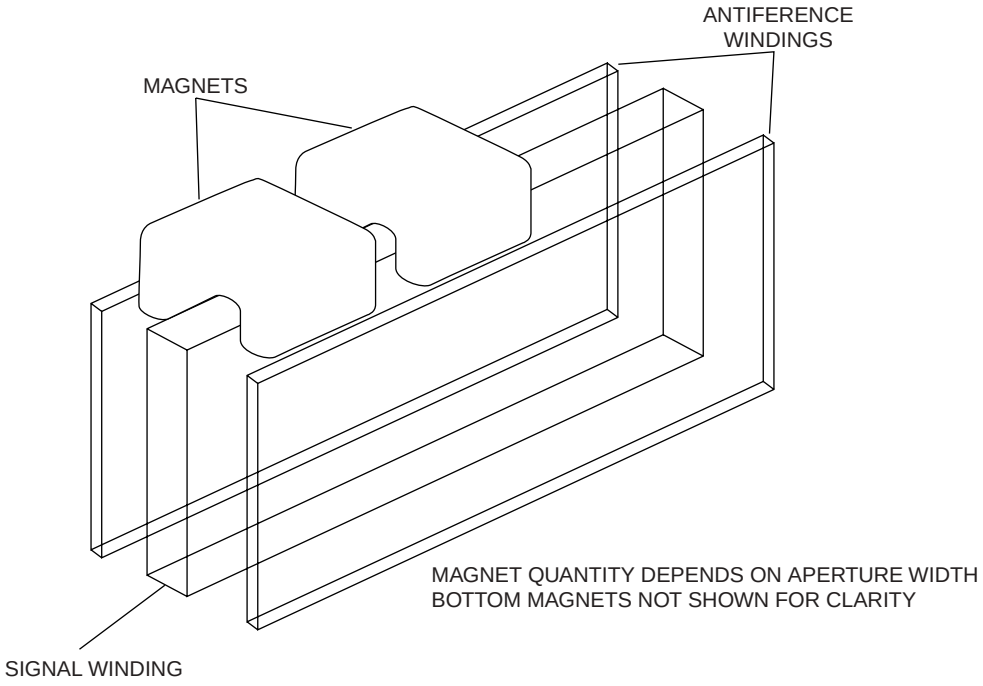
The basic principle by which the detector detects ferrous contamination is Faraday's law of magnetic induction. This states that when a magnet is moved towards or away from a coil, a voltage is induced in that coil which is proportional to the rate of change of linking flux.

This principle can be employed to detect magnetic materials (eg ferrous metals) passing through a coil provided those materials firstly become temporarily magnetised.



A typical detector is shown above. It consists of a metal box with an aperture through which the product passes, and the control unit, which processes the received signal. Inside the metal box, referred to as the search head, there are three multi-turn coils surrounding the aperture, as shown below. The strong magnetic field required to temporarily magnetise any

ferrous contamination, which may be present in the product, is supplied by a fixed array of permanent U shaped magnets.



A simplified diagram of the internal coil and magnet arrangement is shown above. The signal winding is a coil of about 3000 turns. No balancing is required in the head as the metal signal is entirely self-generated by the motion of the metal contamination through the coils. The second outer pair of antiference windings is connected in series opposition to the signal winding. This ensures minimum pickup of unwanted external interfering signals.

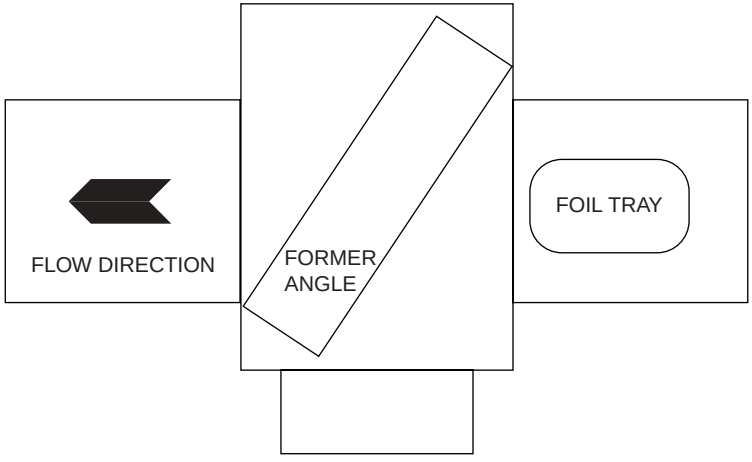
The detector is unaffected by effects from the product itself; the foil is the limiting signal.

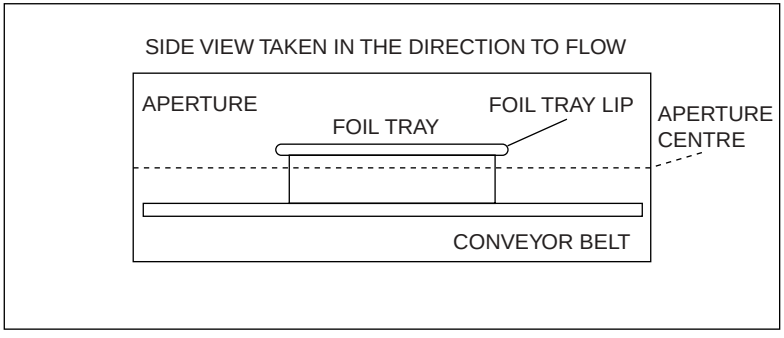
The speed at which the metal contaminant passes through the coils directly affects the level of signal that is picked up in the signal winding, as is the foil signal that is generated. If not compensated for, it will affect the performance of the detector. The method for reducing such signals is achieved by two basic methods.

The first method is the angle at which the former within the case is positioned with respect to product flow, as shown below. A large number of angles are possible; the angle chosen for your detector would have been based on the size, shape and thickness of the foils to be

used. The effect created by the angled former is to reduce the amount of foil passing across the windings at any given moment, and thereby reduce the induced foil signal. The use of product guides will ensure consistent tray alignment and reduce false triggers due to changes in tray orientation.

The second method is to ensure the centre of the foil passes approximately through the centre of the search head, as shown below. This is why the search head mounting fittings are height adjustable. When a number of different foils are to be used the height setting will be a compromise and may have to be based on the worst case foil signal.





Fine adjustment of the tray position is achieved by observing the foil signal shown on the control panel display unit, and adjusting the search head height for the minimum foil signal.

Sensitivity

The sensitivity of a detector is normally specified as the smallest diameter of sphere that can be detected when passed through the aperture within foil packaging. Sensitivity varies with foil type and design; therefore the correct choice of aperture height, former angle and correct positioning of the detector to minimise the foil signals is important in obtaining a good performance.

For instance, a detector designed for a thin round foil tray of shallow depth will not perform very well with a thick square deep foil tray.

Shape and orientation

The sensitivity of a detector is based on spherical samples of ferrous metal. These are commonly used as the standard for testing and comparing performance of metal detectors, because they present a regular shape to the aperture irrespective of their orientation.

For magnetic materials, the detectability is more bulk dependant. However with smaller irregular shapes orientation becomes more of a factor; for example a piece of ferrous wire lying with its longest dimension parallel to the signal winding will be less detectable than if it was lying with its longest dimension at right angles to the signal winding.

Good practice

The following procedures are recommended for ensuring and maintaining an effective metal inspection regime. There are three essential components in using the IQ^{2}F Metal Detector effectively:

- Establishing detector sensitivities
- Regular in-line detector sensitivity testing
- Effective handling of rejected products.

Establishing detector sensitivities

Once your metal detector has been calibrated with the product, it is important to establish what size of metal contaminant your detector is capable of finding. A selection of metal test wands was supplied with your metal detector. As standard, chrome steel (ferrous test wand) is supplied. The range of sizes initially supplied are factory chosen based upon inspection procedures.

It is important to note that the size of contaminant the system is capable of detecting can only be sensibly determined under normal line conditions and with truly representative product.

The detector has a single mode of operation unlike a general purpose detector such as the Superscan Microisc. The automatic calibration systems used by your detector determine which is the correct operating condition for your product.

Determining the achievable sensitivity is fairly straightforward and is best achieved by inserting the test wand into the representative product sample approximately halfway down the product height. The test wand should be placed in at least three places; the leading and trailing edges and at the centre. The product is then passed through the detector to determine sensitivity.

The reasons for using the test wand in this way are:

Shielding
The foil packaging can mask the generated metal sample signal in some instances. This is why the test wand needs to be placed in the product within the packaging, including replacing lids. A sample, which is detectable at the leading edge, may pass undetected at the trailing edge or product centre, or any combination thereof.

Rejection
Test wands are placed at the leading and trailing edges to ensure correct product rejection. This is very important with a non photo-eye system as reject time is affected by the position of the contaminant within the product.

Note: It is important to be aware of the effects of contaminant orientation and relative detectability. The test wands used throughout the metal detection industry are spherical, as this eliminates any orientation effects and ensures repeatability. However in practice this may not always be the case, therefore the user must be mindful of this fact. For more information on the effects of orientation, see *Shape and orientation*, page 13.

Regular in-line detector sensitivity testing

It is important to maintain regular and accurate in-line sensitivity testing of the metal detector using the same techniques as the initial sensitivity testing. This should include tests to ensure that the reject systems are effective.

Regular testing should be conducted using the same techniques as initial sensitivity testing. This should include ensuring the reject systems are effective, including reject confirmation systems if fitted.

The records generated by this system should be maintained in a safe and easily retrievable place for a time period suited to your particular quality regime. Factors which may be of help in determining a suitable retention period might be:

- The anticipated life of your product within normal consumer usage
- Any statutory time period in which enforcement authorities have to institute legal proceedings after notification of a complaint.

Handling rejected products

A reject collection device, such as a reject bin, will typically be used to prevent contaminating products from being mixed with uncontaminated products. Any rejected product should be kept segregated for later examination. Never let your bin overfill.

It is advisable to examine rejected product with a view to identifying any contamination. The information gained can be used to implement preventative measures, thus improving further the product quality. Multiple contaminants may be a clue to machinery break-up, identification can pinpoint the source, and effective maintenance can then be conducted.

The metal detector can also be helpful when examining contaminated products. For example, you can alter the orientation of the product and pass it back through the metal detector to help identify its position. Alternatively, you can subdivide the product into a number of smaller samples and then use the metal detector to identify which sample contains the contaminant.

ISO9000

Advice is given below on probable areas of concern.

Certificates of calibration

This type of calibration is confined to the checking of the electronics of the metal detector against original specification, effecting any adjustments or repairs as necessary. This is normally carried out by the manufacturer against a written specification and using equipment traceable to national and international standards. A certificate of calibration would then be issued for that piece of equipment. Loma recommend this calibration should be done at least yearly.

Product calibration

This type of calibration is carried out by the user and involves passing the product through the detector according to the requirements of the particular detector calibration system in use. This optimizes the detector for best performance and subsequent metal contaminant detection.

Metal test wands

It is recommended that all sensitivity checking is conducted using test wands which use metal spheres certified and traceable to national and international standards. Loma can supply upon request certificates of conformity for test wands supplied either with new equipment or as spare parts.

Work instructions, training and record keeping

It is recommended that in-line sensitivity testing is covered by written instructions, thus ensuring a clear and consistent approach by operators at all times and providing the means to substantiate your methods to any assessment body who may ask.

It is recommended that all personnel who may conduct testing are suitably trained to do so and records are kept to substantiate that training.

