Copyright and acknowledgements

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http://www.interface.co.uk

Part number: 814120 issue level B
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 a.c. or 50V d.c. 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.

12. **HEIGHT ADJUSTMENT.** Care should be taken when adjusting the height of the Pipeline and Pharmaceutical detectors. If appropriate measures are not taken, severe injury to an individual or damage to the detector could result.
The following safety warnings relate to specific metal detectors in the IQ range.

**Pipeline versions**

13. **STAND-MOUNTED VERSION.** Do not unscrew the locating screw in the height adjustment strut of a stand-mounted pipeline metal detector. If it is unscrewed and removed, the body of the detector and the reject valve may spin round on the height adjustment strut, causing the machine to fall over. This could result in death or severe injury to an individual and/or severe damage to the detector.

14. **SECURITY.** Due to the high centre of gravity, care should be taken when moving a pipeline metal detector on a stand as the applied force and/or obstructions of the wheels may cause the machine to fall over. This could result in death or severe injury to an individual and/or severe damage to the detector.

15. **START UP WITH AUTOMATIC REJECT VALVE.** When a pipeline is switched on, the automatic reject valve changes state from "Reject" mode to "Run" mode. Do not put any part of the body within close proximity of the reject valve outlet when the machine is switched on. This could result in severe injury to an individual.

16. **HEIGHT ADJUSTMENT.** When adjusting the height of a detector assembly, do not unscrew the locating screw in the height adjustment strut. If it is unscrewed and removed, the body of the detector and the reject valve may spin round on the height adjustment strut, causing the machine to fall over. This could result in death or severe injury to an individual and/or severe damage to the detector.

17. **SECURITY.** The detector is mounted on a gas-filled height-adjustment strut. After adjusting the height of the detector, make sure the adjustment handle is fully tightened. If the handle is not fully tightened, the detector could rise on the strut. This could result in severe injury to an individual and/or severe damage to the detector.

**Handtmann versions**

18. **HANDLING A HINGE MOUNTED VERSION ON A PA30 FILLER.** When a pipeline is mounted on a PA30, the detector must be removed from the PA30 before disconnecting the PA30 from the main filler. Failure to do this may result in the PA30 falling over resulting in death or severe injury to an individual and or severe damage to the PA30.

19. **HANDLING WITHOUT A STAND.** Care should be taken when fitting or removing the detector off the filler hinge. The detector should be lifted by two persons using the handles fitted to the detector. If lifting is attempted by a single person or the handles are...
not utilised then this could result in death or severe injury to an individual and/or severe damage to the detector.

20. **HANDLING WHEN MOUNTED ON A STAND.** Care should be taken when moving a detector as applied force and/or obstructions of the wheels may cause the machine to fall over. Remove all attachments before disconnecting from the filler; failure to do this may result in the detector falling over. This could result in death or severe injury to an individual and/or severe damage to the detector.

21. **SECURITY WHEN MOUNTED ON A STAND.** The detector when mounted on a stand uses a gas filled height-adjustment strut. After adjusting the height of the detector using the handles supplied on the unit to manoeuvre the detector, make sure the adjustment handle is fully tightened. If the handle is not fully tightened, the detector could rise on the strut. This could result in severe injury to an individual and/or severe damage to the detector.

22. **START UP WITH AUTOMATIC REJECT VALVE.** When a pipeline is switched on, the automatic reject valve changes state from “Reject” mode to “Run” mode. Do not put any part of the body within close proximity of the reject valve outlets when the machine is switched on. This could result in severe injury to an individual.

23. **HANDLING WITH A WATER JACKET FITTED.** When a pipeline is fitted with a water jacketed product pipe, surface temperatures of the product pipe and the water jacket coil may be up to 75 °C. Contact with the product pipe or the water jacket coil may result in minor burns or light scalding.

24. **OPERATING WHEN USED FOR HANDLINKING.** When a pipeline is fitted to a filler and used for handlinking. The location of the filler knee control lever is located closer to the detector infeed than the detector outfeed.

**Pharmaceutical versions**

25. **ADJUSTMENT.** The detector is mounted on a gas-filled height-adjustment strut. If the height of the detector requires adjusting, make sure the adjustment clamp is fully tightened afterwards. If the clamp is not fully tightened, the detector could rise on the strut. This could result in severe injury to an individual and/or severe damage to the detector.
26. **SECURITY.** The metal detector head and product chute are mounted on an arm such that they can be rotated when the tilt angle adjustment clamp is loosened. When loosening the clamp to adjust the tilt angle, always support the head and product chute. If they are not supported, severe injury could result to an individual.

**Freefall versions**

27. **REMOVAL OF TROUSER LEG REJECT DEVICE.** Care must be taken when removing a trouser leg reject device. Dropping the unit could result in severe injury to an individual.

28. **START UP WITH TROUSER LEG REJECT DEVICE.** When a freefall detector is switched on, the trouser leg reject device changes state from the “Reject” mode to the “Run” mode. Do not put any part of the body within close proximity of the reject valve outlets when the machine is switched on. This could result in severe injury to an individual.

**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 IQ Metal Detector range. It consists of the following chapters:

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

Using the IQ Metal Detector
Provides general information about using the IQ Metal Detectors, 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 IQ Metal Detector
Explains how to calibrate the metal detector and set up parameters including the tracking limits, time and data, and machine ID.

Using Performance Validation
Describes the benefits of the performance validation procedure and explains how to set up the IQ Metal Detector for PV testing.

Installing the IQ Metal Detector
Gives general instructions for installing any of the IQ Metal Detector range, together with general rules about positioning for correct operation.

Maintenance
Gives detailed maintenance instructions for the IQ Metal Detectors.

Appendices
Give information about special purpose options included in the Loma IQ Metal Detectors.

Conventions
For clarity this guide uses the following typographical conventions:

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<thead>
<tr>
<th>Style</th>
<th>Used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTER</td>
<td>Keys that you press on the IQ Metal Detector control panel.</td>
</tr>
<tr>
<td>BOLD</td>
<td>Names of menus and parameters that appear on the metal detector display.</td>
</tr>
<tr>
<td>reference</td>
<td>A cross-reference to another part of this guide, or to another guide.</td>
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About the IQ Metal Detector range

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

To cater for the requirements of different types of product the IQ 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 variants are as follows:

- Belt conveyor, with flat or plastic modular belts.
- Pipeline versions.
- Handtmann versions.
- Pharmaceutical versions.
- Freefall versions.

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, pipeline, pharmaceutical, and freefall metal detectors.

A second search head may be fitted when product is packaged in both non-foil and foil packaging; this is called a Ferrous in Foil 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. It provides the serial data link protocols (standard 2 x RS232 software hand shaking). An optional 20mA current loop and further RS232 data links can be fitted, with or without hardware hand shaking.

The control unit is compatible with the following communication packages:

- LomaNet (optional node required).
- LomaView (optional node required).
- LomaLink (optional connectors required).
**IQ 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 and joined with an angled join.

The following illustration shows a typical flat belt conveyor:
**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 illustration shows a typical plastic modular belt conveyor:

Three different plastic modular belt types are supplied by Loma:

- Flat top belt
- Flush grid belt
- Lightweight flush grid belt.
The flat top belt has a smooth, closed surface and is manufactured in white polyethylene. Designed for use with heavy products up to a maximum weight of 60kg, it is suitable for use with either fresh or frozen product, which may be wrapped or loose.

The flush grid belt has an open grid pattern with a smooth surface, and is manufactured in white polyethylene. Designed for use with heavy products up to a maximum weight of 60kg, it is suitable for use with either fresh or frozen product, which may be boxed or wrapped.

The lightweight flush grid belt has an open grid pattern with a smooth surface, and is manufactured in white polyethylene. Designed for use with light products up to a maximum weight of 25kg, it is suitable for use with either fresh or frozen product, which may be boxed or wrapped.

### Reject mechanisms

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

- Stop-On-Detect (SOD)
- Air blast
- Pusher
- Plough
- 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 the pusher and plough reject mechanisms – small and large. The size of the bin determines the maximum size of the product pack that can 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.

**Plough reject**
The plough reject uses a plough (or paddle), to push 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 an electrical services box. The box, which is mounted at the front of the conveyor frame, contains an isolator, ‘Start’ and ‘Stop’ pushbutton switches, a contactor, a thermal overload, earth terminals, and various connector blocks. The door of the box is fitted with the isolator handle and the ‘Start’ and ‘Stop’ pushbuttons.

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**
Each conveyor is fitted with an emergency ‘Stop’ button. This is mounted on a pillar 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, plough reject, or 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.
About the IQ Metal Detector range

Product registration photo-eye
Conveyors that are supplied with either a pusher or plough reject are fitted with a photo-eye. As standard, the photo-eye is mounted on the side of the conveyor. It is used to register the position of the products on the conveyor. As an option, the photo-eye may be mounted directly above the belt. This is particularly suitable for the registration of products that have very little depth.

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

<table>
<thead>
<tr>
<th>Option</th>
<th>Stop-On-Detect reject</th>
<th>Air blast reject</th>
<th>Pusher and plough reject</th>
<th>Retracting band reject</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audible alarm</td>
<td>S</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>‘Bin Full’ photo-eye</td>
<td>–</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Indicator beacon</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Overhead electrical services</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Product guides</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Product registration photo-eye</td>
<td>–</td>
<td>O</td>
<td>–</td>
<td>O</td>
</tr>
<tr>
<td>PVS indicator lamp</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Reject actuation confirmation</td>
<td>–</td>
<td>–</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>Reject confirmation with photo-eye</td>
<td>–</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

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 beacon
Illuminates when a contaminated product is detected. The red beacon is mounted on a pillar.

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.

Product 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)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>Each machine is designed to suit a customer's requirements.</td>
</tr>
<tr>
<td>Weight</td>
<td>Displayed on identification plate mounted on frame.</td>
</tr>
<tr>
<td><strong>Power requirements</strong></td>
<td></td>
</tr>
<tr>
<td>Standard option</td>
<td>400/380V, 3-phase, 50Hz, neutral and earth</td>
</tr>
<tr>
<td>Non-standard options</td>
<td>400/380V, 3-phase, 50Hz, earth but no neutral</td>
</tr>
<tr>
<td></td>
<td>220/230V, single phase, 50Hz</td>
</tr>
<tr>
<td></td>
<td>440V, 3-phase, 50Hz, neutral and earth</td>
</tr>
<tr>
<td></td>
<td>220V, 3-phase, 60Hz, neutral and earth</td>
</tr>
<tr>
<td></td>
<td>220V, 3-phase, 50Hz, earth but no neutral</td>
</tr>
<tr>
<td>Control voltage</td>
<td>24V ac, 50Hz</td>
</tr>
<tr>
<td>Current consumption</td>
<td>350VA</td>
</tr>
<tr>
<td><strong>Air supply (Pusher, plough and retracting reject)</strong></td>
<td></td>
</tr>
<tr>
<td>Optimum pressure</td>
<td>5.5 bar (80psi)</td>
</tr>
<tr>
<td>Minimum pressure</td>
<td>4.5 bar (65psi)</td>
</tr>
<tr>
<td>Maximum pressure</td>
<td>6.0 bar (90psi)</td>
</tr>
<tr>
<td>Capacity (litre/second at 100psi)</td>
<td>10</td>
</tr>
<tr>
<td><strong>Air supply (Air blast reject per nozzle)</strong></td>
<td></td>
</tr>
<tr>
<td>Optimum pressure</td>
<td>6.8 bar (100psi)</td>
</tr>
<tr>
<td>Minimum pressure</td>
<td>6.8 bar (100psi)</td>
</tr>
<tr>
<td>Maximum pressure</td>
<td>8.0 bar (120psi)</td>
</tr>
<tr>
<td>Capacity (litres/second at 100psi)</td>
<td>27</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-10°C to 40°C</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>80% up to 31°C (86°F) reducing to 50% @ 40°C (104°F)</td>
</tr>
</tbody>
</table>
IQ pipeline versions

This section describes Loma Pipeline Metal Detectors, which are designed to detect ferrous and non-ferrous contaminants in pumped products such as meats, liquids, emulsions, slurries and pastes. They can interface with a wide range of meat pumps and clipping machines.

The Pipeline Metal Detector is of stainless steel construction and consists of a pipeline detector assembly and a Loma IQ control unit. An automatic reject valve can optionally be fitted. The pipeline detector assembly consists of a pipeline body, which contains a removable Acetal product pipe, and a Loma IQ search head.

A water jacket may be fitted, if the detector is to be used for products liable to solidify or smear.

Pipeline detectors may be mounted in either a horizontal or downward flowing section of the pipeline. Upward flowing sections are not suitable as reject timing becomes unpredictable due to the effect of gravity on the contaminant.
Mounting arrangements
Two types of mounting arrangement are available for pipeline detectors: stand mounting and 'L' bracket mounting.

The stand mounting is constructed from bead blasted stainless steel. A gas-filled strut is fitted in the centre pillar, which allows the height of the detector to be easily adjusted. Four lockable wheels are fitted to the stand, allowing the detector to be manoeuvred easily.

Reject Valves
There are a number of application dependent optional reject valves. Three common types are described below.

Loma automatic reject valve
The pneumatically operated, straight-through flow diverter device is constructed from 304L stainless steel. The valve comprises a body with a double acting pneumatic actuator. A piston assembly is fitted inside the body. All metallic components are constructed from either 304L stainless steel or aluminium. The piston is constructed from Acetal co-polymer or polysulphone.

Compressed air to the actuator is supplied via a 5-port pneumatic valve that is mounted on top of the control unit. The compressed air supply must be dry and lubricated at a recommended pressure of 80psi (5.5 bar). Compressed air is supplied to the lower port of the actuator when a contaminated product is detected. This causes the piston to rise and the section of the product containing the contaminant to flow from the reject outlet at the base of the valve.