Accurate, easily retrievable records should be kept in a safe place for a defined period.

Entering a keycode

The metal detector can be set up to restrict access using a keycode.

When the key panel is locked pressing any key apart from ▲ or ▼ will prompt for the keycode.

To enter a keycode

- Press ↵ to display the keycode prompt.

- Press ▲ or ▼ to adjust the number to the appropriate keycode and press ↵.

Selecting a product

The IQ²F Metal Detector can be precalibrated for up to 100 different products.

To select the product code

- Press G.

  The display will show the name and number of the currently selected product.

- Press ▲ or ▼ to move up or down the list of products until the one you want is displayed, and press ↵ to select it.

  The display shows **Changing to** followed by the name and number of the product, and then returns to the normal display.

The displays

During normal operation you can step between the following displays using ▲ or ▼.

Threshold/signal display

Shows the signal, together with the threshold above which packs will be rejected. The signal is updated continuously as the signal changes.

Bargraph display

The bargraph display shows the signal in bargraph form, with the threshold point represented by a fixed vertical bar approximately three-quarters away along the display. When the signal reaches the threshold the bargraph display shows **METAL**:

Reject count

Displays the reject count for the current batch of products.

Currently selected product

Displays the number and name of the currently selected product.

Control panel

Operator keys

The following table explains the function of the control panels keys:

Key	*Description*
	**Cancel key** – Cancels the current operation.
	**Lock key** – Locks the keyboard.
 and 	**Arrow keys** – Allow you to step between menu options or change the value of the current menu option.
 and 	**Sensitivity keys** – Allow you to decrease or increase the sensitivity.
	**Change key** – Allows you to change the currently selected product.
	**Setup key** – Allows you to set up a new product.
	**Calibrate key** – Allows you to calibrate a product.
	**Results key** – Allows you to display the results for the products being checked.
	**Enter key** – Selects a menu or confirms an enter value.

Indicators

Symbol	*Description*
	Indicates that the metal detector is searching for metal.
	Indicates that the metal detector is performing a calibration cycle.
	Indicates that a system fault has been logged.
	Indicates that a run error has been logged.

Adjusting the sensitivity/threshold

The threshold determines the signal above which packs will be rejected. For example, with no product passing through the metal detector the signal might be between 0 and 10, and with uncontaminated product the signal might be between 50 and 200. In this case you could set the threshold to 300 to cause all packs giving a signal of 300 or greater to be rejected.

To adjust the threshold from the threshold/signal display

- Press ENTER.

  The arrow indicates that you can adjust the sensitivity.

- Press ▲ or ▼ to increase or decrease the threshold value.
- Press ↵ to confirm the current threshold value or C to cancel without changing the threshold.

To adjust the sensitivity from the bargraph display

- Press ◄ or ► to decrease or increase the sensitivity.

  As you decrease or increase the sensitivity a - or + symbol will flash at the right-hand end of the display.

Note that decreasing the sensitivity is equivalent to increasing the threshold.

Using the menus

The options for setting up, calibrating, and checking the operation of the metal detector are accessed from the four menus which you can select using the G, #, ▼, or Σ keys.

To select a menu	
• Press G, #, ▼, or Σ.	
To move between the menu options	
• Press ▲ or ▼.	
To edit a menu option	
A * indicates a menu option with a value you can edit.	
• Press ↵ to edit the value. An arrow points to the value being edited:	
• Press ▲ or ▼ to edit the value. If the value is a number pressing ▲ or ▼ will increase or decrease the value respectively. If the value has alternatives such as **Yes** and **No**, pressing ▲ and ▼ will cycle between the alternatives.	
• Press ↵ to confirm the value you have entered or C to cancel it and return to the previous setting.	

To edit a text field

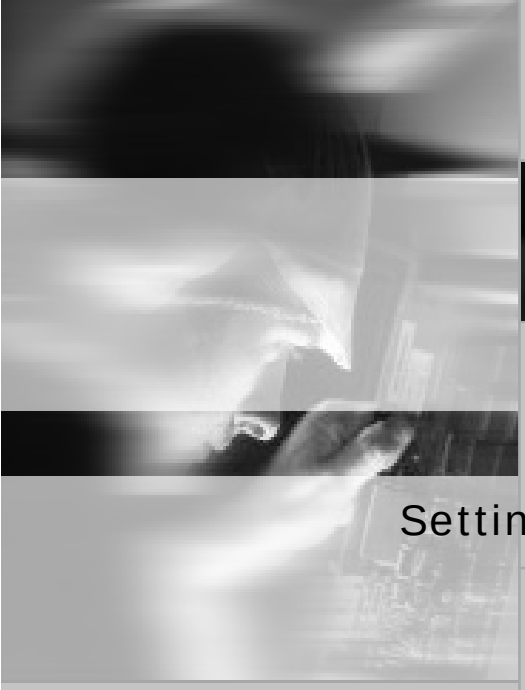
- Press ↵ to edit the text.

  The previous text will be displayed; blanks will be displayed if there was no previous text.

- Press ▲ and ▼ to step between the following characters: Underline, Space, 0 to 9, and A to Z.

- Press ↵ to select the next character position.

  When you have entered the name keep pressing ↵ until all characters have been entered.



Setting up a new product

This chapter explains how to create a new product code and calibrate the metal detector for that product.

Setting up a product

The metal detector must be calibrated for each of the different types of product it will be used with. Each time you use the metal detector you must specify which product you are testing to ensure it is running with the correct calibration.

To set up a new product

- Press #.

  If the keyboard is locked the display will prompt you for a keycode; see *Entering a keycode*, page 17.

Product setup will then be displayed:

- Press ↵ to select the **Product setup** menu and display the first option:

- Press ↵ to edit the product number.
- Press ▲ or ▼ to select the number for the new product and press ↵ to confirm it.

The product number can be from 1 to 100.

- Press ▼ to display the **Name** of the option.

.

To set up a new product *(Continued)*

- Press ↵ to edit the name.
- Enter a name of up to 10 characters and press ↵ to confirm it.

  For information about editing the name see *To edit a text field*, page 22.

- Press ▼ to display the **Flow length** option.

  This option allows you to enter the length of the pack to flow allowing for any skew.

- Press ▼ to display the **Rej delay** option.

  This determines the delay, in seconds, between the detector head, or photo-eye if fitted, and the operation of the reject device.

- Press ▼ to display the **Rej dwell** option.

  This determines the time for which the reject device operates.

To set up a new product *(Continued)*

- Press ▼ to move to the next entry.

  This display will be shown if **PV test** is set to **YES** in the **User Options** menu.
- Press ↵ to select the **PV test setup** menu.

  This contains five system dependent entries and four product dependent entries. To use the PV test all the entries must be completed. For more information see *Setting up PV testing*, page 51.

- Press ▼ to move to the next entry.

  The display will show **Full calibrate?**.

At this point you should have some representative product ready to calibrate and several samples should be used.

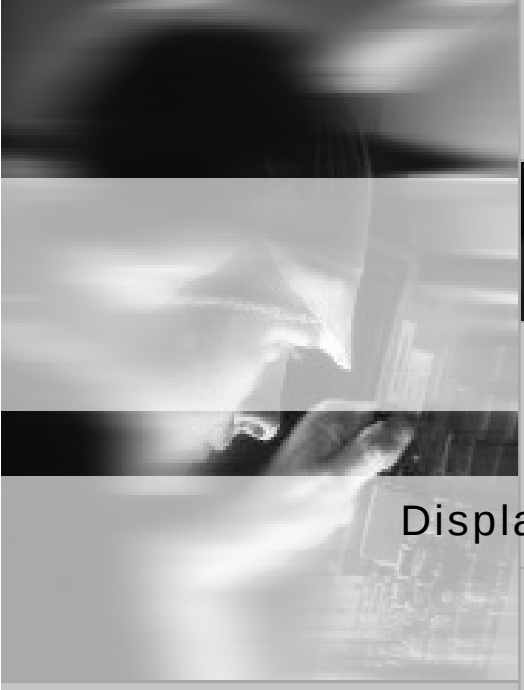
- Press ↵ to start the calibration cycle and keep passing the product until the calibration cycle is complete.

The display will prompt you as necessary.

To set up a new product *(Continued)*

When the calibration is complete the unit will display **Calibrate complete** and then return to the normal display.

Repeat the above set-up procedure with each of the products you wish to calibrate up to 100 in total.



Displaying and printing reports

This chapter gives information displaying the batch results, and the contaminant, error, and fault reports, using the options on the **Results** menu.

It will also describe how to produce printed reports, using the settings on the **Reports Option** submenu of the **Setup** menu.

To print reports the metal detector must be fitted with the optional report/logs package and serial link board.

Displaying batch results

The metal detector maintains the following statistics for the current product:

Statistic	***Description***
Product	The product name.
Reject count	The number of products rejected.
Accept count	The number of products accepted. Note that this will only be displayed if a photo-eye is used for product registration (only available on an IQ^{2}F with straight coils).
Total count	The total number of packs that have passed through the metal detector; ie the sum of reject and accept counts.

To display the batch results

- Press Σ.

  The currently running product is displayed:

- Press ▼ to step through and display the batch statistics for the current running products since the batch was last reset.

To reset the batch

- Press Σ, and press ▼ until the display shows **Reset batch?**

- Press ↵ to reset the current batch statistics.

  If batch reports are set to **Yes** on the **Report Options** menu the accumulated statistics will be printed or transmitted to the serial link.

The batch is reset automatically whenever the product is changed or when a batch report is generated.

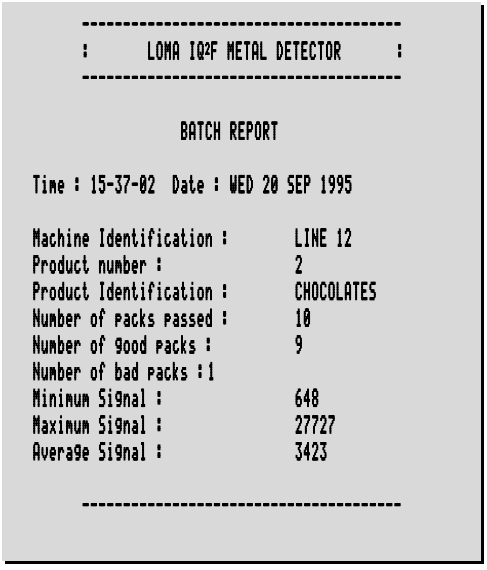
Producing reports

The metal detector can produce a range of reports about product statistics, machine calibration information, and machine status information. These can either be printed to a printer attached to a unit or transmitted down the serial link to a PC or Network.

The reports are as follows:

Report	***Description***
Error	Contains all the details from the Run Error log.
Fault	Contains all the details from the System fault log.
Setup	Contains the product Setup details from the **Product setup** and **Manual setup** menus.
Contaminants	Contains all the details from the Contaminant log.
Calibration	Contains all the data relevant to the calibration of the current product. This report is printed automatically after a calibration cycle.
Status	Contains the accumulated batch statistics since the start of the current batch.
PV test	Contains all the data relevant to PV test operation.
Batch	This report contains all the batch statistics such as the number of rejects for the current batch. This report is produced automatically on a batch-reset command, a change of product, completion of the batch interval, or when the unit is taken out of run. The batch interval can either be specified by time, or if a photo-eye is fitted by number of packs.