**Ladish Dairy reject valve**
Constructed from 316 stainless steel, the valve comprises a divert valve on which a normally closed spring return pneumatic actuator is mounted. A piston assembly is fitted inside the body. All metallic components are constructed from 316 stainless steel. The recommended air supply pressure is 80psi (5.5 bar).

**Lee Turbo Charged Ball reject valve**

The unit comprises a valve body with integral ‘T’ ball connected to a modified actuator. All metallic components are constructed from 316 stainless steel, with teflon (or Mica filled) seals and Buna-N O ring. The recommended air supply pressure is 100psi (6.9 bar).
### Technical specification

<table>
<thead>
<tr>
<th>Mounting arrangement</th>
<th>Stand or ‘L’ bracket</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand arrangement</td>
<td>Gas strut height adjustment</td>
</tr>
</tbody>
</table>
| Pipeline sizes (inside diameter) | 48mm NB (2")  
54mm NB (2.5")  
73mm NB (3")  
98mm NB (4") |
| Weight               | Displayed on the identification plate mounted on the frame. |

**Power requirements**

- **Voltage-standard universal input**: 85V-264V, single phase, 50/60Hz
- **Current consumption**: 20VA

**Air supply (ARV reject valve)**

- **Optimum pressure**: 5.5 bar (80psi)
- **Minimum pressure**: 4.5 bar (65psi)
- **Maximum pressure**: 6.0 bar (90psi)
- **Capacity (litre/second at 90psi)**: 10

**Environment**

- **Operating temperature**: -10°C to 40°C (-14°F to 104°F)
- **Relative humidity**: 80% up to 31°C (86°F) reducing to 50% @ 40°C (104°F)
- **Maximum continuous product pipe pressures**: 55 bar (808 psi) @ 25°C  
40 bar (588 psi) @ 70°C

**Reject mechanisms**

- **Types**: Straight-through flow diverter, Lee Ball, or Ladish Dairy valves.
- **Material**: Stainless steel
- **Operating mechanism**: Pneumatic actuator
- **Fittings**: Available with RD80 x 1/4 DIN11851 3A bevel and Quick Release fittings.
NOTE: Final working pressures may be limited depending upon the overall line configuration including any automatic reject device if fitted.

**IQ Handtmann versions**

This section describes Loma Handtmann Pipeline Metal Detectors, designed to detect ferrous and non-ferrous contaminants in pumped meat products.

The Handtmann Metal Detector consists of a pipeline detector assembly and a Loma IQ control unit. An automatic reject valve can optionally be fitted to the short-hinge version. The pipeline detector assembly consists of a pipeline body, which contains a removable Acetal product pipe and a Loma IQ search head.

**ALLinker version**

<table>
<thead>
<tr>
<th>Materials</th>
<th>Product pipe seals</th>
<th>Acetal/Delrin viton</th>
</tr>
</thead>
</table>

![Diagram of ALLinker version](image)
A water jacket may be fitted if the detector is to be used for products liable to smear.

The AL and Linker units are ‘application specific’; there is a dual version covering both applications, comprising two product pipes plus a hinge adaptor, allowing the unit to be configured for either application. The electrical connection for the AL or ‘dual’ unit is a double connector, and the electrical connector for the Hand Linker and Short Hinge may be either a single or double connection, depending on application.
**Mounting arrangements**

Two types of mounting arrangement are available for Handtmann detectors: stand and hinge mounting and hinge mounting.

The stand is constructed from bead blasted stainless steel. A gas-filled strut is fitted in the central pillar, which allows the height of the detector to be easily adjusted. Four lockable wheels are fitted to the stand, allowing the detector to be manoeuvred easily.

**Technical specification**

<table>
<thead>
<tr>
<th>Mounting arrangement</th>
<th>Stand or Hinge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stand arrangement</td>
<td>Gas strut height adjustment</td>
</tr>
<tr>
<td>Pipeline sizes</td>
<td>57mm inside diameter</td>
</tr>
<tr>
<td>Weight</td>
<td>Displayed on the identification plate mounted on the frame.</td>
</tr>
</tbody>
</table>

**Power Requirements**

| Standard universal input              | 85-264V, single phase, 50/60Hz |
| Current consumption                   | 20VA                           |

**Air supply (ARV reject valve) – short hinge only**

| Optimum pressure                      | 5.5 bar (80psi)                |
| Minimum pressure                      | 4.5 bar (65psi)                |
| Maximum pressure                      | 6.0 bar (90psi)                |
| Capacity (litre/second) at 90psi      | 10                             |

**Environment**

| Operating temperature                 | -10°C to 40°C (-14°F to 104°F) |
| Relative humidity                     | 80% up to 31°C (86°F) reducing to 50% @ 40°C (104°F) |
| Maximum continuous product pipe pressures | 55bar (808psi) @25°C            |
|                                         | 40 bar (588 psi) @70°C         |

**Reject mechanism – short hinge only**

<table>
<thead>
<tr>
<th>Type</th>
<th>Straight through flow diverter</th>
</tr>
</thead>
</table>
NOTE: Final working pressures may be limited depending upon the overall line configuration including any automatic reject device if fitted.

**IQ pharmaceutical versions**

This section describes the Loma Pharmaceutical Metal Detector, designed to detect ferrous and non-ferrous contaminants in pharmaceutical products such as tablets, pills and capsules.

The metal detector is mounted on an adjustable stand and consists of a Loma IQ search head and a product chute. A reject assembly is fitted at the outfeed side of the head.

<table>
<thead>
<tr>
<th>Material</th>
<th>Stainless steel 304L/Acetal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating mechanism</td>
<td>Pneumatic actuator</td>
</tr>
<tr>
<td>Fittings</td>
<td>RD80 x 1/4, 1/4 turn Quick Release</td>
</tr>
</tbody>
</table>

**Materials**

- **Product pipe**: Acetal/Delrin
- **Seals**: Viton

On a standard Pharmaceutical Metal Detector, a Loma IQ control unit is mounted on the stand. A power supply box is secured at the back of the control unit.
The product chute is constructed of low friction ABS and is fitted with a polycarbonate cover. The cover is transparent, to allow an operator to monitor the flow of the product through the detector. Two knurled handnuts are used to secure the chute in position.

**Mounting arrangements**
The stand is constructed from bead blasted stainless steel. A gas-filled strut is fitted in the central pillar, which allows the height of the detector to be easily adjusted. Four lockable wheels are fitted to the stand, allowing the detector to be manoeuvred easily.

The product chute, detector head, and reject assembly can be tilted to a suitable angle by use of a quick release clamp.

**Reject assembly**
The reject assembly comprises an outlet chute and a reject mechanism. The reject mechanism consists of a stainless steel flap operated by a high-speed electrical solenoid. A polycarbonate cover is fitted over the outlet chute. This must always be fitted in position when the detector is operating to ensure that the pills, tablets or capsules flow down the chute.

When a contaminated product is detected, the solenoid opens the flap, allowing the contaminated product to drop through a slot in the outlet chute and through a reject funnel on the underside of the chute. A circular stub outlet from the reject funnel provides for convenient collection of the rejects. This method of operation provides a clean and precise rejection of the contaminated product. The quick action of the flap keeps waste to a minimum.

**Technical specification**

<table>
<thead>
<tr>
<th>Mounting arrangement</th>
<th>Stand, gas strut height adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>See the identification plate mounted on the frame.</td>
</tr>
<tr>
<td><strong>Power requirements</strong></td>
<td></td>
</tr>
<tr>
<td>Standard universal input</td>
<td>85-264V, single phase, 50/60Hz</td>
</tr>
<tr>
<td>Current consumption</td>
<td>100VA</td>
</tr>
</tbody>
</table>
IQ freefall versions

This section describes Loma Freefall Metal Detectors, designed to detect ferrous and non-ferrous contaminants in products fed by gravity through some form of hopper into a packaging system.
Two types of Freefall Metal Detectors are available:

- Slimline contained field (CF) model
- Standard full size case model.

Each type of detector is constructed from 304L stainless steel.

A Loma IQ control unit is supplied with each detector head. If the controls are remote then a cable for mounting the control unit at a remote location is supplied with each detector head. The standard cable is three metres (10 feet) in length, but an optional 25m (80 feet) cable is available.

**Slimline contained field model**

The Slimline contained field (CF) metal detector is less sensitive to fixed and moving metal that is in close proximity to the aperture. It is suitable for use in situations where space and the available metal-free area is limited, eg above bagmakers.

The standard aperture of a CF metal detector is circular, with fixed metal collar top and bottom. The overall depth depends on the size of the aperture.

**Full size case model**

The standard full size case model is suited for use in situations where the metal-free space is unrestricted.

The standard aperture of this detector is rectangular.

**Mounting arrangements**

Like all metal detectors, a Freefall Metal Detector performs better when it is free from vibration. It is preferable for it to be rigidly mounted, as this prevents the detector from moving with respect to its environment. This reduces the moving metal effect.

Freefall metal detectors may be mounted on anti-vibration mounts, on a Tufnol plate, or by a pivoting arrangement.

Anti-vibration mounts are recommended for use only where the level of vibration is significant and there is no metal in the metal-free area. Mounting on a Tufnol plate is often more appropriate. This provides a rigid fixing and is non-conductive. Pivot mounting simplifies the changeover of product and also cleaning of the detector. A pivot-mounted (slimline only) detector must be supported at the end opposite the pivot to prevent vibration.
Reject assembly
A standard trouser leg-type reject device can be used with a Freefall Metal Detector. Alternatively, it may be supplied with voltage-free relay contacts.

Technical specification

<table>
<thead>
<tr>
<th>Mounting arrangement (Head only)</th>
<th>Pivot, fixed, or anti-vibration mount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reject mechanism</td>
<td>Standard trouser leg, or voltage-free contacts</td>
</tr>
<tr>
<td>Weight</td>
<td>See the identification plate mounted on the frame.</td>
</tr>
</tbody>
</table>

**Power requirements**

<table>
<thead>
<tr>
<th>Standard universal input</th>
<th>85-264V, single phase, 50/60Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption</td>
<td>20VA</td>
</tr>
<tr>
<td>Waterproof audible alarm</td>
<td>24V</td>
</tr>
</tbody>
</table>

**Environment**

<table>
<thead>
<tr>
<th>Operating temperature</th>
<th>-10°C to 40°C (-14°F to 104°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative humidity</td>
<td>80% up to 31°C (86°F) reducing to 50% @ 40°C (104°F)</td>
</tr>
<tr>
<td>Voltage-free contacts</td>
<td>5A at 250V ac or 3A at 30V dc resistive load</td>
</tr>
<tr>
<td></td>
<td>2A at 250V ac or 2A at 30V dc inductive load</td>
</tr>
</tbody>
</table>
This chapter provides general information about using the IQ 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

Before using the IQ Metal Detector it is helpful to understand its principle of operation, as this will help you understand the measurements it makes and the basis it uses for detecting a metal contaminant in a foodstuff.

Although several different types of IQ Metal Detector are produced, to suit different types of foodstuff, they all operate in essentially the same way.

The product passes through a tube around which are three coils, as shown in the following diagram:

The central coil is referred to as the transmitter coil, and this transmits a radio-frequency signal similar to the frequencies used in AM broadcasting. Spaced equally on each side of the transmitter coil are two receiver coils, which act as aerials to pick up the radio signal. The IQ Metal Detector measures the difference in voltage between these coils, and this is referred to as the signal.
When there is nothing between the coils the voltage in each receiver coil will be identical, because they are an equal distance from the transmitter coil, and the signal is zero.

Any conductive object moving between the coils will interact with the magnetic field to produce a voltage difference between each of the receiver coils. Although any object will produce a slight difference, metal objects produce a significantly larger difference, allowing them to be detected in non-metal objects such as foodstuffs. The IQ Metal Detector can thus distinguish between an uncontaminated product, and one containing metal contamination.

**Getting the best results**

Before using the IQ Metal Detector with a new product it is important to calibrate it with the product, to allow the IQ Metal Detector to adjust itself to the highest possible sensitivity.

The IQ Metal Detector can use three alternative modes of operation: Dry, Resistive, or Reactive. During calibration it automatically selects the operating mode that will give the best results for a particular product.

**Dry mode**

Dry mode is used for products with low moisture content such as tea and coffee. Frozen foods can also use dry mode, because water does not conduct when it is frozen.

Dry mode gives the best sensitivity, and in dry mode the IQ Metal Detector can typically detect a one millimeter ferrous or non-ferrous metal contaminant in a typical 100 millimeter aperture size.

**Resistive mode**

Resistive mode is used for products with a slight moisture content, such as flour or cocoa, or are iron fortified, such as cereal.

**Reactive mode**

Reactive mode is used for products with a considerable moisture content, which are therefore conductive causing the product to give a large effect when it passes through the metal detector.

In reactive mode the metal detector takes advantage of the difference between the resistive and the reactive signal to distinguish between the effect of the product, and the effect of a product with a metal contaminant. Because the product can mask the signal generated by the metal contaminant, the sensitivity is generally slightly lower than in dry or resistive mode.
Relative detectability of non-ferrous metals

The resistance, and hence ease of detection, of different non-ferrous metals vary widely. The more conductive they are, the easier they are to detect, as shown in the following graph:

Sensitivity to stainless steels is invariably poorer than to other non-ferrous contamination. This is largely due to the relative conductivity of the material as shown above.

It is also possible to phase out a particular size of non-ferrous contaminant but be able to detect a smaller or larger size. This is because the metal signal matches the product signal and has been compensated out. 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.
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 Metal Detector effectively:

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

Establishing detector sensitivities

Once the metal detector has been calibrated with the product it is important to establish what size of metal contaminant the detector is capable of finding.

In dry or resistive mode ferrous and non-ferrous sensitivities are approximately equal. In reactive mode non-ferrous sensitivity will be poorer than ferrous sensitivity.

The metal detectors are normally supplied with a selection of metal test wands. There are three types of wands: ferrous (chrome steel), non-ferrous (brass), and stainless steel. Stainless steel is included because sensitivity is generally poorer than to other non-ferrous contamination due to the relative conductivity of the material. The wands are supplied in a range of sizes depending on the particular instrument you are using.

In dry or resistive mode the sensitivity can be measured by placing the test wand at the trailing and leading edges of a representative sample of the product, and then passing the product through the detector. The test wands should be placed at a height so they pass as near as possible to the centre of the aperture. Test wands are placed at the leading and trailing edges of the product to ensure correct product rejection. This is particularly important in IQ Metal Detectors with no photo-eye system, as the reject time is determined by the position of the contaminant relative to the product.

In reactive operation the signal generated by the metal contaminant can be masked by the product itself. It is therefore important to test the product with test wands not only at the leading and trailing edges, but also at the product’s centre.
Regular inline detector sensitivity testing

It is important to maintain regular and accurate inline 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 IQ 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 IQ Metal Detector can be set up to restrict access using a keycode.

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

**To enter a keycode**

- Press ENTER to display the keycode prompt.

- Press ^ or V to adjust the number to the appropriate keycode and press ENTER.

**Selecting a product**

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

**To select the product code**

- Press " to display the name and number of the currently selected product.

- Press ^ or V to move up or down the list of products until the one you want is displayed, and press ENTER 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

The displays show 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:

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANCEL</td>
<td>Cancel key – Cancels the current operation.</td>
</tr>
<tr>
<td></td>
<td>Lock key – Locks the keyboard.</td>
</tr>
<tr>
<td></td>
<td>Arrow keys – Allow you to step between menu options or change the value of the current menu option.</td>
</tr>
<tr>
<td></td>
<td>Sensitivity keys – Allow you to decrease or increase the sensitivity.</td>
</tr>
<tr>
<td></td>
<td>Change key – Allows you to change the currently selected product.</td>
</tr>
<tr>
<td></td>
<td>Setup key – Allows you to setup a new product.</td>
</tr>
<tr>
<td></td>
<td>Calibrate key – Allows you to calibrate a product.</td>
</tr>
<tr>
<td></td>
<td>Results key – Allows you to display the results for the products being checked.</td>
</tr>
<tr>
<td></td>
<td>Enter key – Selects a menu or confirms an enter value.</td>
</tr>
</tbody>
</table>

Indicators
RUN DETECT – Indicates that the IQ Metal Detector is searching for metal.
CALIBRATE – Indicates that the IQ Metal Detector is performing a calibration cycle.
SYSTEM FAULT – Indicates that a system fault has been logged.
RUN ERROR – 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 \(\text{ENTER}\).
  
  The arrow indicates that you can adjust the sensitivity.

- Press \(\text{ or }\) to increase or decrease the threshold value.

- Press \(\text{ENTER}\) to confirm the current threshold value or \(\text{CANCEL}\) to cancel without changing the threshold.

### To adjust the sensitivity from the bargraph display

- Press \(\text{ or }\) 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 IQ Metal Detector are accessed from the four menus which you can select using the \( h \), \( s \), \( c \), or \( r \) keys.

<table>
<thead>
<tr>
<th>To select a menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Press ( h ), ( s ), ( c ), or ( r ).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To move between the menu options</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Press ( \uparrow ) or ( \downarrow ).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To edit a menu option</th>
</tr>
</thead>
<tbody>
<tr>
<td>A * indicates a menu option with a value you can edit.</td>
</tr>
<tr>
<td>• Press ( \text{ENTER} ) to edit the value.</td>
</tr>
<tr>
<td>An arrow points to the value being edited:</td>
</tr>
<tr>
<td>• Press ( \text{INC} ) or ( \text{DEC} ) to edit the value.</td>
</tr>
<tr>
<td>If the value is a number pressing ( \text{INC} ) or ( \text{DEC} ) will increase or decrease the value respectively.</td>
</tr>
<tr>
<td>If the value has alternatives such as Yes and No, pressing ( \text{INC} ) and ( \text{DEC} ) will cycle between the alternatives.</td>
</tr>
<tr>
<td>• Press ( \text{ENTER} ) to confirm the value you have entered or ( \text{CANCEL} ) to cancel it and return to the previous setting.</td>
</tr>
</tbody>
</table>
### To edit a text field

- Press **Enter** to edit the text.
  The previous text will be displayed; blanks will be displayed if there was no previous text.

- Press **Left** and **Right** to step between the following characters: Underline, Space, 0 to 9, and A to Z.

- Press **Enter** to select the next character position.
  When you have entered the name keep pressing **Enter** until all characters have been entered.
Using the IQ Metal Detector
Setting up a new product

This chapter explains how to create a new product code and calibrate the IQ Metal Detector for that product.
Setting up a product

The IQ Metal detector must be calibrated for each of the different types of product it will be used with. Each time you use the IQ 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 \text{set}. If the keyboard is locked the display will prompt you for a keycode; see \textit{Entering a keycode}, page 30.

\textbf{Product setup} will then be displayed:

- Press \text{enter} to select the \textbf{Product setup} menu and display the first option:

- Press \text{enter} to edit the product number.
- Press \text{ \textdownarrow \textuparrow} to select the number for the new product and press \text{enter} to confirm it.

- Press \text{ \textdownarrow} to display the \textbf{Name} of the option.

\textit{The product number can be from 1 to 100.}
### To set up a new product (Continued)

- Press **ENTER** to edit the name.
  - Enter a name of up to 10 characters and press **ENTER** to confirm it.
    - For information about editing the name see *To edit a text field, page 35.*

<table>
<thead>
<tr>
<th>Name</th>
<th>CHOCOLATES</th>
</tr>
</thead>
</table>

- Press **ENTER** to display the **Dry product** option.
  - Leave this option set to **No** if you want the IQ Metal Detector to monitor the product and automatically choose the appropriate calibration.
  - You can set this option to **Yes** to force the machine to use a dry calibration if you are confident that the product does not contain any moisture.

<table>
<thead>
<tr>
<th>Dry product</th>
<th>NO</th>
</tr>
</thead>
</table>

- Press **↓** to display the **Flow length** option.
  - This option allows you to specify the distance from the aperture to the photo-eye if one is fitted. If no photo-eye is fitted this display will not be shown.

<table>
<thead>
<tr>
<th>Flow length</th>
<th>255 mm</th>
</tr>
</thead>
</table>
### To set up a new product (Continued)

- Press **V** 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 **V** to display the **Rej dwell** option.
  
  This determines the time for which the reject device operates.

- Press **V** to move to the next entry.
  
  This display will be shown if **PV test** is set to **YES** in the **User Options** menu.

- Press **ENT** 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 69.
To set up a new product (Continued)

- Press \( \downarrow \) to move to the next entry.

  The display will show **Full calibrate?** or **Reverse calibrate?** if the **Detection** option is set to **REVERSE** in the **Product setup** menu. For information about reverse calibration see *Appendix A – Reverse Calibration*, page 128.

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

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

  The display will prompt you as necessary.

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

Repeat the above setup procedure with each of the products you wish to calibrate up to 100 in total.
Setting up a new product
Displaying and printing reports

This chapter gives information on 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.
Displaying batch results

The IQ Metal Detector maintains the following statistics for the current product:

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>The product name</td>
</tr>
<tr>
<td>Reject count</td>
<td>The number of products rejected</td>
</tr>
<tr>
<td>Accept count</td>
<td>The number of products accepted</td>
</tr>
<tr>
<td>Total count</td>
<td>The total number of packs that have passed through the metal detector; ie the sum of reject and accept counts. Note that this will only be displayed when a photo-eye is used for product registration.</td>
</tr>
</tbody>
</table>

To display the batch results

- Press `r`
  The currently running product is displayed:

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

To reset the batch

- Press `r`, and press `v` until the display shows `Reset Batch?`

- Press `enter` 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 IQ 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:

<table>
<thead>
<tr>
<th>Report</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error</td>
<td>Contains all the details from the Run Error log.</td>
</tr>
<tr>
<td>Fault</td>
<td>Contains all the details from the System fault log.</td>
</tr>
<tr>
<td>Setup</td>
<td>Contains the product Setup details from the Product Setup and Manual Setup menus.</td>
</tr>
<tr>
<td>Contaminants</td>
<td>Contains all the details from the Contaminant log.</td>
</tr>
<tr>
<td>Calibration</td>
<td>Contains all the data relevant to the calibration of the current product. This report is printed automatically after a calibration cycle.</td>
</tr>
<tr>
<td>Status</td>
<td>Contains the accumulated batch statistics since the start of the current batch.</td>
</tr>
<tr>
<td>PV test</td>
<td>Contains all the data relevant to PV test operation.</td>
</tr>
<tr>
<td>Batch</td>
<td>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.</td>
</tr>
</tbody>
</table>
A sample report is shown below:

```
-------------------------------
  | LOMA IQ 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 **LOMALINK** or **REPORTS** in one of the four link menus, **Link 1 to Link 4**. These are displayed by pressing **Menu**, and selecting the **Serial Links** submenu on the **Service** menu.

**To specify which report to produce**

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

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

  If this option does not appear on the **Setup** menu check that you have turned on one of the links in the **Serial Links** submenu of the **Service** menu.
## Displaying and printing reports

### To specify which report to produce (Continued)

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.

### Press to display the **Batch units** option.

### Examples

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form feed</td>
<td>NO</td>
</tr>
<tr>
<td>All reports</td>
<td>NO</td>
</tr>
<tr>
<td>Batch reports</td>
<td>YES</td>
</tr>
<tr>
<td>Batch units</td>
<td>TIME</td>
</tr>
</tbody>
</table>
## To specify the batch statistics (Continued)

- 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:

  - Press **V** to specify the batch start. To ignore the start time set batch start to 00.00.
  
  *Batch start 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 **V** to display the **Batch length** option and specify the batch length in hours.

  *Batch length 01.00*

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

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

  *Batch packs 1000*

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

  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.
Displaying and printing reports

Displaying the contaminants, run errors, and system faults logs

The IQ 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 🔄 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 **V** until the appropriate **View** option is displayed:

  ![View errors ?]

- Press **ENTER** to select it.
  
  If there are no entries in the log the message **Log Empty** will be displayed.

  ![+ Log empty +]

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

  ![2 Errors in log]

- Press **V** to step through the log entries.

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

<table>
<thead>
<tr>
<th>Entry</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Error name</td>
<td>PV test prompt</td>
</tr>
<tr>
<td>Time and Error code</td>
<td>08:43:01 ACT</td>
</tr>
<tr>
<td>Day and Date</td>
<td>THU  30 MAR 2000</td>
</tr>
</tbody>
</table>
### 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 `ENTER` 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 `ENTER` to select it.
  The display will show **Errors cleared**.
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Displaying and printing reports
Setting up the IQ Metal Detector

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

The IQ Metal Detector provides three alternative calibration procedures:

**Update calibration** fine-tunes the compensation value to minimize the signal, 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** and **Reverse 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 `CALIBRATE`.
  The display shows **Update?**

- Press `ENTER` 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 `CALIBRATE`, and then press `ENTER`.
  The display shows **Full Calibrate?**
The following table lists the messages that may appear during calibration:

<table>
<thead>
<tr>
<th>Message</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>+Use ferrite+</td>
<td>This only applies to product F, and indicates that either the ferrite wand is not being passed through the machine, or that there is not enough ferrite within the wand (check that it is the wand that was supplied with the machine).</td>
</tr>
<tr>
<td>+Head overload+</td>
<td>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, such that it is too conductive for the machine configuration; the product packaging is highly conductive. If in doubt, call your nearest Loma Service Centre.</td>
</tr>
<tr>
<td>Message</td>
<td>Explanation</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>+Working dry+</td>
<td>The product has so little moisture content that it produces no product signal, and therefore the detector has chosen to set the compensation to minimise the effects of vibration (ie the working mode of detection has automatically been set to DRY).</td>
</tr>
<tr>
<td>+Bad pack+</td>
<td>The threshold which the machine is calculating for this product is exceeding the maximum threshold (set in the <strong>Manual Setup</strong> menu). This would typically be because the calibrate pack is contaminated or is too conductive for the maximum threshold setting. Check that the calibrate pack(s) is representative of production packs (eg. for frozen product, the calibrate pack must be frozen). If in doubt, call your nearest Loma Service Centre.</td>
</tr>
<tr>
<td>+Power reducing+</td>
<td>The unit is reducing the head power to account for the product effect of the product.</td>
</tr>
<tr>
<td>+Head locked+</td>
<td>The unit is using the Head power value from <strong>Manual setup</strong> menu, rather than determining it itself, as the head power has been locked in that menu.</td>
</tr>
<tr>
<td>+Mode locked+</td>
<td>The unit is using the working mode from the <strong>Manual setup</strong> menu rather than determining it itself, as the working mode has been locked in that menu.</td>
</tr>
<tr>
<td>+Dry product+</td>
<td>The product has little product signal, and therefore the wrong mode of working may have been locked.</td>
</tr>
<tr>
<td>+Calibrate complete+</td>
<td>A successful full calibration has occurred.</td>
</tr>
</tbody>
</table>
Setting up the IQ Metal Detector

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.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working mode</td>
<td>Dry, Reacts or Resists to specify the working mode.</td>
</tr>
<tr>
<td>Working</td>
<td>Allows the working mode to be locked so it cannot be altered during calibration.</td>
</tr>
<tr>
<td>Min threshold</td>
<td>The minimum acceptable threshold after calibration.</td>
</tr>
<tr>
<td>Max threshold</td>
<td>The maximum acceptable threshold after calibration.</td>
</tr>
<tr>
<td>Threshold</td>
<td>Allows the threshold to be adjusted.</td>
</tr>
<tr>
<td>Compensation</td>
<td>Allows the compensation value to be adjusted.</td>
</tr>
<tr>
<td>Head power</td>
<td>Can be adjusted between Max, 7 to 1, or Min to adjust the head power.</td>
</tr>
<tr>
<td>Head</td>
<td>Allows the head power to be locked so it will not be adjusted automatically during calibration.</td>
</tr>
</tbody>
</table>

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 (Back), and then press (Down) twice until the display shows Manual Setup.

- Press (Enter) 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 working mode

The IQ Metal Detector operates in one of three alternative modes to give the best results with different types of product.

DRY mode is used for products with no product effect.

RESIST mode is used for products that exhibit some product effect, such as cocoa, iron fortified cereals, flour, etc, or that contain some moisture.

REACT mode is used for products that are conductive; ie with a significant water content such as cheese or meat, or products wrapped in metalised film.

For more information refer to Principles of operation, page 24.

Normally this setting is automatically set during calibration, but you can set it manually and optionally lock it so that it does not get altered during subsequent calibration.

To set the working mode

- Select the Manual setup menu as described above.
- Press \( \downarrow \) to display the Working mode option, and press \( \text{ENTER} \) to edit it.
- Press \( \uparrow \) or \( \downarrow \) to step between the three options DRY, RESIST, and REACT.
- Press \( \downarrow \) to display the Working option and press \( \text{ENTER} \) to edit it.
- Press \( \uparrow \) or \( \downarrow \) to switch between LOCK and UNLOCK.

This allows you to lock the working mode setting so it is not automatically set during a calibration procedure.
**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.

Additionally you can specify a trigger threshold, which is used on pipeline systems to ensure that a calibration procedure is not started without product being present in the pipeline.

**To set the minimum and maximum threshold**

- Select the Manual setup menu as described above.
- Press \( \uparrow \) until the display shows Min threshold and press Enter to edit it.

- Press \( \uparrow \) or \( \downarrow \) to increase or decrease the minimum threshold and press Enter to confirm it.

- Press \( \downarrow \) to display the maximum threshold and press Enter to edit it.

- Press \( \uparrow \) or \( \downarrow \) to increase or decrease the maximum threshold and press Enter to confirm it.

*Min threshold 300

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.

*Max threshold 15000

The maximum threshold sets an upper limit on the acceptable threshold as a safeguard against contaminated product being used during calibration.
Adjusting the threshold and compensation

These values are normally automatically set up during calibration and should not normally require adjustment.

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

Note that any manual settings will be lost the next time a calibration is performed.

To set the trigger threshold

- Press \( \downarrow \) to display the current trigger threshold and press \( \text{ENTER} \) to edit it.

  This option will only appear if the Calib trigger option has been set to On in the User Options menu.

- Press \( \uparrow \) or \( \downarrow \) to increase or decrease the trigger threshold, and press \( \text{ENTER} \) to confirm it.

To adjust the threshold

- Press \( \downarrow \) until the Threshold option is displayed and press \( \text{ENTER} \) to select it.

  The display shows the threshold and signal and allows you to edit the threshold.
### To adjust the threshold (Continued)

- Press **ENTER** to edit the threshold.
- Press **^** and **V** keys to increase or decrease the threshold respectively and press **ENTER** to confirm it.

<table>
<thead>
<tr>
<th>Threshold Value</th>
<th>300</th>
<th>13</th>
</tr>
</thead>
</table>

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

### To adjust the compensation

- Press **^** until the display shows Compensation and press **ENTER** to select it.
  
The display then shows the current compensation and signal level values.

<table>
<thead>
<tr>
<th>Compensation Value</th>
<th>-285</th>
<th>13</th>
</tr>
</thead>
</table>

- Press **ENTER** to edit the compensation value.
- Press **^** or **V** to increase or decrease the compensation respectively and press **ENTER** to confirm it.
### 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.

<table>
<thead>
<tr>
<th>To adjust the head power</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Select the <strong>Manual setup</strong> menu.</td>
</tr>
<tr>
<td>• Press ◀ until the current head power setting is displayed:</td>
</tr>
<tr>
<td>• Press <strong>ENTER</strong> to edit it, press ◀ or ◁ to increase or decrease the head power respectively, and press <strong>ENTER</strong> to confirm it.</td>
</tr>
</tbody>
</table>

*The head power can be adjusted to the values Min (least sensitive), 1, 2, 3, 4, 5, 6, 7, or Max (most sensitive).*

<table>
<thead>
<tr>
<th>To lock the head power</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Press ◀ to display <strong>Head</strong>.</td>
</tr>
<tr>
<td>• Press <strong>ENTER</strong> to edit it, press ◀ or ◁ to switch between <strong>LOCKED</strong> and <strong>UNLOCKED</strong>, and press <strong>ENTER</strong> to confirm it.</td>
</tr>
</tbody>
</table>

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

  ![Calendar](calendar.png)

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

  ![Year 2000](year2000.png)

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

  Pressing **CANCEL** exits from the menu without making any changes.
Setting the machine ID

The Machine details menu provides information about the software fitted to the IQ 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 Enter to select it.
- Edit the machine ID in the usual way. See To edit a text field, page 35.

Defining keycodes

Keycodes can be used to restrict operation of the IQ 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 Enter to select it.
- The Keyboard lock option is displayed:
  - Keyboard lock off

Machine details
  - Machine LINE 23
<table>
<thead>
<tr>
<th><strong>To lock the keyboard</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Press <code>K</code>. The following prompt is displayed:</td>
</tr>
<tr>
<td>• Press <code>ENTER</code> to lock the keyboard. <strong>Keyboard locked</strong> will be displayed: Access will now be restricted to entering the numbers specified in the keycode change and PV test options.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>To gain access</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Press <code>K</code>, or select one of the other options to which access is needed. You will be prompted to enter the appropriate keycode:</td>
</tr>
<tr>
<td>• Press <code>▲</code> and <code>▼</code> to set the keycode and press <code>ENTER</code> to confirm it. You will then have access to the options specified by that keycode.</td>
</tr>
</tbody>
</table>

For security the keyboard will automatically lock itself if no keys have been pressed within a period of five minutes.
Setting up the IQ Metal Detector
Using Performance Validation

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

Regular checking of the IQ 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 IQ 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 IQ 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 Identification: ABC
Test Samples Ferrous: 5 x 1.00mm
Test Samples Non Ferrous: 5 x 1.00mm
Test Samples Stainless St: 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 Enter 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.

Note that PV test setup is not available with Reverse mode detection.

<table>
<thead>
<tr>
<th>To set the performance validation interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Select the PV test setup menu as described above. The timing option will be displayed:</td>
</tr>
<tr>
<td>• Press Enter to edit it,</td>
</tr>
<tr>
<td>• Press ↑ or ↓ to select between the options OFF, INTERVAL, or BATCH, and press Enter to confirm it.</td>
</tr>
<tr>
<td>If you have selected INTERVAL:</td>
</tr>
<tr>
<td>• Press ← to display the Interval option and press Enter to edit it.</td>
</tr>
<tr>
<td>• Press ← and → to increase or decrease the interval in hours and minutes and press Enter to confirm it.</td>
</tr>
</tbody>
</table>

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.

BATCH is only available if Batch reports has been set to YES in the Report options menu.
### To set the performance validation interval (Continued)

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press <strong>V</strong> to display the Synch option and press <strong>ENTER</strong> to edit it.</td>
<td>![Synch 14.30]</td>
</tr>
<tr>
<td>Press ^ or V to increase or decrease the synch time respectively and press <strong>ENTER</strong> to confirm it.</td>
<td>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.</td>
</tr>
<tr>
<td>Press <strong>V</strong> to display the Test window option and press <strong>ENTER</strong> to edit it.</td>
<td>![Test window 30]</td>
</tr>
<tr>
<td>![Test window 30]</td>
<td>This specifies the time in minutes within in which the PV test must be completed. If not completed within the specified time a <strong>PV test timeout</strong> error is reported.</td>
</tr>
</tbody>
</table>
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.

<table>
<thead>
<tr>
<th>To specify the characteristics of the PV test</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Press  until the No of passes option is displayed and press ENTER to edit it.</td>
<td><img src="2" alt="No of passes" /></td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>• 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 ENTER to confirm it.</td>
<td><img src="2.00" alt="Fe size" /></td>
</tr>
<tr>
<td></td>
<td>The size can be set between 0.01 and 10.00 millimeters. Setting the size to 0.00 will disable the prompt during testing.</td>
</tr>
<tr>
<td>• Press  to display the Fe size option and press ENTER to edit it.</td>
<td><img src="2.00" alt="Fe size" /></td>
</tr>
<tr>
<td>• Enter the size of ferrous test wand which should be prompted for when a PV test is initiated.</td>
<td><img src="2.00" alt="Fe size" /></td>
</tr>
<tr>
<td>Likewise, set the NFe (non-ferrous) and ST (stainless steel) sizes on the subsequent two menus.</td>