A sample report is shown below:



```
      ---------------------------------------
      :      LOMA IQ2F METAL DETECTOR      :
      ---------------------------------------

                  BATCH REPORT

Time : 15-37-02  Date : WED 20 SEP 1995

Machine Identification :       LINE 12
Product number :               2
Product Identification :       CHOCOLATES
Number of packs passed :       10
Number of good packs :         9
Number of bad packs :1
Minimum Signal :               648
Maximum Signal :               27727
Average Signal :               3423

      ---------------------------------------
```

To produce any reports, **Usage** must be set to **REPORTS** in link menu, **Link 1**. This is displayed by pressing #, and selecting the **Serial Link** submenu in the **Service** menu. The service password is 76.

A complete information package is given in the optional *IQ²F Service Manual*, part no. 814119. Basic link setup information is given in *Appendix A – Commissioning Guide*, page 84.

To specify which report to produce

- Press # to display the **Product setup** menu.

To specify which report to produce *(Continued)*

- Press ▼ until the **Report options** menu is displayed and press ↵ to select it.

  If this option does not appear on the **Setup** menu check that you have turned on the link in the **Serial Link** submenu of the **Service** menu.

The **Form feed** option is displayed.

Set this to **YES** to print a form feed at the end of each report or **NO** to print the reports without breaks.

- Press ▼ to display the **All reports** option.

  Set **All reports** to **YES** to enable all the reports. Alternatively, setting the option to **NO** displays a menu option for each report allowing you to individually specify which report to print.

To specify the batch statistics

If **All reports** has been set to **YES** or **Batch reports** has been set to **YES** in the **Report Options** menu (**Setup** menu), three additional menu options allow you to setup the batch statistics.

To specify the batch statistics *(Continued)*

- Press ▼ to display the **Batch units** option.

- Select **TIME** for the batch interval to be specified by time, or **PACK** for the batch interval to be specified by the number of packs.

  If you specify the batch units as time:

The Batch interval can only be specified in terms of the number of packs if a photo-eye is fitted; otherwise this menu option is not displayed.

- Press ▼ to specify the batch start. To ignore the start time set batch start to 00.00.

This option allows you to synchronize the start of each batch to a particular time of day. For example, if hourly batch statistics are required starting from 6.30 pm set the batch length to one hour and the batch start to 18.30.

- Press ▼ to display the **Batch length** option and specify the batch length in hours.

If batch units are set to **PACK**:

- Press ▼ to display the **Batch packs** option.

This can be set to a number between 0 and 9999 to specify the batch pack interval.

Displaying the contaminants, run errors, and system faults logs

The IQ²F Metal Detector maintains the following logs containing information about the product being tested:

Contaminants log

This contains details of the date and time of any contamination, as well as the product signal recorded for the contaminated product.

Errors log

Keeps a log of all errors generated by the system.

Faults log

Maintains a list of all system faults.

Each log can store up to 20 records. When the log is full the oldest entries will be overwritten with new entries unless the **Reports** option is being used, in which case a copy of the log will automatically be printed or transferred down the serial link ensuring that no information is lost.

To display the appropriate log

- Press Σ to display the currently running product.

- Press ▼ until **Contaminants**, **Run errors**, or **System Faults** menus are displayed and press ↵ to select it.

  After selecting the appropriate log you can either view the log entries, clear the log, or print a report of the log.

To view the log entries

- Press ▼ until the appropriate **View** option is displayed:

- Press ↵ to select it.

  If there are no entries in the log the message **Log empty** will be displayed.

Otherwise the number of entries in the log will be displayed, followed immediately by the most recent entry.

- Press ▼ to step through the log entries.

Each log entry is displayed on three lines, which you can step between by pressing ▼. The information for each entry is as follows:

Entry	***Example***
Error name	
Time and Error code	
Day and Date	

To print a copy of the log

- Select the log you want to print from the **Results** menu.
- Press ▼ to display the appropriate **Report** option.

- Press ↵ to select it.

  The display will show **Report sent**.

To clear the log

- Select the log you want to clear from the **Results** menu.
- Press ▼ to display the appropriate **Clear** option.

- Press ↵ to select it.

  The display will show **Errors cleared.**

Setting up the metal detector

This chapter explains how to calibrate the metal detector and set up the parameters affecting the operation of the machine.

Real-time clock and PV test are only available with the optional reports/logs package.

Calibrating the metal detector

The metal detector provides three alternative calibration procedures:

Update calibration fine-tunes the threshold value, while still checking for metal in the product. Use an update calibration to update the signal when the production line is running, if false rejects are occurring because the signal has drifted.

Full calibration completely recalibrates the detector, and to do this normal metal detection must be turned off. Use full calibration in all other circumstances or when an update fails to produce the required result.

Any calibration procedure must use true samples of the product to be run.

To recalibrate a product

- Press ▼.

  The display shows **Update?**

- Press ↵ to start the **Update**.

  A countdown timer will then be displayed while the update calibration takes place.

Finally the display shows **Calibrate complete**.

To perform a full calibration

- Press ▼, and then press ▼.

  The display shows **Full calibrate?**

To perform a full calibration *(Continued)*

- Press ↵ to start the full calibration.

  The name and number of the product being calibrated are displayed.

Followed by **Pass product**.

It then counts down as the calibration takes place.

Finally it displays **Calibrate complete**.

The following table lists the messages that may appear during calibration:

Message	***Explanation***
+Head overload+	The head power cannot be reduced any further to stop the head overloading. Possible reasons for this could be that: the calibration pack has a large metal contaminant in it, causing the head to overload; a product not specified for operation of the machine is being used; the foil tray is not passing through the aperture centrally. If in doubt, call your nearest Loma Service Centre.
+Bad pack+	The threshold which the machine is calculating for this product is exceeding the maximum threshold (set in the **Manual Setup** menu). This would typically be because the calibrate pack is contaminated or the foil effect is too large for the maximum threshold setting. Check that the calibrate pack(s) is representative of production packs. If in doubt, call your nearest Loma Service Centre.
+Power reducing+	The unit is reducing the head power to account for the effect of the foil.

Message	*Explanation*
+Head locked+	The unit is using the head power value from **Manual setup** menu, rather than determining it itself, as the head power has been locked in that menu.
+Calibrate complete+	Full calibration was successful.

Setting up the calibration parameters manually

Calibration parameters

The following table gives a summary of the calibration parameters you can edit in manual setup mode.

Parameter	*Description*
Min threshold	The minimum acceptable threshold after calibration.
Max threshold	The maximum acceptable threshold after calibration.
Threshold	Allows the threshold to be adjusted.
Head power	Can be adjusted between Max, 2, 1, or Min to adjust the head power.
Head	Allows the head power to be locked so it will not be adjusted automatically during calibration.

The menus are only accessible if **Manual Setup** has been set to **YES** in the **User option** menus.

These are explained in greater detail in the following sections:

To perform a manual setup

- Press ◀, and then press ▼ twice until the display shows **Manual setup**.

- Press ↵ to select **Manual setup**.

The options on the **Manual Setup** menu are normally set up by a Loma Service engineer and should not normally be adjusted.

Setting the trigger thresholds

The calibration procedure automatically determines the best threshold setting based on the samples pack used for calibration. Manual setup allows you to specify the minimum and maximum values for the threshold, as a safeguard that the calibration has been performed correctly.

To set the minimum and maximum threshold

• Select the **Manual setup** menu as described above. • Press ▼ until the display shows **Min threshold** and press ↵ to edit it.	
• Press ▲ or ▼ to increase or decrease the minimum threshold and press ↵ to confirm it.	*The minimum threshold is the lowest threshold that can be adopted after a calibration cycle, and should be set about 15% to 50% higher than the maximum signal levels produced by non-contaminated products.*
• Press ▼ to display the maximum threshold and press ↵ to edit it.	
• Press ▲ or ▼ to increase or decrease the maximum threshold and press ↵ to confirm it.	*The maximum threshold sets an upper limit on the acceptable threshold as a safeguard against contaminated product being used during calibration.*

Adjusting the threshold

This value is normally automatically set up during calibration and should not normally require adjustment.

While the value is being adjusted the **Calibrate** indicator will be illuminated.

Note: Any manual settings will be lost the next time a calibration is performed.

To adjust the threshold

- Press ▼ until the **Threshold** option is displayed and press ↵ to select it.

  The display shows the **threshold and signal** and allows you to edit the threshold.

- Press ↵ to edit the threshold.
- Press ▲ and ▼ keys to increase or decrease the threshold respectively and press ↵ to confirm it.

The threshold can be adjusted between 0 and 65535, in steps of 5, and defaults to 1000.

Adjusting the head power

The head power is set automatically during full calibration and should not normally need adjustment. However, you have the option of adjusting the head power manually, and locking the adjustment so that it will not be changed during calibration.

To adjust the head power

- Select the **Manual setup** menu.

- Press ▼ until the current head power setting is displayed:

- Press ↵ to edit it, press ▲ or ▼ to increase or decrease the head power respectively, and press ↵ to confirm it.

The head power can be adjusted to the values Min (least sensitive), 1, 2, or Max (most sensitive).

To lock the head power

- Press ▼ to display **Head**.

- Press ↵ to edit it, press ▲ or ▼ to switch between **LOCKED** and **UNLOCKED**, and press ↵ to confirm it.

Locking the headpower prevents it from being set automatically during a subsequent calibration.

Setting the time and date

It is important that the correct time and date are set on the machine as they are used to time stamp the data in the contaminant, fault, and error logs, and are shown on the printed reports. In addition, they determine the interval and synchronization of automatically initiated PV tests.

To set the time and date

- Press # to display the **Product Setup** menu.
- Press ▼ until the **Calendar** option is displayed:

- Press ↵ to select it.
- Press ▲ and ▼ to step between the following options: **Year**, **Month**, **Day**, **Date**, **Hours**, and **Minutes**.

- Press ↵ to edit any of the options.
- Press ▲ and ▼ to adjust the option, and then press ↵ to confirm it.

  Pressing C exits from the menu without making any changes.

Setting the machine ID

The **Machine details** menu provides information about the software fitted to the metal detector and the machine ID. The machine ID is printed out on any reports and can be edited to any convenient number, such as the identifier used in the factory.

To set the machine ID

- Press # and press ▼ to display the **Machine details** menu.
- Press ↵ to select it.

- Edit the machine ID in the usual way see *To edit a text field*, page 22.

Defining keycodes

Keycodes can be use to restrict operation of the metal detector to authorized users. Codes can be specified individually for the following areas of access:

- The sizing and changing keycodes
- Changing product
- Running a PV test.

To restrict access

- Press #, press ▼ until the **Keycodes** menu is displayed, and press ↵ to select it:

The **Keyboard lock** option is displayed:

To lock the keyboard

- Press  .

  The following prompt is displayed:

- Press  to lock the keyboard.

  Keyboard locked will be displayed:

  Access will now be restricted to entering the numbers specified in the keycode change and PV test options.

To gain access

- Press  , or select one of the other options to which access is needed.

  You will be prompted to enter the appropriate keycode:

- Press  and  to set the keycode and press  to confirm it.

  You will then have access to the options specified by that keycode.

For security the keyboard must be manually re-locked by pressing  followed by  .

Using Performance Validation

This chapter explains the benefits of the Performance Validation procedure, and explains how to set up the metal detector for PV testing, with information about each of the parameters that need to be specified.

Introduction

Regular checking of the metal detector's sensitivity should be a normal part of any quality assurance procedure. This is particularly important should it become necessary to demonstrate due diligence. One approach is to make regular sensitivity checks and keep handwritten records of the results.