<td><img src="2.00" alt="NFe size" /></td>
</tr>
<tr>
<td><img src="2.00" alt="ST size" /></td>
<td></td>
</tr>
</tbody>
</table>
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 Enter 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 \( \text{r} \) to display the Results menu.
- Press \( \text{V} \) arrow until the Run PV test option is displayed.
- Press \( \text{e} \) to confirm that you want to run the PV test.

The following Operator prompt will be displayed:

- Press \( \text{e} \) to edit the prompt and then enter the operator ID in the usual way; see To edit a text field, page 35.

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

- Press \( \text{e} \) to enter the size of the test wand.
- Press \( \text{e} \) to confirm the size of the test wand.

It will then perform the first pass of PV testing.

If no test sample sizes have been programmed then the display will show \( \text{+ No Samples+} \) and a report will be produced immediately.
To cancel a performance validation test

- Press CANCEL.

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 IQ Metal Detector

This chapter describes how to install the IQ 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 IQ Metal Detector.

For a description of each version of the IQ Metal Detector range see the chapter About the IQ 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 vii.

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 a minimum of 1 metre free space is available at the front of the machine and 1 metre at the rear.
Lifting and moving an IQ Metal Detector
Depending on the size and weight of 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 beneath the metal detector so that the conveyor will not tilt when lifted.
  Attach the straps to the crane.
• Lift the conveyor and carefully move it to the required location.
• Lower the conveyor and remove the straps.

Using a fork lift truck
• Position the forks beneath the metal detector so that the metal detector does not tilt.
  Raise the lift sufficiently to lift the metal detector clear of the ground and any obstacles.
• Carefully move the metal detector to the required location.
• Lower the forks and withdraw them from the metal detector.

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 RF measuring device, which is well screened from outside interference and has excellent electronic discrimination against unwanted electromagnetic fields. However, due to its sensitivity it is possible that other devices which emit high levels of RF noise at the operating frequency of the detector could cause interference, thereby degrading the performance of the detector. It is therefore important to avoid siting the detector next to any devices which emit abnormally high levels of RF interference if proper operation is to be maintained.

Further information is contained in your Service Manual.

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.

**Radio frequency interference**

A metal detector is, essentially, a Radio Frequency (RF) receiver. As such it is sensitive to RF noise in the general vicinity of the detector location. While those frequencies not close to the operating frequency of the detector will usually be filtered out (this includes most ‘walkie talkie’ frequencies, unless the transmitter is held very close to the detector aperture), it is not uncommon for the control frequency (or multiple of it), used in modern speed controllers, to cause interference.

To reduce the risks of such interference causing false rejects or other symptoms of undesirable operation at the metal detector, the following recommendations should be followed:
Always route speed controller input and output wiring away from the metal detector area. NEVER put speed controller wiring in the same conduit or on the same supply as the metal detector wiring.

Run speed controller wiring in the general vicinity of the metal detector in a rigid steel conduit or use other techniques to ensure 100% screening of the cable.

Always follow the speed controller manufacturer's instructions for installation, wiring, screening and grounding.

In addition to following these guidelines, most speed controller manufacturers can supply input and output filters which can be fitted to the field wiring to dramatically reduce RF emissions if necessary.

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 RF noisy environments, provided the other equipment is to the same standards and the field wiring is suitable ‘hard’.

**Installing a serial link**

The main control electronics board supplied with each detector has as standard two serial links.

In order to use any of the serial links 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 external 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 make use of the standard on-board link or add extra serial links to an existing system please contact your local Service Centre who will be pleased to assist.

Refer to your Service Manual for wiring installation guidelines and link position information for all standard and additional links.
IQ 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:

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 vii.

Preparing to install an IQ metal detector

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 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 Loma 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 location of components inside a typical electrical services box:
Installing the IQ Metal Detector

- Remove the plastic terminal cover from the starter isolator.
- Insert a waterproof gland into the base 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 waterproof gland.
- Split the cable inside the box and cut the wires to suitable lengths. The wires for the three phases and neutral are to be connected to terminals on the isolator switch but the earth wire is to be connected to the PE/Earth TERMINAL block.
- Make the connections to the isolator switch as follows:

<table>
<thead>
<tr>
<th>Core</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three Phases</td>
<td>1, 3, and 5</td>
</tr>
<tr>
<td>Neutral</td>
<td>N</td>
</tr>
</tbody>
</table>

- Connect the earth wire to a free terminal on the PE/Earth TERMINAL block.
- 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. An air-blast type reject does not require the use of a regulator. If the conveyor is fitted with either a carriage retract or plough reject mechanism, a lubricating unit is also supplied. This is attached to the regulator. Other air-operated reject mechanisms do not require the use of a lubricator, and one is therefore not fitted.
The following illustration shows a typical regulator and lubricating unit assembly:

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 in series with the starter motor coil. This goes open-circuit if the air pressure drops below 40psi (2.8 bar).

- If a pneumatically-operated reject system is fitted, but it is not an air-blast type, connect the air supply to the air regulator unit (see Figure 8) via a 6mm O/D air tube.
- If the reject is an air-blast type, an air regulator is not fitted to the conveyor. Refer to the following illustration:
• Connect the air supply to the conveyor via a 90-degree elbow fitting, using a 10mm O/D air tube. The elbow may be fitted to either the right- or left-hand end of the reject mounting bracket, depending on the layout of the machine.

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:
• 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
The belt must be checked for correct tracking before running the conveyor for any length of time. The tracking adjusters are found at the drive area on the standard conveyor.

If belt tracking needs to be reset see Routine maintenance, page 119.
Setting up reject mechanisms
The conveyor system is supplied with the reject mechanism correctly set up. Normally, no further adjustment should be required. If adjustment is required see Adjusting the reject mechanisms, page 124.

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 38.

Pusher and Plough rejects
The system is supplied with the reject cylinders already set, and normally no further adjustment should be necessary.

If adjustment is required, refer to the following illustration and carry this out as described below:
At the 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).

**IQ pipeline versions**
This section describes how to install a Loma stand-mounted pipeline metal detector. After connection of the appropriate services, the detector is ready for immediate use.

**Warnings**
The following additional safety warnings apply to these procedures:

13. **STAND-MOUNTED VERSION**
14. **SECURITY**
15. **START UP WITH AUTOMATIC REJECT VALVE**
16. **HEIGHT ADJUSTMENT**
17. **SECURITY**

For details see *Safety warnings*, page iii.

**Preparing to install a detector**
All stand-mounted pipeline metal detectors are dispatched from Loma Engineering in the following state:

- Wheels are locked.
- Spanners required for installing and maintaining the detector are supplied.
- The reject valve is packed separately in bubble-wrapping.
Connecting the detector

- Connect the automatic reject valve to the body of the detector.
- Slacken the height adjustment handle, taking care that the detector does not rise too quickly on the gas-filled strut. Carefully adjust the height of the unit so that the input and output ports are aligned with the existing pipe system and the weight of the detector is fully supported on the wheels. Fully tighten the adjustment handle.
- Lock all four wheels.
- Connect the unit to the existing pipe system.

Connecting electrical supplies

The standard Loma stand-mounted pipeline metal detector requires a single-phase electrical supply. Electrical connections are made to a connector block inside a junction box. The junction box is located at the side of the control unit.

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

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MAINS</td>
</tr>
<tr>
<td>2</td>
<td>INPUT</td>
</tr>
<tr>
<td>3</td>
<td>EARTH</td>
</tr>
<tr>
<td>4</td>
<td>REJECT COMMON</td>
</tr>
<tr>
<td>5</td>
<td>REJECT N/C-FAULT COMMON</td>
</tr>
<tr>
<td>6</td>
<td>FAULT N/O</td>
</tr>
<tr>
<td>7</td>
<td>FAULT N/C</td>
</tr>
<tr>
<td>8</td>
<td>AUX REJECT COMMON</td>
</tr>
<tr>
<td>9</td>
<td>AUX REJECT N/O</td>
</tr>
<tr>
<td>10</td>
<td>AUX REJECT N/C</td>
</tr>
<tr>
<td>11</td>
<td>ATTENTION COMMON</td>
</tr>
<tr>
<td>12</td>
<td>ATTENTION N/O</td>
</tr>
</tbody>
</table>

Terminals 8, 9 and 10 provide a complete set of Reject relay contacts for auxiliary purposes. Terminals 11 and 12 provide a set of normally-open contacts from an Attention relay.

In this illustration the status of the relay contacts shown is with the detector switched on, not detecting, and not in a fault condition.

- Remove the cover of the junction box.
- Insert a waterproof gland into the base of the junction box.
• The supply to the conveyor must be either 3-core cable fed through a flexible conduit or 3-core armoured cable. Insert the cable through the waterproof gland.

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

• Split the cable inside the box and cut the wires to suitable lengths.
• Refer to the previous illustration for connector block wiring details. Make the connections to the connector block as follows:

<table>
<thead>
<tr>
<th>Core</th>
<th>Colour</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIVE/HOT</td>
<td>(brown or black)</td>
<td>3</td>
</tr>
<tr>
<td>NEUTRAL</td>
<td>(blue or white)</td>
<td>2</td>
</tr>
<tr>
<td>EARTH/GROUND</td>
<td>(yellow + green, or green)</td>
<td>1</td>
</tr>
</tbody>
</table>

For reference, the relationship between the European and North American wiring names and colours are given below:

<table>
<thead>
<tr>
<th>European</th>
<th>N. America</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIVE (brown)</td>
<td>HOT (black)</td>
</tr>
<tr>
<td>NEUTRAL (blue)</td>
<td>NEUTRAL (white)</td>
</tr>
<tr>
<td>EARTH (yellow + green)</td>
<td>Ground (green)</td>
</tr>
</tbody>
</table>

• Connect the Reject device supply to terminal 4. For full fail-safe operation, connect the Reject device to terminal 7.

If the metal detector already has a reject device fitted it will already be connected.

• Make further connections to the terminals in the junction box as required; see the previous illustration for details.
• Check that all connections are secure and correct then securely refit the cover of the junction box.
Connecting the air supply (pneumatically-operated reject valve only)
An air supply at a pressure of between 80psi (5.5 bar) and 90psi (6.0 bar) is required when the detector is fitted with a pneumatically-operated automatic reject valve. The minimum air pressure should not fall below 75psi (5.2 bar) when the reject valve operates. The air supply must be dry and lubricated.

- If a pneumatically-operated reject valve is fitted, connect the compressed air supply to the input port of the 5-port valve via a 10mm O/D air tube. This valve is situated on the control unit bracket.

Checking the detector
- Check that all couplings are securely tightened and that the unit is not hanging from the pipeline, or pressing upwards in such a way as to distort the assembly.
- Check that the four wheels are securely located on the floor and locked.

Powering up the detector
- Switch on the supply and the search head control unit.
- Switch on the air supply to the detector.
- Set up the unit as described in Setting up the IQ Metal Detector, page 53.

IQ Handtmann versions
This section describes how to install a Loma Handtmann pipeline metal detector. The detector is mounted from the hinge block located on the filler outfeed adjacent to the filler product pipe. Depending upon application the metal detector may additionally be supported on a wheeled height adjustable stand with or without a pneumatically-operated automatic reject valve.

Warnings
The following additional safety warnings apply to these procedures:

18. HANDLING A HINGE MOUNTED VERSION ON A PA30 FILLER
19. HANDLING WITHOUT A STAND
20. HANDLING WHEN MOUNTED ON A STAND
21. SECURITY WHEN MOUNTED ON A STAND
22. START UP WITH AUTOMATIC REJECT VALVE

23. HANDLING WITH A WATER JACKET FITTED

24. OPERATING WHEN USED FOR HANDLINKING

For details see Safety warnings, page iii.

**Handlinking applications**

This requires the removal of the hand linking gearbox assembly from the filler hinge and refitting it to the replica hinge block on the outfeed of the metal detector assembly. Power and reject connections are made as follows:

If the metal detector has a terminal box fitted then power is connected as described in the Connecting electrical supplies, page 81.

If the metal detector does not have a terminal box then power is made via the free power cable exiting the underside of the control box.
The reject system used with this model is Stop-on-Detect, a pair of voltage free relay contacts are wired into either a single connector as shown in the following illustration which locates into the Utensil Socket on the rear of the filler:

**AL applications**

This requires the uncoupling of the AL machine from the filler hinge block and re-coupling it to the replica hinge block on the outfeed of the metal detector assembly.

If the metal detector has a terminal box fitted then power is connected as described in the *Connecting electrical supplies*, page 81.

If the metal detector does not have a terminal box then power is made via the free power cable exiting the underside of the control box.
The reject system used with this model is Stop-On-Detect, a pair of voltage free relay contacts are wired into a dual connector as shown in the previous illustration. This will require the removal of the AL connection cable from the utensil socket on the rear of the filler, the metal detector dual connector is located in that socket and the AL re-connected to the back of the dual connector.

**Dual applications**
Installation is a combination of the above. The unit will require two product pipes, one for handlinking and one for AL linking. The metal detector will also have a hinge adapter which is located between the filler hinge and the metal detector for use when AL linking is required. Its purpose is to move the metal detector position forward from the filler body to allow the extra length AL product pipe and swivel fitting to connect to the filler.

Power and reject connections are as described for the AL application above.

**Short Hinge applications**
Installation again is a combination of the above. The unit is normally stand mounted and may have a pneumatically-operated reject valve fitted. It may also precede a clipping machine.

Power may be made via the terminal box, if fitted, or the free power cable exiting the underside of the control box as described above.

If a pneumatically-operated reject valve is fitted, then the unit will require a compressed air supply for the valve of between 80psi (5.5 bar) and 90psi (6.0 bar). The minimum air pressure should not fall below 75psi (5.2 bar) when the valve operates. The air supply must be dry and lubricated. Connection is made to the input port of the 5-port valve via a 10mm O/D air tube.

**Checking the detector**
- Check that all couplings are securely tightened and that the unit is not fitted in such a way as to distort the assembly.
- Check all electrical and pneumatic connections as applicable are secure and connected correctly.
- If a stand is fitted check that all four wheels are securely located on the floor and are locked.
IQ pharmaceutical versions

This section describes how to install a Loma pharmaceutical metal detector. The detector is supplied complete with its own stand and reject mechanism. After connection of the appropriate services, the detector is ready for immediate use.

Warnings
The following additional safety warnings apply to these procedures:

25. ADJUSTMENT
26. SECURITY

For details see Safety warnings, page iii.

Preparing to install a detector
The pharmaceutical metal detector is dispatched from Loma Engineering with the wheels locked.

Connecting the detector
• Adjust the height of the detector by slackening the height clamp and sliding the head up or down the stand tube. The stand is supplied with an internal gas strut, aiding adjustment by giving the detector an effective zero mass. Re-tighten the height clamp.
• Tilt the metal detector by slackening the tilt clamp slightly and carefully tilting the head to the required angle. The reject mechanism must always be on the lower side. Re-tighten the tilt clamp.
• The height may now need further adjustment.
• Lock all four wheels by means of the integral brakes.

Connecting electrical supplies
Pharmaceutical metal detectors are supplied with fitted mains plugs. No wiring is required.

Checking the detector
• Check that all guards are in place and are secure and that the infeed and outfeed of the system are clear of obstructions.
Powering up the detector

- Switch on the supply and the search head control unit.
- Set up the unit and verify the operation of the metal detector as described in Setting up the IQ Metal Detector, page 53.

IQ freefall versions

Loma supply two versions of slimline freefall metal detector search heads:

- Standard full size case model
- Slimline contained field (CF) model.

For reasons identical to those for the mounting of heads on conveyors, certain guidelines must be followed to achieve optimum sensitivity.

Warnings

The following additional safety warnings apply to these procedures:

28. START UP WITH TROUSER LEG REJECT DEVICE.

For details see Safety warnings, page iii.

Search head mounting methods

Freefall metal detectors may be mounted on anti-vibration mounts, on a Tufnol plate, or by a pivoting arrangement. See IQ freefall versions, page 94, for more information.

Whichever method is used to mount the head, the head must be insulated from any surrounding metalwork. It should be grounded only by means of the 12-core screened cable which connects the head to the control box.

Search head metal-free area

As with heads mounted on conveyors there is both a metal-free area for moving and fixed metal. However, due to the different construction of slimline freefall heads, the metal-free area is different and varies between standard and contained field variants.

If a standard metal detector head is used in a freefall application, then the metal-free area figure in the section on mounting heads on conveyors should be followed.
Routing the cable between the search head and the control box
The 12-core screened cable supplied must be used to join the search head to the control box.

NOTE: Do not route the cable with any electrically noisy wiring, such as mains supplies.

Connecting the air supply (pneumatically-operated trouser leg only)
An air supply at a pressure of between 100psi (6.9 bar) and 150psi (10.4 bar) is required. The minimum air pressure must not fall below 75psi (5.2 bar) when the reject operates. The air supply must be dry and lubricated.

- Connect the compressed air supply to the input side of the air filter and regulator unit. This unit is located on the inside of the reject device framework.

Static precautions for dry powder products
For products likely to generate static it is essential that the product pipe which runs through the aperture is fitted with an antistatic screen. Please consult your Loma Service Centre for details.

Metal free area for contained field freefall

- The metal-free area shown is for moving metal.
- Provide a 150mm metal-free area around the end plate gasket.
• The metal-free area is symmetrical about each side of the head.
• The metal-free area may be reduced, but at the possible expense of sensitivity.

**Metal free area for standard freefall**

The metal-free area is computed by measuring out from any point on the nearest receiver coil (29mm in from the casing) by the smallest aperture dimension A.

• The metal-free area is symmetrical about each side of the head.
• For moving metal, dimension A should be doubled.
• Provide a 150mm metal free area around the end plate gasket.

**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 one end, and kept free from sources of electrical noise (eg mains supplies for large electrical machines).

**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 99, to thoroughly familiarise themselves with the installation requirements.

**Connecting electrical supplies**
Whenever a Loma metal detector search head is supplied as a Head only it is fitted with a waterproof junction box mounted on the side of the control unit. Electrical connections are made to a connector block inside the junction 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:

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-4</td>
<td>MAINS</td>
</tr>
<tr>
<td>5-7</td>
<td>INPUT</td>
</tr>
<tr>
<td>8-10</td>
<td>REJECT COMMON</td>
</tr>
<tr>
<td>11-12</td>
<td>REJECT N/C-FAULT COMMON</td>
</tr>
<tr>
<td>13-15</td>
<td>FAULT N/O</td>
</tr>
<tr>
<td>16-18</td>
<td>FAULT N/C</td>
</tr>
<tr>
<td>19-21</td>
<td>AUX REJECT COMMON</td>
</tr>
<tr>
<td>22-24</td>
<td>AUX REJECT N/O</td>
</tr>
<tr>
<td>25-27</td>
<td>AUX REJECT N/C</td>
</tr>
<tr>
<td>28-30</td>
<td>ATTENTION COMMON</td>
</tr>
<tr>
<td>31-33</td>
<td>ATTENTION N/O</td>
</tr>
</tbody>
</table>

Terminals 8, 9 and 10 provide a complete set of Reject relay contacts for auxiliary purposes. Terminals 11 and 12 provide a set of normally-open contacts from an Attention relay.

**NOTE:** In the above illustration the status of the relay contacts shown is with the detector switched on, not detecting, and not in a fault condition.

- Remove the cover of the junction box.
- Insert a waterproof gland into the base of the junction box.
- The supply to the conveyor must be either 3-core cable fed through a flexible conduit or 3-core armoured cable. Insert the cable through the waterproof gland.

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

- Split the cable inside the box and cut the wires to suitable lengths.
- The above illustration for connector block wiring details. Make the connections to the connector block as follows:

<table>
<thead>
<tr>
<th>Core</th>
<th>Colour</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIVE/HOT</td>
<td>(brown or black)</td>
<td>3</td>
</tr>
<tr>
<td>NEUTRAL</td>
<td>(blue or white)</td>
<td>2</td>
</tr>
<tr>
<td>EARTH/GROUND</td>
<td>(yellow + green, or green)</td>
<td>1</td>
</tr>
</tbody>
</table>
For reference, the relationship between the European and North American wiring names and colours are given below:

<table>
<thead>
<tr>
<th>European</th>
<th>N. America</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIVE (brown)</td>
<td>HOT (black)</td>
</tr>
<tr>
<td>NEUTRAL (blue)</td>
<td>NEUTRAL (white)</td>
</tr>
<tr>
<td>EARTH (yellow + green)</td>
<td>GROUND (green)</td>
</tr>
</tbody>
</table>

- If a reject device is to be used, connect the reject supply to terminal 4. For full fail-safe operation, connect the reject device to terminal 7.
- Make further connections to the terminals in the junction box as required (see previous illustration).
- Check that all connections are secure and correct, then securely refit the cover of the junction box.
- Please refer to Appendix C 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 now, and our current conveyor design incorporates this wealth of experience. There are a number of points to watch 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 conveyor must be of substantial and welded – not bolted – construction.
- There shall be no fixed metal closer to the centre of the head aperture than 1.5 times the smaller of the two aperture dimensions; see Further information, page 105.
- There should be no moving metal closer to the centre of the head aperture than three times the smaller of the two aperture dimensions.
- The head should be mounted on the conveyor using the mounting kit supplied.
- The conveyor belt should be of plastic construction with an angled heat sealed or vulcanised joint. Straight joints using even non-metallic clips must not be used. Rollers should be PVC coated steel or of high grade stainless steel construction.
• The belt must be supported through the aperture by a non-metallic skid plate such as Tufnol which must be strong enough not to bow under the product weight.
• Electrical Interference. The reject relay usually switches inductive loads such as motor starter contactors, solenoid valves etc. Suppressors must be fitted to these devices.

Most problems with intermittent or nuisance triggering are due to insufficient appreciation of the basic problems involved. The following sections explain the reasoning.

**Conveyor construction**
Where the product to be screened is dry or frozen, the detector can be run in dry or resistive mode, where it is inherently resistant to vibration or shock. However, where the product is wet and/or salty (e.g. fresh meats, meat products, cheese, pickles, mortar etc.) the unit has to be run in reactive mode to compensate for product effect. In consequence the detector head’s resistance to vibration is much reduced. The conveyor must therefore be designed with this criterion in mind.

It must be capable of supporting the detector head (larger ones can weigh hundreds of kilograms), together with the product, at all times without flexing or sagging at any point and with the minimum of inherent vibration.

The metal detector is a radio frequency electromagnetic device which sets up a high frequency field through the aperture. The stainless case acts as a screen to prevent external metal, or electrical or magnetic fields, affecting the search coil assembly, and to retain the field within the head. However because there has to be an aperture through which the product to be monitored can pass, some of this field radiates to the outside and, by induction, causes small electrical currents (eddy currents) to flow in nearby metallic structures which form closed electrical circuits or loops.

Such closed loops are inherently part of the framework of the conveyor upon which the head is mounted and consist of side supports, stringers, cross braces, rollers and roller shafts, etc. Provided that the eddy current paths have a constant electrical resistance, the metal detector can ignore them.

Welding the framework of the conveyor ensures that most of the eddy current paths maintain a constant electrical resistance. It is impossible to guarantee this if the frame is bolted together – bolts can loosen slightly due to vibration and mating surfaces can corrode or get painted over – all of which will affect the resistance of the joint and can cause false triggering.
With rollers it is virtually impossible to provide a constant resistance path, mainly because the bearings are usually lubricated by grease which is non-conductive. The balls act as the contacts and in consequence the contact resistance varies as they move through the grease. Here the alternative approach of permanently open circuiting the loop must be taken by electrically insulating one end of the roller shaft from the frame of the conveyor. In practice it does not matter whether the eddy current path is open circuited or short circuited provided it can be guaranteed to be constant throughout the life of the conveyor, since problems arise only when the resistance of the path varies.

Be careful also when installing the conveyor, since large eddy current loops can be formed by service conduits such as electricity and air. Only bring down one electrical conduit since it has to be bonded to the conveyor frame for safety electrical earthing purposes. For the same reason, the metal detector conveyor should not be bolted directly to any infeed or outfeed conveyors.

Ensure that the air service pipe, if metallic, is insulated where it touches the head or the conveyor frame at any point, or the electrical conduit in the region of the conveyor. It is always better to bring the final air connection in on flexible nylon tube.

To prove the point you may like to try a simple experiment. Take a piece of wire and form it into a loop a little smaller than the aperture. Do not at this stage short the two ends together. It will be found that the open circuit loop can be brought quite close to the aperture without causing the detector to trigger off. If the ends of the loop are intermittently close and open circuited, it will be found that the detector will trigger at the instant of open or close circuiting the loop even when it is at some distance from the aperture.

**Fixed metal**

Since the detector is efficiently screened, large masses of metal near the top, bottom or sides will not effect its performance. However metal nearer to the aperture than 1.5 times the smaller of the two aperture dimensions can be a major cause of poor performance, requiring the detector to be run at a reduced sensitivity. The general guidelines which can be followed for metal free area for all head sizes are illustrated in *Further information*, page 105.

Metallic infeed and outfeed decking brought to the limit of the fixed metal area must be supported and fastened down firmly along the edge closest to the aperture, otherwise it becomes moving metal and must be sited further away, see below. This movement need only be very small and cases have been known where the decking was ‘singing’ as the conveyor belt passed over, causing spurious detections. Any guide rails mounted near or
into the aperture must also be non metallic. Use Darvic or some similar material and keep the mounting posts out of the metal free area.

**Moving metal**
Moving metal must be sited at least three times the smaller of the two aperture dimensions from the centre of the head, as illustrated in *Further information*, page 105. Moving metal includes rollers whether idler, drive or end rollers. This requirement determines the minimum length of the conveyor, eg for a 300mm smaller dimension aperture, assuming the head is sited in the middle, the minimum conveyor length has to be 1.8m to ensure that the end rollers are out of the moving metal free area. If rollers cause false triggering when rotating, try insulating one end to open circuit a possible eddy current loop. Other moving metal could include supply cables or conduits draped across or to one side of the conveyor and not rigidly fixed.

**Vibration**
It is important that the head is not subjected to excessive vibration. Thus the conveyor on which the head is mounted must be substantial and well supported to keep the head stable. Electrical services to the head must be taken up in a flexible not rigid conduit.

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

**NOTE:** Do not use the head as a walkway across the conveyor or as a convenient writing desk or repository for odds and ends.

**Belting**
The conveyor belt should be of a plastic or polyurethane type with an angled belt join, preferably at 60 degrees, but no more than 75 degrees, and be vulcanised or heat sealed. A 90 degree lap, clipped or sewn joint is not acceptable as product can get picked up in the joint and the detector will have to be run at reduced sensitivity to avoid false triggering.

Some belts, particularly slatted types, use oxide pigments as a colouring material. These are metallic in origin and can cause false triggering, particularly at the belt joint where the oxides are concentrated. These should be avoided.
Care must be taken when fitting a belt that all metallic swarf and filings have been cleared away and that all rollers are coated, preferably with PVC, to prevent rust formation. Rust on the rollers or swarf will be picked up onto the underside of the belt and will cause false triggering.

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 wall, vibrations will be transmitted causing false triggering. It should be noted that most slatted belting use metallic pins to join the slats. These must be replaced by non-metallic pins.

**Skid plate**

It is imperative that the belt does not touch the bottom or sides of the aperture. The belt must be supported through the aperture by a non-metallic skid plate such as Tufnol, Darvic, Phenolic (dry applications) or Delrin (wet applications). This must extend beyond the metal free area and be firmly fixed to the conveyor frame to be level with the infeed and outfeed decking. It must be strong enough not to bow under the product weight as it passes through the aperture. There must be at least 10mm clearance between the bottom and sides of the skid plate and the bottom and sides of the aperture.

Care must be taken to prevent anything touching the aperture top or bottom or sides including product passing through, skid plate, guide rails, etc. Care must be taken in conveyor system design to prevent product build-up at the sides and under the skid plate which eventually will cause false triggering.

**Electrical interference**

The detector head has been designed with a high immunity to mains borne 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. We must also highlight the possible problem of other metal detectors that may be in the vicinity. These could cause interference if operating on the same frequency. We advise a distance of not less than 16 x the smallest aperture dimension (ie height or width) between the detectors.

All inductive devices, such as reject solenoid valve coils, motor starter contactors and similar devices, should be suppressed by fitting suitable suppressors across the inductive load as close as possible to the coil. Other devices such as thyristor control gear should be suppressed in the best possible manner. Airborne interference is more difficult to deal with as it is being picked up by the search coil acting as an aerial. Common sources are radio
paging aerials and loops, RF heaters, welders of all types and even airport radar. The only cure is to re-orientate either detector head or the source of interference so that the aperture is not looking directly at it.

**Post-installation problems**
Commissioning procedures are covered comprehensively in Service Bulletin MD20. Copies are available on request.

**Spurious triggering**
Moving metal anywhere within the metal free area up to a distance of twice the smaller of the aperture dimensions away from the head can be detected.

Examples of moving metal include:
- Operator rings or watches
- Belt contamination even by small particles of rust
- Metallic belt clips even if plastic coated
- Metallic guide rails particularly into the metal free area
- Loose infeed decking
- A conveyor bolted together rather than welded
- Metallic inks or labels
- Metallic frames to infeed or outfeed guards
- Low grade or reclaimed cardboard packing materials which often contain metallised paper or foil
- Washers or swarf under the skid plate.

Other causes, include:
- Excessive vibration, particularly when run in reactive mode
- Eddy current loops
- Aperture pressure
- Electrical Interference and EMC considerations.
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 IQ Metal Detector range
Inspection and cleaning

These procedures relate to all the metal detectors in the IQ 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.

For details, see Safety warnings, page iii.

See also the safety warnings relating to specific metal detectors in the Preface.

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.

Handtmann and Pipeline versions

- Remove and clean the product pipe; see Cleaning the product pipe, page 112.
- Replace reject container, if fitted.
- Reconnect power and air to the system.
- Check that the reject mechanism or automatic reject valve operates correctly.

Pipeline versions

- If the system is fitted with a reject valve, clean the valve as described in Cleaning the automatic reject valve (Loma ARV), page 110.

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

- Water jet nozzle is <12.5mm (1/2") diameter, rounded.
- Water delivery rate is <105 litres/minute (23.1 gallons/minute) rounded.
• Distance of nozzle from equipment 2.5 - 3 meters (8.2-9.8 ft) rounded.

Pharmaceutical versions
• Isolate the electrical power supply to the metal detector.
• Check that the polycarbonate cover is fitted to the reject tray assembly and is not damaged.
• Restore the electrical power supply to the metal detector.
• Check that the reject assembly operates correctly.

NOTE: Do not remove the cover from the power supply box that is located at the rear of control unit. The components contained in this box do not require the attention of customer-personnel.

Weekly
• Isolate the electrical and compressed air power supplies to the conveyor.
• Check the security of fixtures and fittings, including the height adjustment clamp, if fitted.
  On some conveyors that are made to special order, electrical interlocks may be fitted.

Belt conveyor versions
• Check that the conveyor and associated equipment has been cleaned correctly and there is no build-up of product anywhere.
• Inspect the belt for damage.
• Check that the belt is correctly tensioned and is neither too tight nor too slack. If the belt feels too loose but is still capable of moving the product without slippage, it may not need to be adjusted. If the belt is too loose, adjust it as described in the section titled Routine maintenance, page 119.
• If the conveyor is fitted with an air regulator/lubricator unit, check that the level of oil in the lubricating unit is not too low. If oil is required, top up the lubricating unit as described in Routine maintenance, page 119.
• Do not direct water directly into any bearing.

Pharmaceutical and pipeline versions
• Check that the wheels are locked.
• Clean the reject mechanism as described in Cleaning procedures, page 110.
Pipeline versions
- If the detector is fitted with an automatic reject valve, remove the piston assembly from
  the valve; see Cleaning the automatic reject valve (Loma ARV), page 110. Check the
  condition of the piston. Also check that ‘O’-rings are fitted to the piston and that they are
  in good condition. Fit new ‘O’-rings if necessary. Finally, refit the piston assembly.
- Remove the product pipe; see Cleaning the product pipe, page 112. Check the condition
  of the pipe. Also check that fitted ‘O’-rings are in good condition. Fit new ‘O’-rings if
  necessary. Finally, refit the product pipe.
- Switch on the electrical and compressed air supplies to the unit.
- Check that the reject mechanism or automatic reject valve operates correctly.

Cleaning procedures

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

Cleaning the automatic reject valve (Loma ARV)
Pipeline and Handtmann versions
- Isolate the electrical and compressed air power supplies to the metal detector.
- Unscrew the two knurled locking screws.
- Turn the two release handles in a counter-clockwise direction to release the piston
  assembly. Lift the piston assembly out of the valve body.
- Thoroughly clean the piston using a mild detergent solution.
- Check that the fitted ‘O’-rings are in good condition.
- Lift the piston assembly by the two release handles and lower it into the valve body.
  Ensure that the direction of flow is correct.
• Turn the handles in a clockwise direction to secure the piston assembly in the body.
• Tighten the two locking screws.
• Restore the electrical and compressed air power supplies to the metal detector.

**Cleaning the extension linker drive**

**Handtmann versions**

The Short Hinge Handtmann unit does not have a linker drive or outfeed end hinge unit. The dedicated AL Handtmann unit does not have a Linker drive but does have a different outfeed end hinge unit.
The Linker Drive does not require greasing. To remove, use the following procedure:

- Undo the cap head screws.
- Remove the Linker Drive unit and backing ring, taking care not to damage the external components.

**NOTE:** Do not inject water directly into Linker drive gears.

### Cleaning the product pipe

**Pipeline versions**

- Isolate the electrical and compressed air power supplies to the metal detector.
- Disconnect the fitting from the outfeed of the detector.
- Turn the coupling in a counter-clockwise direction and remove the coupling.
- On the product pipe, unscrew and remove the sample plug.
- Remove the product pipe from the body of the detector.
- Thoroughly clean the product pipe using a mild detergent solution.
- Check that the fitted ‘O’-rings are in good condition.
- Insert the product pipe into the body of the detector.
- Refit the coupling and secure the product pipe in position.
- Refit the sample plug into the product pipe.
- Restore the electrical and compressed air power supplies to the metal detector.
Handtmann versions
- Isolate the electrical and compressed air power supplies to the metal detector.
- Undo the two cap head screws on the pipe clamp and remove the clamp.

- Rotate the pipe until the flats on the pipe line up with the head aperture. Push the pipe out.
- Thoroughly clean the pipe in a mild detergent solution.
- Replace the pipe, ensuring that the clamp flat is at the top of the unit.
- Refit the clamp and screws, ensuring that the screws are not overtightened, as this could strip the threads.

Cleaning the Ladish Dairy reject valve
Pipeline versions
- Isolate the electrical and compressed air power supplies to the metal detector.
- Unscrew the clamp and remove the lower valve body from the upper valve body.
• Unscrew the piston from the actuator and thoroughly clean the piston and valve using a mild detergent solution.
• Inspect the fitted seals and seats for signs of excessive wear. Replace as necessary.

![Diagram of valve assembly](image)

• Check that the fitted ‘O’-rings and the split bushing are in good condition. Replace as necessary.
• Screw the piston onto the actuator.
• Replace the lower valve body and clamp the upper and lower valve bodies together.

**Replacing the actuator bushing/packing**

**Pipeline versions**

• Remove the end cap from the actuator by unscrewing the four screws, separate the clear stem protector from the end cap and replace the end cap.
• Apply 60 psi air to the end cap, which will force the packing and bushing out. Remove the air supply once this occurs.
• Replace the packing (with the ‘v’ side facing the actuator) and the bushing, taking care not to damage or roll the lip of the packing.
• Replace the end cap and four screws.
• Carry out this procedure to the other end of the actuator.
• Restore the electrical and compressed air power supplies.

**Cleaning the Lee Turbo Ball reject valve**

**Pipeline versions**

• Isolate the electrical and compressed air power supplies to the metal detector.
• Unscrew the three wing nuts and remove the inlet adapter from the valve body.
• Unscrew the four screws which attach the actuator bracket to the valve body and remove the actuator adapter and coupler.
• Unscrew the valve stem from the “T” ball and thoroughly clean the ball using a mild detergent solution.
• Inspect the fitted seals for signs of excessive wear. Replace as necessary.

- Check that the fitted ‘O’-ring is in good condition. Replace as necessary.
• Insert the “T” ball and seals into the valve body, and replace the valve stem, actuator coupling and adapter.
• Replace the actuator bracket and tighten the four screws.
• Replace the inlet adapter and tighten the three wing nuts.

**Cleaning the reject mechanism**

**Pharmaceutical versions**

• Isolate the electrical supply to the detector.
• Loosen the two knurled knobs that are located at the underside of the product chute and carefully withdraw the chute from the detector head. Gently tighten the knurled knobs, to avoid loss, while cleaning.
• Remove the polycarbonate cover from the reject tray.

![Diagram of reject mechanism](image-url)
• Unscrew fully both captive knurled screws that are attached to the reject support bracket. This releases the tray and flap. Hold the reject flap and pull the reject tray approximately 25mm away from the rotary solenoid. Disengage the reject flap from the shaft and remove it. Pull the tray away from the solenoid until it is released.
• Wash the product chute, polycarbonate cover, reject tray and reject flap in a mild detergent solution. Rinse and dry thoroughly.
• Either dust or lightly brush the remainder of the reject assembly to remove any loose particles. Do not use any cleaning fluids.
• Ensure that all components are clean and dry before re-assembly.
• Reach under the reject support bracket and push vertically the two spring-loaded shoulder screws that are furthest away from the solenoid. This allows the reject tray to slide onto the dovetail clamps. Push the tray towards the solenoid shaft until the shaft appears flush with the hole on the inside of the tray.
• Hold the reject flap at an angle of approximately 45 degrees to the horizontal and locate the headed pin held captive in the tray with the circlip. Now carefully push the tray approximately 1.5mm towards the solenoid to engage the solenoid shaft and flap. Push the tray fully home and release the flap. Re-tighten the two knurled captive screws to secure the tray.
• Refit the polycarbonate cover on the reject tray.
• Loosen the two knurled knobs on the product chute and refit the chute in the original position in the detector head. Tighten the two knurled knobs to secure the chute.
• Switch on the electrical supply to the metal detector.
• Check the reject operation.
NOTE: Do not operate the metal detector unless the infeed chute and the polycarbonate cover are fitted in position.

Cleaning the freefall head
Freefall versions
• Isolate the electrical supply to the metal detector.
• Wipe down the metal detector with mild detergent.
• Restore the electrical supply to the metal detector.

Cleaning a trouser leg reject
• Isolate the electrical and compressed air supplies to the metal detector.

To clean a fixed trouser leg reject:
• Release the gaiters where fitted.
• Remove the top product pipe and the reject unit product pipe.
• Remove the top plate from the trouser leg unit.

To clean a removable trouser leg reject:
• Release the gaiters where fitted. Unbolt the top flange.
• Remove the top product pipe.
• Unscrew the hand screws from either side of the unit to release it. Remove the unit from the frame.
• Remove the reject unit product pipe.
• Remove the top plate from the trouser leg unit.
• Clean thoroughly, ensuring that any residual product is removed from the reject outlet.
• Ensure that all component parts are dry.
• Re-assemble the components in reverse order.
• Restore the electrical and compressed air supplies to the metal detector.
Routine maintenance
These procedures relate to all the metal detectors in the IQ 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.

See also the safety warnings relating to specific metal detectors in the Preface.

For details, see Safety warnings, page iii.

Greasing
On conveyors fitted with a flat belt, the drive roller shaft is fitted with bearings that require greasing at regular intervals. Grease nipples are usually fitted underneath the unit next to the motor housing. On the Euroconveyor, the bearings are positioned at each end of the belt.

On conveyors fitted with a plastic modular belt, the drive and idle shafts are fitted with bearings that require greasing at regular intervals. Grease nipples may not be accessible until the belt has been removed.

On freefall heads fitted with a trouser leg reject system, the reject bucket pivot is fitted with bearings that require greasing at regular intervals. Grease nipples are fitted in the top of the bearings. There is a bearing on either side of the trouser leg (one bearing is in under the pneumatic pivot assembly cover).

Bearings should be greased four times per year, unless the environment or cleaning regime dictates that they are greased more frequently.

Before greasing, isolate the electrical and compressed air power supplies to the conveyor and switch on the supplies after greasing.
Flat belt conveyor versions
- Remove the covers from the motor drive housing to gain access to the grease nipples.
- 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.
- Refit the covers to the motor drive housing.

Plastic modular belt conveyor versions
- 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.

**NOTE:** If you do not clamp the belt it will fall off the loose sprockets when you remove the pin.
- Carefully slide out the plastic hinge pin and separate the two sections of belt.
- Apply grease to each nipple in turn. Take care not to apply too much grease. Grease should not issue from the bearing.
- When greasing is completed, carefully interlock the two sections 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 rod through the two interlocked sections of belt.
- If product guides were removed from the conveyor, refit them in position and tighten the securing screws.

Freefall versions
- Isolate the electrical and compressed air supplies to the detector.
- Remove the pneumatic pivot assembly cover.
- Apply grease to each nipple in turn. Take care not to apply too much grease. Grease should not issue from the bearing.
- Replace the pneumatic pivot assembly cover.

The following table contains recommended greases and oils:

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.P</td>
<td>Energrease LS2</td>
</tr>
<tr>
<td>Mobil</td>
<td>Mobilux EP2</td>
</tr>
<tr>
<td>TexacMultifak All Purpose EP2</td>
<td>Mobilux EP2</td>
</tr>
<tr>
<td>B.P</td>
<td>Energol 4PL 68 ISO Viscosity 68</td>
</tr>
</tbody>
</table>
Air regulator unit maintenance
Belt conveyor and freefall versions
If the conveyor or freefall metal detector is fitted with an air regulator/lubricator/filter unit, adjust the pressure setting and fill with oil as described below.

- Check that the regulator pressure setting is correct. This should be between 80psi (5.5 bar) and 120psi (8.0 bar) depending on the system type; refer to the appropriate Technical specification in the chapter About the IQ Metal Detector range, page 1. To adjust the regulator pressure, pull up the cap and turn it either clockwise to increase the pressure or counter-clockwise to decrease the pressure. Push down the cap to lock it when finished.
- Check that the water trap is empty. Empty it by pressing the drain pin.
- Check that the oil level is correct in the lubricating unit (if fitted). To refill the lubricating unit, first turn off the air at the regulator, then unscrew the unit bowl. Top up to the fill level line with ENERGOL 4PL 68 ISO Viscosity 68 oil or similar. Finally, reset the regulator to the correct pressure as described above.
- Check that the lubricator setting is correctly adjusted. It should be set to provide approximately one drop of oil per four reject cycles. This is monitored through the oil drip window and adjusted using the oil drip adjusting screw on top of the lubricating unit.
Adjusting the belt tension
Belt conveyor versions

NOTE: Do not over-tension the belt as this will cause premature wear of the bearings.

If the belt slips or moves during normal operation, check the condition of the rollers and follow the steps described below.

If any difficulty is found with tensioning or tracking, consult your local Loma Customer Service Department.

The belt tensioning and tracking screw adjusters are located either at:

- The drive module, located behind the ABS covers.
- The end roller (exposed screw heads).

NOTE: When the screw adjusters are located behind the ABS covers, it is necessary for the ABS drive and bearing covers to be removed. This exposes the drive sprockets and chain. Care must be taken when making adjustments.

- Check that the belt and all rollers are clean and free from debris and greasy elements.