To assist in maintaining quality assurance controls the metal detector includes an automatic Performance Validation system. This can be set up to prompt the operator to perform quality assurance checks on a regular basis, and it then prompts the operator through a sequence of tests using standard test samples. At the end of the Performance Validation test the results are transmitted to a PC or printer to produce a printed copy of the report.

A typical PV Test report is shown below:

```
      ---------------------------------------
      :      LOMA IQ²F METAL DETECTOR      :
      ---------------------------------------

                  PV TEST REPORT

Time: 10-22-00 Date:           MON 09 JUL 1995
Machine Identification:        MH23843
Product Number:      1         Name: CHOCOLATES
Prompt: 10-15-00               On:  MON 09 JUL 1995
Operator Identication:         ABC
Test Samples Ferrous:          5 x 1.00mm
Threshold Detection: 1000      False: 2000
PV Test prompt:                06:00

             **PV TEST SUCCESSFUL**

      ---------------------------------------
```

Setting up PV testing

To use PV testing the **PV Test** option must be set to **YES** in the **User Options** menu. An additional **PV test setup** option will then appear when defining a new product:

- Press ↵ to select it.

A series of options then allow you to specify how the performance validation test operates, and these are described in the following sections.

To set the performance validation interval

• Select the **PV test setup** menu as described above. The timing option will be displayed:	
• Press ↵ to edit it. • Press ▲ or ▼ to select between the options **OFF**, **INTERVAL**, or **BATCH**, and press ↵ to confirm it.	***BATCH*** *is only available if* ***Batch reports*** *has been set to* ***YES*** *in the* ***Report options*** *menu.*
If you have selected **INTERVAL**: • Press ▼ to display the **Interval** option and press ↵ to edit it.	
• Press ▲ and ▼ to increase or decrease the interval in hours and minutes and press ↵ to confirm it.	*The maximum time is 24 hours and the minimum time is the* ***Test window*** *value plus one minute. For example, to perform a PV test every six hours set* ***Interval*** *to 6.00.*

To set the performance validation interval *(Continued)*

- Press ▼ to display the **Synch** option and press ↵ to edit it.

- Press ▲ or ▼ to increase or decrease the synch time respectively and press ↵ to confirm it.

*Set **Synch** to 00.00 for unsynchronized testing. For example, if the Interval is set to six hours each PV test will be initiated six hours after the completion of the previous one.*

*Set **Synch** to the time of day for synchronized timing. For example, if **Interval** is set to six hours and **Synch** is set to 14.30, a PV test will be initiated at 2.30pm and then subsequently every six hours, irrespective of how long the PV test takes to complete.*

- Press ▼ to display the **Test window** option and press ↵ to edit it.

  This specifies the time in minutes within in which the PV test must be completed. If not completed within the specified time a **PV test timeout** error is reported.

The following options in the **PV test setup** menu allow you to specify the types of test that should be performed during performance validation.

The test wands you specify for performance validation should have been determined using sensitivity tests with the product after calibration**.**

To specify the characteristics of the PV test	
• Press ▼ until the **No of passes** option is displayed and press ↵ to edit it.	
• Press ▲ or ▼ to specify the number of passes of each specified test wand that must be detected to constitute a successful PV test and press ↵ to confirm it.	*The number can be set between 1 and 8. This should be set to a multiple of two so that test wands can be placed at the leading and trailing edges of the product.*
• Press ▼ to display the **Fe size** option and press ↵ to edit it.	
• Enter the size of ferrous test wand which should be prompted for when a PV test is initiated.	*The size can be 0.01 to 10.00 millimeters. Setting the size to 0.00 will disable the prompt during testing.*

To specify the false threshold

- Press ▼ to display the **False thresh** option and press ↵ to edit it.

This is used to identify metal test samples, which are greater than those specified for testing.

It can be set to any value between 0 and 99990, and can be adjusted in steps of ten units. It defaults to twice the normal threshold value.

Running a performance validation test

If timing has been set to **INTERVAL** or **BATCH** in the **PV Test Setup** menu a Performance Validation test will automatically be initiated during normal product testing. A PV test is automatically initiated in the following situations:

- If timing has been set to **Interval** in the **PV Test Setup** menu and the specified time interval has lapsed.
- If the **Batch**, **Interval**, **Time,** or **Size** has been exceeded, depending on how the batch reporting has been setup.
- If a batch is manually reset.
- If the product is recalibrated.
- If a batch is terminated or a new batch is started as a result of changing the current product.

When this happens the normal operating display will show:

- Press ↵ to proceed with the PV test.

Alternatively, a Performance Validation test can be run at any time from the **Results** menu using the following procedure.

To run a performance validation test

- Press Σ to display the **Results** menu.
- Press ▼ arrow until the **Run PV test?** option is displayed.
- Press ↵ to confirm that you want to run the PV test.

The following **Operator id** prompt will be displayed:

- Press ↵ to edit the prompt and then enter the operator ID in the usual way; see *To edit a text field*, page 22.

The test will then prompt the operator for the size of the first type of test wand specified in the **PV test setup** menu:

It will then perform the first pass of PV testing.

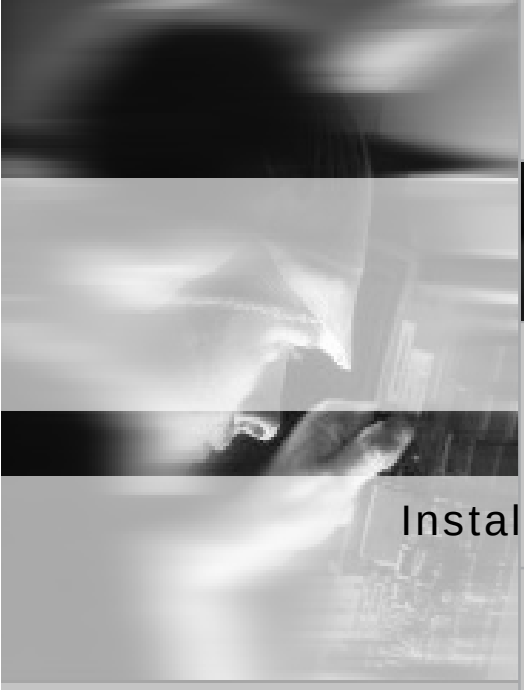
If no test sample sizes have been programmed then the display will show **+ No Samples+** and a report will be produced immediately.

To cancel a performance validation test

- Press C.

  If the PV test was run manually no error is caused, but if the PV test was initiated automatically a non-action error is recorded and a report is generated.

At the end of the PV test the display will revert to the previous display.



Installing the metal detector

This chapter describes how to install the metal detector range. It first gives general information, applicable to all versions, followed by specific installation instructions for each version.

General information

The following information applies to all versions of the metal detector.

For a description of each version of the metal detector range see the chapter *About the metal detector range*, page 1.

Warnings

The following safety warnings apply to the procedures for all versions:

1. LETHAL HAZARD – ELECTRICAL SUPPLIES

2. LETHAL HAZARD – COMPRESSED AIR SUPPLIES

3. WORKING ON EQUIPMENT

4. REJECT DEVICES

6. HEAVY EQUIPMENT

7. LIFTING EQUIPMENT

8. MOVING METAL DETECTORS

9. CONTAMINANTS

For details see *Safety warnings*, page iii.

The following emergency procedures apply to these procedures:

2. DEALING WITH FIRE.

For details see *Emergency procedures*, page v.

Space required for installation and maintenance

It is important that sufficient free space is left at the front and back of a metal detector to enable commissioning and maintenance personnel to easily gain access to components. It is recommended that wherever possible a minimum of 1 metre free space is available at the front of the machine and 1 metre at the rear.

Lifting and moving a metal detector

Depending on the size and weight of the metal detector either a crane or a fork-lift truck will be required to lift and move it into the final location.

When a metal detector which is fitted with wheels is to be pushed on the wheels, it is important that it is moved carefully. Avoid hitting obstacles with the wheels as this can damage the plastic wheel inserts inside the legs.

Do not attempt to lift or move a metal detector by a reject cover. Reject covers are made of plastic and are easily damaged.

Using a crane

- Position the straps on any unit so it will not tilt when lifted. Attach the straps to the crane.
- Lift the unit and carefully move it to the required location.
- Lower the unit and remove the straps.
- Never put straps through any aperture.

Using a fork lift truck

- Position any unit on the forks so it does not tilt. Raise the lift sufficiently to lift the unit clear of the ground and any obstacles.
- Carefully move the unit to the required location.
- Lower the forks and withdraw them from the unit.

Removing packing materials

- Remove and discard all packing and protective materials.

EMC considerations

All Loma equipment is designed to operate under factory conditions, and has been tested to recognised international standards for Electromagnetic Compatibility (EMC). It is still necessary, however, to ensure that the equipment is not subjected to excessive electrical noise via its supply or airborne sources.

Electrical supply considerations

The unit should have its own dedicated supply, unless the line supply is known to be clean. The earth should be robust, of low impedance and noise free.

Any dedicated supply line should run in its own conduit/trunking away from other noisy supplies.

The input voltage should not be subject to voltage fluctuations outside the limits (NWML0320):

- Minus 15% to plus 10% of the nominal supply voltage (230V or 110V).
- Zero voltage for more than 20mS.
- 50% of nominal voltage for more than 40mS.
- 80% of nominal voltage for more than 100mS.

Operation outside these limits may cause loss of function until the supply condition recovers to within limits.

Other EMC considerations

Any signal I/O which is connected to the auxiliary connections should be in screened cable, grounded at one end by a low impedance path to RF, and kept free from sources of electrical noise (eg mains supplies for large electrical machines).

The metal detector is a highly sensitive measuring device, which is well screened from outside interference and has excellent screening against unwanted magnetic fields. However, due to its sensitivity it is possible that other devices which create a magnetic field could cause interference, thereby degrading the performance of the detector. It is therefore important to avoid siting the detector next to any devices which contain either fixed or electomagnetic devices if proper operation is to be maintained.

All Loma metal detectors are designed, and tested, to meet the requirements of the FCC and the new stringent European regulations for RF emissions, both in terms of not emitting excessively and not being subject to undesirable operation in the presence of other equipment whose emissions also meet the standards.

This approach allows Loma to offer stable operation even in noisy environments, provided the other equipment is to the same standards and the field wiring is suitable ‘hard’.

These guidelines are based on the PPMA EMC Code of Practice, which should be referred to if in doubt about any aspect of making external electrical connections to the detector.

Installing a serial link

The main control electronics board must have the optional Report/Logs package and serial link board fitted.

In order to use any of the serial link options your detector will require a cable and connector assembly which facilitates external connection to the on board serial link electronics. The connector is normally located on the underside of the control box.

If a serial link option was ordered with your detector the necessary internal cables and external socket complete with a blank mating external plug and connection diagrams will be supplied.

If you wish to add a serial link to an existing system please contact your local Service Centre who will be pleased to assist.

Refer to your optional Service Manual for wiring installation guidelines and link position information for all available links.

Belt conveyor versions

This section describes how to install Loma flat belt and plastic modular belt conveyors that are ready fitted with Loma metal detector search heads. After connection of the appropriate services, a conveyor is ready for immediate use.

Warnings

The following additional safety warnings apply to these procedures:

5. EXCESSIVE NOISE

10.TRAPPED FINGERS.

For details see *Safety warnings*, page iii.

The following emergency procedures apply to these procedures:

1. EMERGENCY SHUTDOWN OF CONVEYORS.

For details see *Emergency procedures*, page v.

Preparing to install a conveyor version

All conveyor metal detectors are dispatched from Loma Engineering in the following state:

- Feet (if fitted) are screwed fully in.
- Wheels (if fitted) are screwed fully in and are locked (UK only), or supplied in a polythene bag which is placed inside the reject bin (Europe). Feet may have been fitted for transit purposes or 20mm bolts may be used to secure the conveyor to the pallet.
- Delicate items are covered in protective wrapping material.

Removing bolts and fitting wheels

- Conveyors for customers in Europe may have been secured to the pallet by 20mm bolts which are screwed into the underside of the legs. Remove these bolts if fitted.
- If wheels have been supplied for the conveyor, remove them from the reject bin and remove the packing material. Fit the wheels to the outrigged legs of the conveyor.

Adjusting/levelling the conveyor

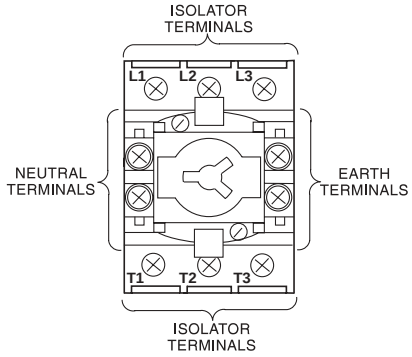
- Adjust the infeed and outfeed heights as necessary by means of either the adjustable feet or adjustable wheels. Make sure that all feet or wheels are firmly on the ground, and are evenly supporting the conveyor so that it does not rock. If necessary, anchor the conveyor to the ground using bolts screwed into the feet. Do not fasten the conveyor to any other piece of machinery as this could lead to vibration being transmitted to the head, resulting in spurious triggering.
- When the height is correct, lock the wheels (if fitted).
- If the conveyor is fitted with feet, you are recommended to apply silicone sealant around the feet and floor.

Connecting electrical supplies

The standard metal detector conveyor is fitted with a starter isolator and a 24V ac control circuit. The supply voltage for the conveyor is indicated on the identification plate that is mounted on the frame.

- Switch the isolator to the ‘Off’ position then unlock and open the door.

The following illustration shows the isolator inside a typical electrical services box:



- Remove the plastic terminal cover from the starter isolator.
- Cable entry is via the brass gland provided on the bottom rear face of the electrical services box.

NOTE: Do not use rigid conduit of any type. Rigid conduit can lead to vibration being transmitted to the head, resulting in spurious triggering.

- The supply to the conveyor must be either 5-core cable (3-core cable is suitable for single-phase machines) fed through a flexible conduit or 5-core armoured cable. Insert the cable through the gland.
- Split the cable inside the box and cut the wires to suitable lengths. The wires for the phases, neutral, and earth are connected to terminals on the isolator switch.

- Make the connections to the isolator switch as follows:

3-phase earth and neutral	
Core	***Terminal***
3-phases	L1, L2 & L3
Neutral	N
Earth	E
3-phase earth and no neutral	
Core	***Terminal***
3-phases	L1, L2 & L3
Neutral	Not used
Earth	E
1-phase earth and neutral	
Core	***Terminal***
3-phases	L1
Neutral	N
Earth	E

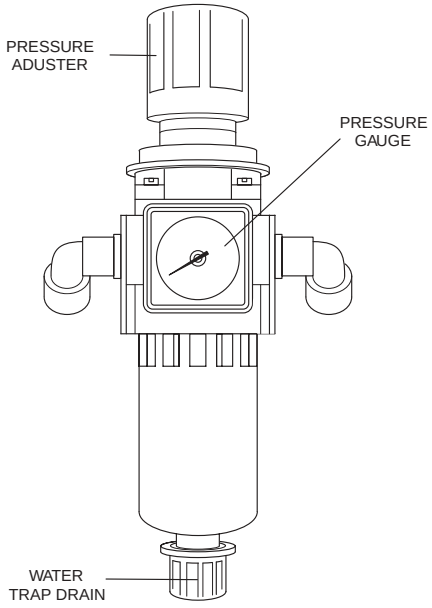
- Check that all connections are secure and correct then securely refit the plastic terminal cover onto the isolator.
- Close and lock the door.

Connecting the air supply (pneumatically operated reject only)

The minimum air pressure must not fall below 65psi (4.5 bar) when the reject operates.

With the exception of a conveyor that is fitted with an air-blast reject, the air supply is connected to a regulator that is fitted to the front of the conveyor, set to 80psi (5.5 bar). For air blast units the air supply should be 100psi (6.9 bar).

The following illustration shows a typical regulator unit:



With the exception of conveyors fitted with either an air-blast reject system or Stop-On-Detect reject, a low-pressure air switch is fitted electrically in series with the starter motor coil. This goes open-circuit if the air pressure drops below 40psi (2.8 bar).

The air supply is connected using 10mm O/D tubing to the 90° elbow. The elbow will be located on the side of the air regulator unit or the air blast solenoid depending upon the reject type fitted.

Checking guards

- Check that all guards are securely fastened in place. On some conveyors that are made to special order, electrical interlocks may be fitted.
- Check that the infeed and outfeed of the conveyor are clear of obstructions.

Powering up the conveyor

- At the electrical services box, switch on the main isolator.
- Switch on the Control Unit.
- Switch on the compressed air supply to the conveyor.
- At the electrical services box, press the ‘Start’ button. Check that the conveyor starts and the belt runs in the correct direction.

If it is running correctly:

- Where a low air pressure switch is fitted, disconnect the air and check that the motor stops. No low air pressure switch is fitted to a Stop-on-detect system.

If it is not running in the correct direction (3-phase systems only):

- At the electrical services box, press the ‘Stop’ button. Switch off the control unit.
- At the electrical services box, switch off the main isolator to isolate the electrical supply to the conveyor.
- Isolate the pneumatic supply to the conveyor, if appropriate.
- Unlock and open the door of the electrical services box.
- At the isolator switch, reverse the connections of any two phases.
- Close and lock the door of the electrical services box.
- Repeat the above procedures.

Checking belt tracking (PV belt systems only)

The belt must be checked for correct tracking before running the conveyor for any length of time.

If belt tracking needs to be reset see *Routine maintenance*, page 79.

Setting up reject mechanisms

The conveyor system is supplied with the reject mechanism correctly set up. Normally, no further adjustment should be required.

If the reject Delay and Dwell times need to be adjusted, these are set up via the user interface from the control panel. Refer to *Setting up a product*, page 24.

Air Blast reject

Since this type of reject has no throttle controls, adjustment is via the reject delay and dwell times or by changing the height or angle of the air blast nozzle(s).

IQ^{2}F search head only installation

This section describes how to install a Loma metal detector search head to either an existing conveyor or to a conveyor being built by a customer.

Electrical supply considerations

All Loma equipment is designed to operate under factory conditions, and has been tested to recognised international standards for mains-borne interference. It is still necessary, however, to ensure that the equipment is not subjected to excessive electrical noise via its supply. The following simple steps should be followed to ensure this:

The unit should have its own dedicated supply, unless the line supply is known to be clean.

Any dedicated supply line should run in its own conduit/trunking away from other noisy supplies.

Any signal I/O which is connected to the auxiliary connections should be in screened cable, grounded at the point of entry to the detector control box, and kept free from sources of electrical noise (eg mains supplies for large electrical machines).

The installation space must be free from all source of external magnetic interference.

Before starting to install a head

Before starting to install a head on a conveyor, installation personnel are strongly recommended to read *Mounting heads on conveyors*, page 69, to thoroughly familiarise themselves with the installation requirements.

Connecting electrical supplies

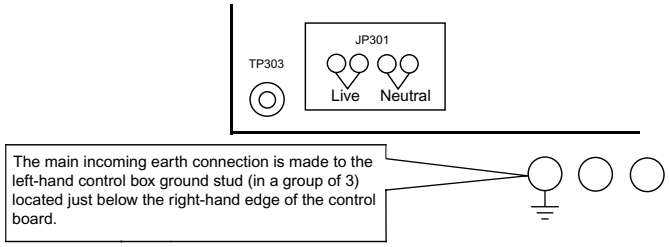
In the case of a metal detector search head supplied as a Head, electrical connections are made to a connector block inside the control box.

Use a clean supply source preferably with a dedicated breaker for both the main supply and reject power. It is important that the system has a good ground.

When routing the main supply source to your system ensure the cable routing does not pass through nor run parallel to any electrically noisy enclosures or cables. Do not mix main supply cables with signal cables.

Use a suitable suppressor to suppress the reject supply coil. This must be fitted as close as possible to the coil.

The following illustration shows the connection arrangements at the connector block:



- Power cabling must be rated at no less than 5A current carrying capability and be routed into the control box by a suitable watertight gland. The power input gland hole is on the extreme left of the control box when facing the controls.

NOTE: Do not use rigid conduit of any type. Rigid conduit can lead to vibration being transmitted to the head, resulting in spurious triggering.

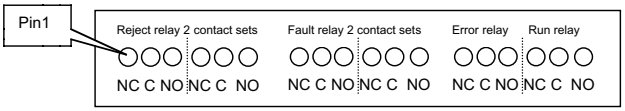
- Open the control box door and remove the safety cover angled terminal access plate only from the power supply cover. Place it in the bottom of the control box door.
- Split the cable inside the box and cut the wires to suitable lengths.
- The previous illustration provides connector block wiring details. Make the connections to the connector block as follows:

AC wiring colours will vary according to territory.			
North America	Black	=	HOT
110/120v	White	=	NEUTRAL
	Green/Yellow	=	EARTH
All Others	Brown	=	LIVE
200/240v	Blue	=	NEUTRAL
	Green/Yellow	=	EARTH

Relay contact information

When connecting your own reject device refer to the voltage free relay connection information given below. It is suggested that the reject device wiring is connected in series with a set of fault relay contacts to enable the reject to be operated in the event of a system fault being generated, ensuring failsafe reject operation for a fault condition. Contact switching information is given in *About the metal detector range*, page 1.

Connections are made depending upon your requirement. Contacts shown are for relays when de-energized (failsafe):



- Check that all connections are secure and correct, then securely refit the terminal access plate over the power supply.
- Close and secure the control box door.
- Please refer to *Appendix D* for details for connecting reject confirmation, bin full and product registration photo-eyes.

Mounting heads on conveyors

Loma Engineering has been manufacturing metal detector systems for many years and our current conveyor design incorporates this wealth of experience. There are a number of points to be aware of when fitting a new Loma metal detector head to an existing conveyor of whatever manufacture, or when building a new conveyor to incorporate a metal detector head, if nuisance triggering necessitating operation at reduced sensitivity settings is to be avoided.

The basic rules are summarised as follows:

1. The conveyer must be of a substantial and preferably welded - not bolted - construction. **Note**: If the IQ^{2}F is to be mounted on the same conveyor along with a general detector, then the conveyor construction must take into account the construction requirements applicable to a general purpose detector such as the IQ^{2}F.

2. Fixed and non-magnetic moving metal must be no closer than 100mm (4 inches) from either aperture face.

3. The search head should be mounted on the fixing bars supplied, with an insulated resilient strip between the bottom of the case and the bars. The bars are fixed to the conveyor frame via the long threaded bolts. All nuts and bolts required for the supplied parts are in the fixing kit. Suitable mounting plates to secure the long threaded jacking screws are conveyor design and width dependent and are not supplied.