- Check that all rollers are square across the conveyor and are free to rotate.
- With the belt in a slack condition, i.e. belt slipping when the motor is running, and centralized along the length of the conveyor, adjust the tensioning/tracking screws evenly until belt drive is achieved.
- Increase the tension until there is no slip condition with the belt under load (full product load).

Setting the belt tracking
Belt conveyor versions

With the belt tension set, the belt should be running down the centre of the conveyor. If the belt moves to one side, this indicates that the tracking needs to be adjusted.

NOTE: The following procedure is a general guide only. In some cases it may be necessary to reverse the tracking procedure.

- If the screw adjusters are located at the end roller, turn the screw on the same side of the conveyor to which the belt is moving by a quarter turn clockwise.
- If the screw adjusters are located at the central drive area, turn the screw on the opposite side of the conveyor to which the belt is moving by a quarter turn clockwise.
• If the belt still moves in the same direction, repeat until the belt moves back to the centre of the roller.
• If necessary, slacken the opposite tensioning/tracking screw by turning a quarter turn counter-clockwise.
• Refit all covers before resuming normal operation.

**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 is achieved as shown below:
**Adjusting the reject mechanisms**

*Pusher, plough, and retracting band rejects*

At the 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).
**Adjusting the height and tilt angle**

**Pharmaceutical versions**

To adjust the height:

- Slacken the height clamp and slide the head up or down the stand tube.

The stand is supplied with an internal gas strut, aiding adjustment by giving the detector an effective zero mass.

- Re-tighten the height clamp.

To tilt:

- Slacken the tilt clamp slightly and carefully tilt the head to the required angle.

The reject mechanism must always be on the lower side.

- Re-tighten the tilt clamp.

Once you have adjusted the tilt angle, it may be necessary to re-adjust the height.
Appendices
Appendix A – Reverse Calibration

This menu option replaces the Full calibrate menu. It will only appear when the product selected is set to Detection REVERSE.

When the detector is operating in Reverse, the selected product must be calibrated using the Reverse calibrate function to achieve optimum performance. Products used for calibration must be representative of the product to be tested. Either a single product can be repeatedly passed through the search head, or a set of at least eight identical items may be used (assuming Autocal is set to SHORT).

Once this command has been initiated the Reverse calibration cycle takes place, commencing with the instruction Pass good product. During this cycle the product containing the metal object is passed through the search head until the optimum head power is selected.

When this has been selected, the message Head Power x set will be displayed, where x is the head power that has been selected. This will be followed by the message Pass fail product.

It may be necessary at this stage to change the orientation of the metal object and repeat the first stage of the calibration sequence to ensure that the lowest head power setting is chosen i.e the maximum signal is obtained from the product.

The calibration sequence can then be continued by passing products which do not contain metal, to obtain the correct working mode, compensation and threshold values.

If the calibration cycle is started by invoking the Rev calibrate command in the Product setup menu, then the product number calibrated will be the one specified in that menu. The current running product will otherwise be calibrated.
Press ENTER to initiate a Reverse calibration cycle for the currently selected product number.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Head overload</em></td>
<td>This indicates that the head power cannot be reduced any further to stop the head overloading. Possible reasons for this could be that the calibration pack has too large a metal content in it, causing the head to overload; a product not specified for operation of the machine is being used, such that it is too conductive for the machine configuration; the product packaging is highly conductive. If in doubt, call your nearest Loma Service Centre.</td>
</tr>
<tr>
<td><em>Working dry</em></td>
<td>The product has so little moisture content that it produces no product signal, and therefore the detector has chosen to set the compensation to minimise the effects of vibration (i.e. the working mode of detection has automatically been set to DRY).</td>
</tr>
<tr>
<td><em>Bad pack</em></td>
<td>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 is too conductive for the maximum threshold setting. Check that the correct calibrate pack(s) is representative of production packs. If in doubt, call your nearest Loma Service Centre.</td>
</tr>
<tr>
<td><em>Power reducing</em></td>
<td>The unit is reducing the head power to account for the metal content of the product.</td>
</tr>
<tr>
<td><em>Head locked</em></td>
<td>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.</td>
</tr>
<tr>
<td><em>Mode locked</em></td>
<td>The unit is using the working mode from the Manual setup menu rather than determining it itself, as the working mode has been locked in that menu.</td>
</tr>
<tr>
<td><em>Dry product</em></td>
<td>The product has little product signal, and therefore the wrong mode of working may have been locked.</td>
</tr>
<tr>
<td><em>Calibrate complete</em></td>
<td>Reverse calibration was successful.</td>
</tr>
</tbody>
</table>

Whilst the Reverse calibration cycle takes place, the metal detector will not attempt to check for any metal contamination (the Run Detect LED will go out).

If Reject out of run has been selected in the User options menu and a photo-eye is fitted, all packs will be rejected during the calibrate cycle.
Appendix B – 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 optimise 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 IQ 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 ENTER.
• Press ▼ until the display shows Service and press ENTER.
• Press ▼ until the password shows 76 and press ENTER.

The display shows User options.

• Press the ▼ until the display shows Configuration and press ENTER.

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 34.
The parameters and available options are summarised in the following table:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language</td>
<td>ENGLISH (default entry), FRANÇAIS, NEDERL, DEUTSCH, ESPAÑOL, ITALIAN, PORTUGES, KATAKANA.</td>
</tr>
<tr>
<td>Type</td>
<td>CONVEYOR, FREEFALL, PIPELINE or PHARM.</td>
</tr>
<tr>
<td>Units</td>
<td>METRIC or IMPERIAL.</td>
</tr>
<tr>
<td>photo-eye</td>
<td>Select YES if a photo-eye has been wired to the control board.</td>
</tr>
<tr>
<td>Coil gap</td>
<td>Enter the coil gap as shown on the machine details plate (inside control box) or from the table in your Service Manual.</td>
</tr>
<tr>
<td>photo-eye length</td>
<td>This entry will appear 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).</td>
</tr>
<tr>
<td>Filter resist</td>
<td>Enter the filter resistor value as fitted on the main control board.</td>
</tr>
<tr>
<td>Speed mode</td>
<td>Select FIXED, unless your system is vari-speed or free running. For variable speed system select VBLE, and for free-running FRUN.</td>
</tr>
<tr>
<td>DSP</td>
<td>Enter YES for a catalogue Freefall unit, otherwise NO.</td>
</tr>
<tr>
<td>Belt speed</td>
<td>This entry will appear if speed mode is set to FIXED. Enter the belt speed.</td>
</tr>
<tr>
<td>CTB constant</td>
<td>This entry will appear, if speed mode is set to VBLE. Enter the CTB constant.</td>
</tr>
<tr>
<td>Tolerance</td>
<td>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.</td>
</tr>
<tr>
<td>Autocal</td>
<td>Select the desired auto-calibration period: Short, Long or Extra Long.</td>
</tr>
<tr>
<td></td>
<td>Short is recommended for most applications, provided that at least eight packs can be passed during a calibration cycle.</td>
</tr>
</tbody>
</table>
The following table summarises the available tolerance settings:

<table>
<thead>
<tr>
<th>Menu position</th>
<th>% of calibrated threshold added</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIN</td>
<td>15%</td>
</tr>
<tr>
<td>LOW</td>
<td>25%</td>
</tr>
<tr>
<td>MED</td>
<td>50%</td>
</tr>
<tr>
<td>HI</td>
<td>75%</td>
</tr>
<tr>
<td>MAX</td>
<td>100%</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>Photo-eye</th>
<th>No photo-eye</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short</td>
<td>8 packs</td>
<td>20 seconds</td>
</tr>
<tr>
<td>Long</td>
<td>20 packs</td>
<td>1 minute</td>
</tr>
<tr>
<td>Extra long</td>
<td>n/a</td>
<td>2 minutes</td>
</tr>
</tbody>
</table>

• Press CANCEL 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 as desired.
The available options are summarised in the following table:

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracker</td>
<td>This option will only appear if phot-eye operation has been selected in the <strong>Configuration</strong> menu. Turn this <strong>ON</strong> or <strong>OFF</strong> as required.</td>
</tr>
<tr>
<td>Reject time</td>
<td>Leave this at the default option of <strong>ON</strong> to enable access to the reject timing information in the <strong>Product setup</strong> menu. Only set this to <strong>OFF</strong> once the reject time has been correctly set, and you wish to deny line operators access to it.</td>
</tr>
<tr>
<td>Manual setup</td>
<td>Turn this <strong>ON</strong> or <strong>OFF</strong> as required.</td>
</tr>
<tr>
<td>Aux relay</td>
<td>Turn this to <strong>ERROR</strong> or <strong>RUN</strong> as required.</td>
</tr>
<tr>
<td>Access ferrite</td>
<td>This entry must be set to <strong>YES</strong>, in order that a ferrite tune can be performed.</td>
</tr>
<tr>
<td>Rej out of run</td>
<td>Turn this <strong>ON</strong> or <strong>OFF</strong> as required.</td>
</tr>
<tr>
<td>Cal trigger</td>
<td>Turn this <strong>ON</strong> or <strong>OFF</strong> as required.</td>
</tr>
<tr>
<td>*PV test</td>
<td>Set to <strong>YES</strong> to enable the Performance Validation system.</td>
</tr>
<tr>
<td>*Fault on PV</td>
<td>Set to <strong>YES</strong> to cause the fault relay to operate if a Performance Validation system test is not actioned or completed in the time allowed.</td>
</tr>
<tr>
<td>*Reverse mode</td>
<td>Set to <strong>YES</strong> to cause the detector to reject when there is no metal present in the product. <strong>NO</strong> is normal operation. The menu entry will only appear if photo-eye in the <strong>Configuration</strong> menu is set to <strong>YES</strong>.</td>
</tr>
</tbody>
</table>

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

**To set up the reject options**
Refer to **Appendix D – Reject options**, page 140.
- Press **CANCEL** 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 described in **Installing a serial link**, page 79.

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. Before any products can be calibrated, it will be necessary to perform a ferrite tune in order to minimise the effects of vibration when running products with no product effect.
To perform a ferrite tune

- Ensure that Access ferrite in the User options menu is set to YES.
- Press and press until Ferrite F is displayed.
- Press Enter.
- Perform a Full Calibration whilst moving the end of the ferrite wand with the sample in and out of the search head.
- Take care not to put your hand in or get any watches/rings near the search head.
- On systems fitted with a photo-eye block the photo-eye to register that packs are present. To do this press , followed by the and then Enter.
- Return to the User options menu and disable the access to Access ferrite.

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 4 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 C – Product signal tracking menu

This facility allows the detector to automatically adjust its threshold between two preset limits, so that the sensitivity of the machine can be optimised in situations where the product signal drifts up and down as the product effect changes.

For instance, for a frozen product the product effect signal is very small when the product has just come out of the freezer, so that a low threshold can be used to give high sensitivity. However, if the line stops for any reason then the product could thaw slightly, or build up a layer of moisture on the packaging, creating a significant product signal. In this event, the threshold will have to be raised to allow the product to be passed, without false rejection. However, this means that the sensitivity will become degraded when the product again becomes hard frozen, as there will be a large difference between the product signal and threshold. Turning the tracker facility on allows the machine to automatically switch the threshold between two upper and lower limits, thereby optimising the sensitivity.

The Tracker works by looking at the product signals from the last 100 packs, according to the following conditions: if the threshold is working at the lower limit and there are five or more packs that have product signals between optimising the lower and upper limits, then the threshold will switch to the upper limit; if the threshold is working at the upper limit and all of the last 100 packs have product signals less than the lower limit, then the threshold will switch to the lower limit.

The following tables describes the options on the Product signal tracking menu:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracking</td>
<td>Turns the tracker facility on or off for the product.</td>
</tr>
<tr>
<td>Upper thrsh</td>
<td>Sets the upper threshold limit. The value should be set as low as possible, so that when product is running with high product signal no false rejects occur. You should check that the detector will detect the minimum contaminant sizes for your company QA specification, under all production conditions, when the detector is working with this threshold value.</td>
</tr>
<tr>
<td>Lower thrsh</td>
<td>Sets the lower threshold limit. This value should be set as low as possible, so that when product is running with low product signals no false rejects occur.</td>
</tr>
</tbody>
</table>
The **Product signal tracking** menu is only accessible if the tracker facility has been enabled in the User options menu.

For this facility to be operative, a photo-eye must be fitted for product registration purposes.

This menu is product relative, i.e. there are on/off, upper limit and lower limit values for each of the 100 products.

Tracking is initialised to the upper limit on a product change, a power up, if the reject is enabled or the tracker limits are changed.

On completion of a calibration the threshold derived by the automatic calibration will be used until tracking takes place, at which point either the upper or lower limit will be used.
Appendix D – 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 are options are detailed in the following table:

<table>
<thead>
<tr>
<th>Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracker</td>
<td>Allows the user to select the tracker option for each of the products as required. See Appendix C – Product signal tracking menu, page 136.</td>
</tr>
<tr>
<td>Manual setup</td>
<td>Allows the user to make manual adjustments to the calibration of the unit via the Manual setup menu.</td>
</tr>
<tr>
<td>Auxiliary relay (Aux relay)</td>
<td>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.</td>
</tr>
<tr>
<td>Access Ferrite</td>
<td>Allows the user to gain access to product F, either via the Change Product or Product setup menus. See Appendix B – Commissioning Guide, page 130.</td>
</tr>
<tr>
<td>Reject out of run</td>
<td>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.</td>
</tr>
<tr>
<td>Cal trigger</td>
<td>Turn this facility on if product calibration is to be initiated after the signal level exceeds a preset value (set by Trigger thrsh in the Manual setup menu). Only appears if no photo-eye is used or if FRUN (free run) speed mode is selected in the Configuration menu.</td>
</tr>
<tr>
<td>PV test</td>
<td>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 set-up for PV testing to operate. Select NO to disable PV testing.</td>
</tr>
<tr>
<td>Fault on PV</td>
<td>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.</td>
</tr>
</tbody>
</table>
Appendices

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.

| Reverse mode | Only appears if photo-eye is set to YES in the Configuration menu, ISC is set to OFF, Tracker is set to OFF, Cal trigger is set to OFF and PV test is set to NO. Select YES to enable the metal detector Reverse Mode option. This will then cause an extra menu position to appear in the Product setup menu, which enables the metal detector to be set to operate either in NORMAL or REVERSE mode for the product selected. |

Reverse mode Only appears if photo-eye is set to YES in the Configuration menu, ISC is set to OFF, Tracker is set to OFF, Cal trigger is set to OFF and PV test is set to NO.

Select YES to enable the metal detector Reverse Mode option.

This will then cause an extra menu position to appear in the Product setup menu, which enables the metal detector to be set to operate either in NORMAL or REVERSE mode for the product selected.
Appendix E – 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, whereupon the reject device state is toggled. Note, that 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:** that 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 F – Wiring diagram for external sensors
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