4. The search head cut out depth should be sufficient to allow the search head to be vertically lifted up and down in order to position the foil to be used centrally in the aperture.

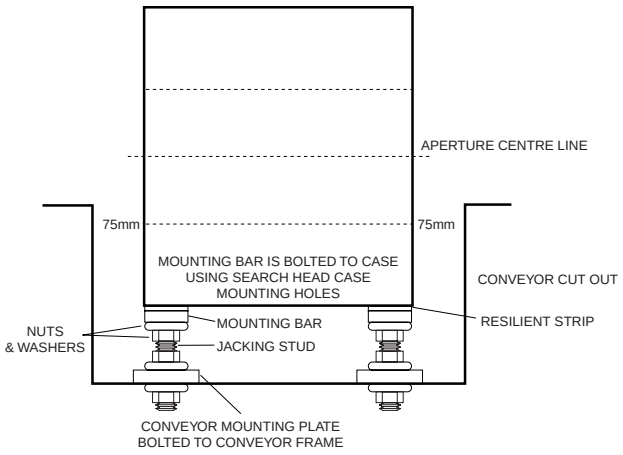
5. The conveyor belt should be of non-metallic polyurethane construction of suitable thickness and durability to adequately convey the product, with an angled heat sealed or vulcanised joint. The joint angle can be horizontal to no more than 30º from the horizontal when looking in the direction of flow. If an angled joint is used the leading edge of the joint must be on the right-hand side of the belt, again looking in the direction of flow. Care must be taken to ensure the belt does not touch any part of the aperture.

6. Roller construction should be of PVC coated aluminium, or non-magnetic stainless steel. Mild steel or cast iron roller must never be used.

7. Roller shafts and bearings should be of non-magnetic stainless steel construction. Mild steel shafts and carbon steel bearings should never be used.

8. The belt must be supported through the aperture by means of a non-metallic skid plate, which must be strong enough to support the weight of the product to be conveyed without bowing. A careful choice of material is important to avoid excessive build up of static electricity.

9. Electrical interference: The reject relay usually switches inductive loads such as motor starter contactors, or solenoids for air operated reject devices etc. These devices should have interference suppressers fitted at the device to be switched.



Reasoning behind the basic rules

Most problems with intermittent or nuisance triggering are due to insufficient appreciation of the basic problem involved. This section sets out to describe the reasoning behind the basic rules.

Conveyor construction

For a conveyor to be effective and to give many years of trouble free service, it is important to ensure the conveyor is of a sturdy welded construction using a good grade of stainless steel. It is extremely important not to use any mild steel parts in the construction, as these could become magnetised and if they were to move at any time could cause the detector to trigger.

Bearings must be of a non-magnetic stainless steel as the search head contains a number of powerful permanent magnets. Although the outer surface of the case is of stainless steel, the inner case is of mild steel, which contains the majority of the magnetic field produced by magnets. However, because the search head has an opening (aperture) through which the product passes, the field will escape in that region.

Therefore any carbon steel bearings within that field will in time become magnetised and when subjected to movement will cause the detectors to false trigger. The same rules apply to rollers and shafts if made from mild steels.

Fixed and moving metal: A gap is left between the faces of the search head and the edge of the conveyor cut out to ensure no contact can be made between the conveyor and the search head, which could transmit unnecessary vibration or impede its vertical adjustment.

Vibration

It is important the search head is not submitted to excessive vibration. The conveyor should be stable and well supported in order to keep the search head stable. All fixing nuts and bolts should be kept tight and any adjustments made to the search head in the vertical direction to suit the foils being used must be an equal amount to each of the four jacking screws, in order to maintain a horizontal aperture.

Do not use the search head or its control box as a convenient point to anchor any conduit or pipe work whatever, whether it be rigid or flexible.

Never use the search head as a walkway across the conveyor nor as a convenient writing desk or repository for any loose objects

Belting

The conveyor belt should be of a plastic or polyurethane type preferably with an angled belt at 30º to the horizontal when looking in the direction of the flow, and vulcanised or heat sealed. The leading edge of the joint should be located on the right-hand side of the belt when looking in the direction of flow. This ensures the joint traverses the pick-up coil progressively when the belt is in motion. However, as the pick-up coil within the search head is itself angled, a straight joint could be used if an angled joint is not possible.

A clipped or sewn joint is not acceptable as product can become caught in the joint and cause problems with cleaning, or if the clips were in any way ferrous in nature they may cause false triggers.

The belt must be wide enough to transport the product but not touch the sides of the aperture.

Care must be taken when fitting a belt. All metallic swarf and filings, particularly those of a ferrous nature, must be cleared away before beginning any belt jointing process, as metal can become embedded in the joint and cause false triggers

Care must be taken to ensure that the belt tracks easily and does not track off touching the aperture sides. Apart from cutting a groove into the aperture lining material, vibrations will be transmitted causing possible false triggers

Skid Plate

The belt must be securely supported through the aperture. The material chosen should be rigid and capable of supporting the weight of the product/s to be run without bowing. Suitable materials include phenolic plastic, UHMW or Delrin for example. However a plastic such as Darvic or an Acrylic or polycarbonate derivative is not recommended, as the motion of the belt running across the surface of the material can create very high levels of static electricity, which upon discharge to earth would cause a false trigger.

Electrical and magnetic interference

The detector system has been designed with a high immunity to mains born interference. If trouble is experienced, the offending devices should be located and suppressed at source where it is much easier to control. The detector may have to be run at reduced sensitivity if this is not possible.

All inductive devices, such as reject solenoid valve coils, motor starter contactors and similar devices, should be suppressed by fitting suitable suppressers across the inductive load as close as possible to the coil. Other devices such as thyristor control gears should be suppressed in the best possible manner.

Airborne interference is more difficult to deal with as it is picked up in the internal coil, which acts as an aerial. Common sources are radio paging aerials and loops, and hand-held two-way radio devices.

Magnetic interference can be generated by devices such as electromagnetic brake systems, relays and solenoids. The cure for this type of interference is to magnetically screen the device at source.

Post-Installation Problems

Spurious Triggering

The Loma range of metal detectors is the product of many years of experience and development. They are inherently reliable. Provided a detector is set up as described in the setting up procedure, it is unlikely that any problem lies within the search head or control unit. Remember the unit is a metal detector and thus can detect moving metal anywhere within the metal free area.

This metal can be:

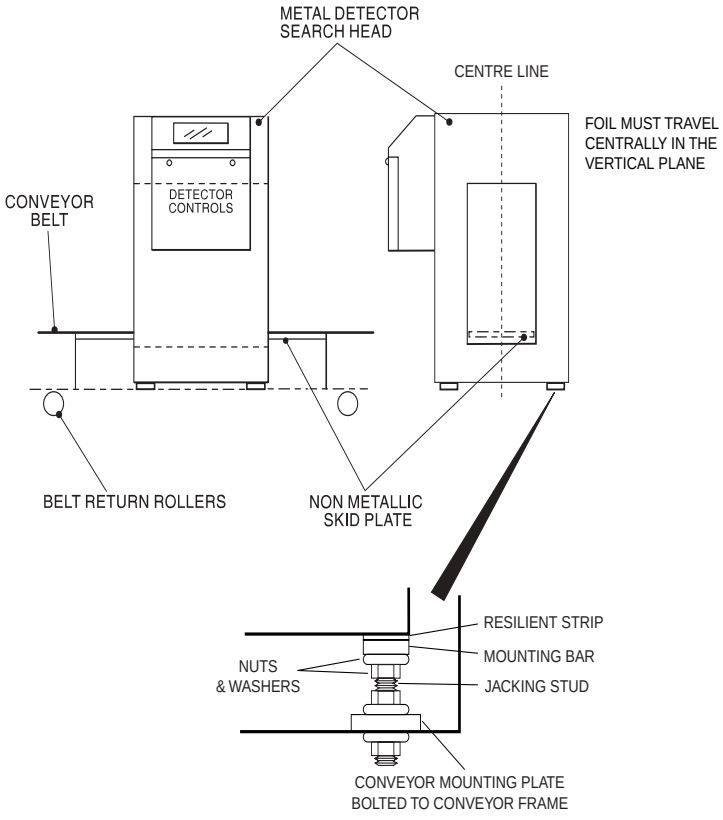
- Operator rings or watches
- Belt contamination by ferrous particles: Remember to clean both the underside as well as the top surface of the transport belt
- Metallic (ferrous) belt clips or low grade stainless steel even if plastic coated
- Metallic guide rails again ferrous or low-grade stainless steel
- Ferrous or low-grade stainless steel swarf attracted by the permanent magnets and suspended within aperture.

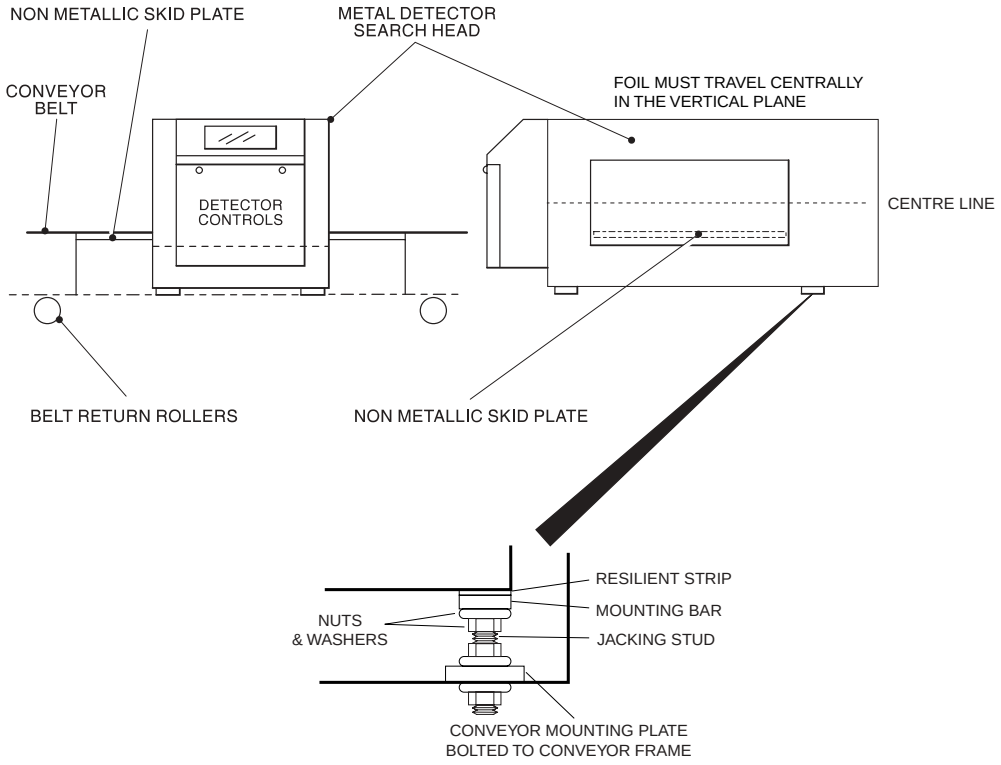
Other sources, magnetic:

- Engineers tools which have become magnetised over time
- Operator keys, which have become magnetised over time
- Another magnet of any kind.

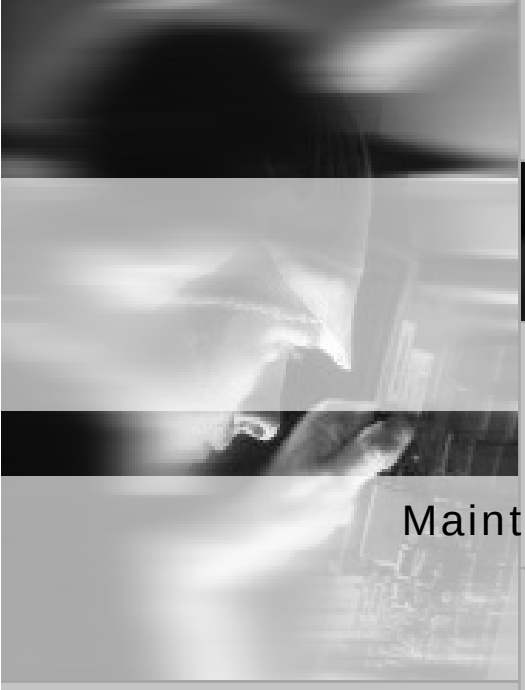
Further information

This section contains standard mounting positions for Loma Metal Detector heads.





Further information and advice can always be obtained from the Service Department.



Maintenance

This chapter describes the maintenance procedures for the metal detector range.

Inspection and cleaning procedures

These procedures relate to all the metal detectors in the IQ²F range.

Warnings

The following safety warnings apply to these procedures:

1. LETHAL HAZARD – ELECTRICAL SUPPLIES.

2. LETHAL HAZARD - COMPRESSED AIR SUPPLIES.

3. WORKING ON EQUIPMENT.

4. REJECT DEVICES.

For details, see *Safety warnings*, page iii.

Cleaning information

Conveyor systems may be hose washed, handwashed or dry wiped.

More information may be contained in the individual system paragraphs.

If a hose wash is to be used the maximum safe wash down conditions are as follows:

- Water jet nozzle is < 12.5mm (1/2") diameter.
- Water delivery rate is <105 litres/minute (23 gallons/minute).
- The distance of the nozzle from the equipment is 2.5 - 3.0 meters (8 - 10 feet).
- Never direct water into bearings.

Daily

- Isolate the electrical and pneumatic supplies to the conveyor.
- If fitted remove the reject container. Empty, wash with a mild detergent, rinse and dry.
- Brush any loose debris off exposed conveyor surface and belt scraper, if fitted.
- Wash all exposed surfaces, rollers, skid plate and underside of belt using a mild detergent.
- Rinse and dry thoroughly all washed areas. Particular attention should be taken when drying rollers, skid plate and the underside of the belt.

Weekly

Belt conveyor versions

- Isolate the electrical and compressed air power supplies to the conveyor.
- Check the system has been cleaned correctly and there is no build-up of product anywhere.
- Inspect the conveyor belt for signs of damage.
- Where an air regulator unit is fitted check the water build up in the trap and drain off as required as described in *Routine maintenance*, page 79.
- Check the security of all conveyor guarding systems.
- Re-connect power and air supplies then check the following.
- Where interlocked guarding is fitted check the conveyor stops when the guard is opened.
- For PU belted conveyors check the belt is correctly tensioned and that the belt tracking is correct. Belt tensioning and tracking is described in *Routine maintenance*, page 79.
- For plastic modular belting conveyors check the belt for any damage. Belt tension and tracking are not adjustable. For replacement of individual sections see *Routine maintenance*, page 79.
- Check the correct operation of the reject system. Advice can be found in *Good practice*, page 13.
- If the system is fitted with reject confirmation and bin full sensing check that a rejected item is correctly confirmed by the detector and that blocking the bin full sensor for more than five seconds produces a system fault.

Specific cleaning procedures

NOTE: After any of the following procedures thoroughly dry all the washed components to remove any detergents, to avoid product contamination.

Routine maintenance

These procedures relate to all the metal detectors in the IQ²F range, unless otherwise specified.

Warnings

The following safety warnings apply to these procedures:

1. LETHAL HAZARD – ELECTRICAL SUPPLIES.

2. LETHAL HAZARD - COMPRESSED AIR SUPPLIES.

3. WORKING ON EQUIPMENT.

4. REJECT DEVICES.

9. CONTAMINANTS.

For details, see *Safety warnings*, page iii.

Greasing

Drive end and idle roller shafts on conveyor systems are fitted with bearings that require greasing at regular intervals.

Bearings should be greased four times per year, unless the environment or cleaning regime dictates greasing more frequently. BP Energrease LS2 or an equivalent grease is recommended.

Conveyor systems

- Isolate the electrical and compressed air supplies.
- Some designs may require the removal of fitted covers or guards to gain access to the bearings.
- Using a grease gun, apply grease to each nipple in turn. Take care not to apply too much grease. Grease should not issue from the bearing.
- Re-connect the electrical and compressed air supplies.
- Ensure all removed covers/guards are replaced.

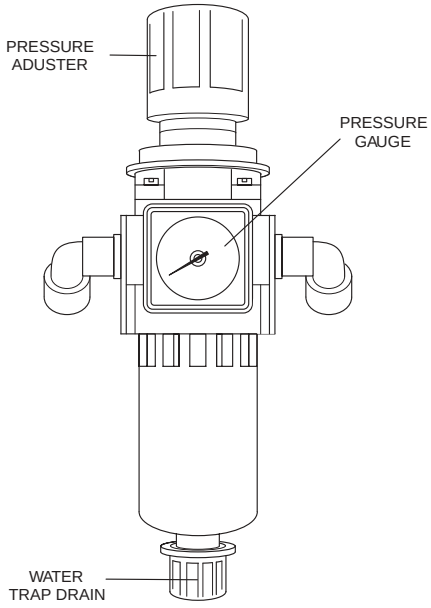
Air regulator unit maintenance

With the exception of systems fitted with air blast or Stop-On-Detect or electrically driven rejects the compressed air supply pressure to the fitted reject device is fed through an air regulator unit. The particular model of regulator may vary according to the specification of the system. Each type will have a pressure adjustment control air input and output fittings a pressure gauge and water trap.

Adjustment of the air pressure is normally carried out by pulling up the adjustment knob to release the lock and by turning the control clock or anticlockwise the pressure can be adjusted.

Removal of water from the water trap bottle is carried out by operation of a rotating knob or by pressing a button. Either way the control will be located at the bottom of the water trap bottle. Water should be removed regularly.

A typical regulator unit is shown for information:



The correct setting of the air pressure can be found in the individual system specifications in *About the metal detector range*, page 1.

Conveyor belt maintenance

Plastic modular belt conveyor versions – belt section replacement

- If product guides are fitted to the conveyor, unscrew the retaining screws and remove the guides.
- Clamp the belt either side of one of the plastic hinge pins that are used to join the sections of the belt together that require changing.

NOTE: If you do not clamp the belt it will roll off the loose sprockets when you remove the pin.

- Carefully slide out the plastic hinge pins and remove the section of belt to be replaced.
- Carefully interlock the new section of the belt. Make sure the belt is located on the drive sprocket and correctly engage with the other ‘floating’ sprockets.
- Carefully slide the plastic hinge rods through the interlocked sections of belt.
- If product guides were removed from the conveyor, refit them in position and tighten the securing screws.

Setting the belt tension and tracking

If the belt slips or moves during normal operation, check the rollers are clean and free from debris and greasy elements then follow the steps below.

Adjusting the hexagonal lock nuts on the studs of the four hanger bearings at the ends of the conveyor facilitates belt tracking and tension adjustment for this type of conveyor. Do not over-tension the belt as this may cause premature wear to the bearings.

- Main belt tensioning is controlled by the hanger bearings at the drive end of the conveyor. This is factory set and must not be adjusted on site.
- Tracking and minor tension adjustment is controlled by the hanger bearings at the idle end of the conveyor. Increasing the tension on the right-hand side of the belt will cause the belt to move to the left. A decrease in tension on the right will cause the belt to move to the left. Adjust until the belt track is central.

Adjusting the drive chain tension

The conveyor belt drive chain is tensioned by undoing the four bolts holding the motor and moving the motor until the correct tension of 5mm maximum free play at the central point between the pulleys is achieved.

Adjusting the reject mechanisms

Pusher and retracting band rejects

At the reject solenoid valve, adjust the two throttle screws, in conjunction with the reject delay and dwell times, until the required reject timing and speed of operation are obtained. Both the reject timing and the speed of operation are affected by the air pressure supplied to the conveyor.

Air blast reject

Since this type of reject has no throttles, the only variables that can be adjusted are the reject delay and dwell times. There is no air regulator supplied with the air blast reject. However, the air supply pressure should be approximately 100psi (6.9 bar).

Appendices

Appendix A – Commissioning Guide

Each time the detector is switched on the software version fitted on the detector's control board will be displayed for approximately 0.5 seconds. If this is the first time the detector is switched on it needs to be configured for the end application. Wherever possible this will be carried out by Loma before the unit is dispatched, or by a Loma Service Engineer during a commissioning visit. Primarily, this information is required to optimize machine performance for the application, and to enable certain features.

There are circumstances, however, where it may be necessary for the end user to carry out the commissioning procedure for the control unit himself. Typically, this would occur when Loma do not have enough information about the end application, such as the belt speed or reject details, to fully configure the machine. There are, in addition, other instances such as performing a software update, moving the detector to a different application, replacing a control card, etc. The unit can easily be set up from scratch as required. Alternatively, if only small changes are required to the configuration of the machine, then the menu entries within the **Service** menu can be adjusted individually.

Configuring the metal detector

Record the configuration details for the machine on the map menu. We suggest that you fill this in when you configure the system, so that if you ever need to repeat the exercise all the information will be ready to hand.

To enter the **Configuration** menu:

- Press  .
- Press  until the display shows **Service** and press  .
- Press  until the password shows **76** and press  .

The display shows **User options**.

- Press the  until the display shows **Configuration** and press  .

The display shows **+Not detecting+**.

The correct parameters must now be entered into the configuration menu. For information about using the menus see *Using the menus*, page 21.

The parameters and available options are summarised in the following table:

Parameter	***Options***
Language	ENGLISH (default entry), FRANÇAIS, NEDERL, DEUTSCH, ESPAÑOL, ITALIAN, PORTUGES, KATAKANA.
Type	FOIL
Units	METRIC or IMPERIAL.
Photo-eye	Select **YES** if a photo-eye has been wired to the control board.
Coil gap	Enter the coil gap as shown on the machine details plate (inside control box) or from the table in your Service Manual.
Photo-eye length	This entry will appear, if a value must be entered. The photo-eye length is the distance from the centre line of the photo-eye to the leading face of the detector plus the Rx distance (again shown on the machine details plate).
Filter resist	Enter the filter resistor value as fitted on the main control board.
Speed mode	Select **FIXED**, unless your system is vari-speed. For variable speed systems select **VBLE**.
Belt speed	This entry will appear if speed mode is set to **FIXED**. Enter the belt speed.
CTB constant	This entry will appear, if speed mode is set to **VBLE**. Enter the **CTB** constant.
Tolerance	Select the required level of tolerance to be adopted during auto-calibration. The higher the setting the more sensitive the detector, but the more prone it will be to false rejects if the product effect varies (phase dispersion). We recommend **LOW** for most applications.
Autocal	Select the desired auto-calibration period: **Short**, **Long** or **Extra Long**. Short is recommended for most applications, provided that at least eight packs can be passed during a calibration cycle.

The following table summarises the available tolerance settings:

Menu position	***% of calibrated threshold added***
MIN	15%
LOW	25%
MED	50%
HI	75%
MAX	100%

The auto-calibration periods are summarised in the following table:

	Photo-eye	***No photo-eye***
Short	8 packs	20 seconds
Long	20 packs	1 minute
Extra long	n/a	2 minutes

- Press C to exit the **Configuration** menu.

Setting up user options

The detector must now be set up for the desired user options. Until you are completely familiar with the operation of the detector, it is recommended that all the options are left at their default values.

- Press ▲ until the display shows **User options**.
- Press ↵ to move into the **User options** menu, and then set up your options are desired.

The available options are summarised in the following table:

Options	*Description*
Reject time	Leave this at the default option of **ON** to enable access to the reject timing information in the **Product setup** menu. Only set this to **OFF** once the reject time has been correctly set, and you wish to deny line operators access to it.
Manual setup	Turn this **ON** or **OFF** as required.
Aux relay	Turn this to **ERROR** or **RUN** as required.
Rej out of run	Turn this **ON** or **OFF** as required.
*PV test	Set to **YES** to enable the Performance Validation system.
*Fault on PV	Set to **YES** to cause the fault relay to operate if a Performance Validation system test is not actioned or completed in the time allowed.

- Press C to exit from the **User options** menu.

To set up the reject options

Refer to *Appendix C – Reject options*, page 91.

- Press C to exit the **Reject options** menu.

To set up serial links

If you are using any of the serial links, then you will need to set up the serial links as follows:

Serial link menu configuration

Link 1 may be set to one of the following options. Press ↵ to select the usage list then press it again and use ▼ to select one of the uses below:

USAGE	**NOT USED** is the default setting.
LOMALINK	For use with LomaLink control protocol.
or	For use with LomaView management systems.
REPORTS	For use with LomaNet or a single printer.

- Press ↵ to accept.

When LOMALINK or REPORTS is selected further menu entries within the link allow the protocol to be set.

- Press ▼ to step down the menu below:

Baud rate	150, 300, 600, 1200, 2400, 4800, 9600
Data bits	7 or 8
Stop bits	1, 1.5 OR 2
Parity	ODD, EVEN or NO
Flow Ctrl	NONE, CTS-RTS or XON-XOFF

- Pressing ↵ in any menu position changes the "*" to a ">". Use ▲ or ▼ to select entry required then press ↵ again to accept.
- Pressing C will exit the menu without making any changes.

NOTE: Please refer to *Displaying and printing reports*, page 29, if using the report option, or appropriate LomaView, LomaNet or LomaLink information.

The machine will now be looking for metal in your product, although the sensitivity will not be fully optimised as the detector has not yet been calibrated for the product.

The control unit is now fully commissioned for your application.

Variable speed systems

On systems employing variable speed conveyors, special hardware is required to drive the CTB (conveyor time base) input on the micro control card. Conveyor systems supplied by Loma will already have this hardware fitted and commissioned, but on head only sales the following information should be observed when using vari-speed.

In order for the reject timing to work correctly, it must be supplied with information about how far the contaminant has travelled between the head and point of reject. This is achieved via a shaft encoder which supplies pulses to the CTB input of the micro control board.

The delay information, which is entered in the **Product setup** menu, then counts the CTB pulses out to time the contaminated product to the reject point. For this reason the delay is measured in distance, and should be set at the fastest conveyor speed in order for the reject device to actuate in time. The dwell, on the other hand, should be set at the slowest belt

speed to guarantee accurate rejection at all speeds. The dwell can be in units of time or distance depending upon the type of reject device.

CTB Constant

This parameter is the number of pulses per metre/foot of belt travel. For systems fitted with a photo-eye it can be set between 1 and 999 pulses per metre/foot, whereas for non photo-eye systems it can be set between 1000/coil_gap and 999 pulses per metre/foot. The shaft encoder for the system should be chosen so that it gives sufficient resolution for accurate rejection, but not so much that the CTB rate will exceed a frequency of 100Hz at the maximum belt speed. An absolute minimum of four pulses must occur over the coil gap distance. The coil gap distance can be found on the machine details plate (inside control box).

Vari-speed errors

Because the detector can only work within a pre-determined speed range it is possible for belt speed to move outside the limit of reliable operation of the machine. In these cases, speed logging problems can be turned on in the **Configuration** menu which will generate either **Speed too slow** or **Speed too fast** run errors.

Appendix B – Service menu

The entries within this menu allow certain user options and facilities to be turned on and off, as appropriate to your machine application. These options are detailed in the following table:

Options	***Description***
Manual setup	Allows the user to make manual adjustments to the calibration of the unit via the **Manual setup** menu.
Auxiliary relay (Aux relay)	The relay marked Attention on the power relay PCB has two different functions: select **Run**, in order that the relay is energised whenever the detector is in run, ie it is looking for metal; select **ERROR**, in order that the relay is energised when a run error occurs.
Reject out of run	Turn this to **ON** if no product is to be allowed down the line without being checked for metal. This makes it impossible to disable the reject mechanism via the disable reject menu and in addition, provided a photo-eye is fitted to the system, that product will be rejected during a full calibration cycle.
PV test	Select **YES** to enable the Performance Validation System (PVS) or (PV testing). A number of additional menu positions will appear, which require data input to be set up for PV testing to operate. Select **NO** to disable PV testing.
Fault on PV	Select **YES** to enable fault relay operation when a system fault is generated by failure to complete a prompted for PV test. When the conveyor belt motor controls are wired through this relay the conveyor will stop. Select **NO** to disable the system fault relay operation only.

Wherever possible, Loma will have set the entries within this menu to those required by your application before the dispatch of your system, or during a commissioning visit by a Loma engineer if applicable.

Appendix C – Reject options

The entries contained within this menu allow selection of the type of reject timing and certain reject options as described below.

Mode

Selects the reject configuration from the following options:

Pulse (only available if a photo-eye is fitted)
When a contaminated package is detected the reject delay time is counted down, in order for the package to travel from the photo-eye to the reject device, where-upon the reject is turned on for a time equal to the reject dwell time. Typically, this mode of reject would be used for air blast or pusher type rejects for the accurate rejection of small packages at high speed.

Pulse extension
The same as pulse mode, except that the dwell time is extended if a second contaminated product reaches the reject point before the dwell time from the first contaminated product has timed out. This could typically be used with an air blast or retracting band reject device, but not a pusher type device. This reject mode is always available.

Toggle (only available if a photo-eye is fitted)
When a contaminated package is detected the reject delay time is counted down, in order for the package to travel to the reject device, where upon the reject device state is toggled.

NOTE: No Reject dwell entry will appear in the **Product setup** menu for this mode of operation.

Dwell extension (not available if a photo-eye is fitted)
When a contaminated product is detected the reject device is immediately activated, and stays activated for a time equal to the reject dwell time. If a second reject product is detected before the dwell time has timed out, then the dwell time is counted down from the beginning again. No Reject delay entry will appear in the **Product setup** menu.

Reject till accept (only available if a photo-eye is fitted)
When a contaminated product is detected the delay time is timed out, at which point the reject device becomes activated. The reject device will then stay activated until an uncontaminated product reaches the reject point.

Reject relay

Can be set to be either normally energised or normally de-energised (the normal state is the not rejecting state). For failsafe applications the relay state should be normally energised, shown as **ENERG** on the display, so that if the power fails to the system the relay will drop out causing rejection of non-inspected product.

Reject timing

Can be selected to be either product relative or universal. Product relative means that each of the products can have different dwell/delay times, whereas universal means that they will all be the same.

NOTE: If universal timing is selected, then when the reject timings are adjusted for one product, then all the others will automatically be updated to the same values.

Reject confirm

Set to **YES** if reject confirmation facility is fitted to your system, and you wish a system fault to be generated on a confirmation failure.

If reject confirmation is set to **ON**, then the entries confirm delay if a photo-eye is fitted and a confirm window will appear in the menu list. These entries allow a time window to be set up in which a reject confirmation signal must be received when a contaminated pack is rejected.

For example, if the confirmation signal should occur within 50 to 150ms of the reject device being activated, set the confirm delay to 50ms and the confirm window to 100ms.

Bin full

Select this if a bin full facility has been fitted to your system, and you wish a system fault to be generated if the reject bin becomes full.

For failsafe operation, the fault relay should be wired into the conveyor drive or reject circuitry to ensure that no contaminated product can pass in the event of a reject or bin full failure.

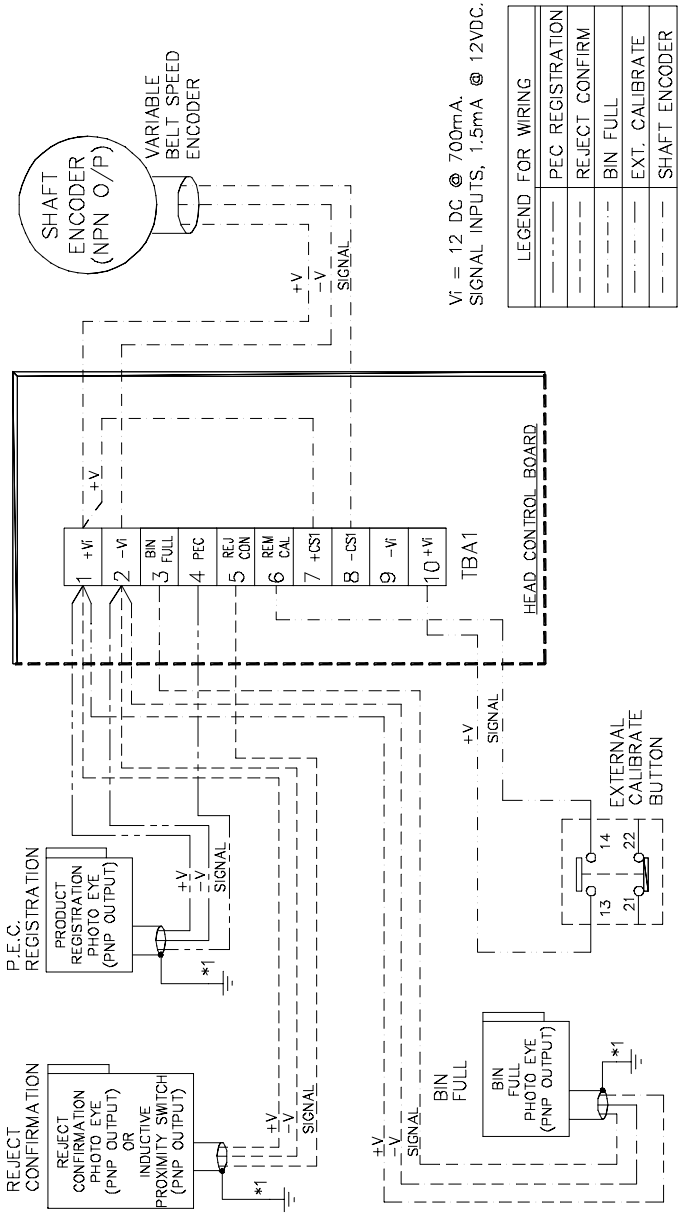
Dwell unit (only available if vari-speed operation is selected)

This option will only appear if vari-speed operation has been selected. Select either time or distance depending upon the sort of reject device that has been fitted to the system.

Wherever possible the necessary settings will be selected before the unit is dispatched by Loma.

Specific hardware requirements are needed for some of the options to be operational, such as bin full detection. The reject dwell and/or delay times are set in the **Product setup** menu.

Appendix D – Wiring diagram for external sensors



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