

Operating and Instruction Manual

R/RB/RZ-Series Profile

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1 Introduction

This chapter provides important information which all users should read before installing or operating the equipment.

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1.1 Copyright Notice

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1.2 Aims of this Manual

This manual is intended to help those customers who need to:

1. Install the detector.
2. Commission the detector subsequent to replacement or installation.
3. Operate the detector on a day to day basis.
4. Change some of the product dependent and installation dependent parameters.
5. Communicate with the detector using serial communications.
6. Run regular performance checks.

This manual is NOT intended as:

1. A service manual (although some fundamental diagnosis is included in this manual).
2. A workshop manual. No detailed technical analysis (mechanical, electrical or electronic) is contained in this manual.
3. Commercial information i.e., sales literature or publicity information.

This manual is designed to be backwardly compatible with all previous versions of R/RB/RZ-Series Profile detectors. This means that the later issues of manuals will be fully compatible with older equipment; however the older equipment may not have all of the features of later manuals.

If the document was purchased directly from SAFELINE, or the supplier is unavailable at the supplier address given, then contact SAFELINE directly via the address given on the title page of this document.

If the owner of the manual has any comments or suggestions as to the form, content or presentation of this manual then they should write their suggestions and send them to the Technical Department at the address given on the title page.

For further information or to order copies of this document contact SAFELINE at the address shown on the title page of this document, quoting the reference number given on the title page.

1.3 Software Version

This manual is based upon software version F4.8.0.

Note: An upgrade service is available from SAFELINE, at a fee, which will upgrade older detectors to the latest specification, where possible. Please contact your supplier's technical departments for information on this service. Remember to have your serial number ready when making the call.

1.4 Important Notice

1.4.1 Intended Use

The metal detector should only be used for its intended purpose which is for the detection of suitably sized metallic objects. The detector should always be operated in accordance with the manufacturer's guidelines.

1.4.2 Limitations of Use

Using metal detection inspection equipment is an important tool in minimizing the risk of shipping product from your facility containing metal contaminants which could eventually pose a risk to a consumer.

Using this or any other metal detector inspection unit does not guarantee that all contaminated products will be identified and rejected from the product flow. Metal contaminant orientation, geometry and composition will influence the minimum size of contaminant that can and will be detected. In addition, the metal detector settings used to suppress unwanted signals from the product under inspection or the system vibration, may also suppress and in some instances prevent the detection of contaminant signals which are larger than the minimum detectable ball size.

1.4.3 Equipment Malfunction and Customer Responsibility

The unit itself may also experience either continuous or intermittent operational malfunction which will severely impede its ability to detect and reject product containing potentially harmful metal contaminants. To minimize the risk of contaminated product leaving the facility where the metal detector equipment is applied, it is vital that operational procedures (see page 9) are in place to continuously test the performance of the metal detector detection system.

If any test shows a risk of either continuous or intermittent malfunction of the metal detection inspection system procedures to isolate and either discard or re-inspect the product which may contain contaminants must be initiated.

Ensuring that product containing metal contaminants do not leave the facility where the metal detection equipment is installed and applied is therefore outside the reasonable control of SAFELINE

1.4.4 Minimizing the Risk of Undetected Contaminants in your Product

SAFELINE recommends that use is made of the in-built Performance Validation Routine (PVR). The feature will help you as a company to comply with quality assurance standards by ensuring that the detector system is tested and operated to your company's specified quality assurance standards and performance.

1.4.5 Customer Standard Operating Procedure (SOP) Requirements

SAFELINE recommends that the metal detection system is operated in accordance with a customer defined Standard Operation Procedure (SOP) that, as a minimum, contains the following elements:

- Determine a metal detector test interval – hourly, shift, daily etc.
- Use of certified traceable test samples.
- Records of tests performed and results obtained.
- Records of personnel who are authorized to perform testing.
- Procedures for quarantine of "suspect" product and the initiation of corrective and preventive measures if any test fails to meet defined criteria.

1.4.6 Food Contact Applications

SAFELINE declares that this equipment is suitable for use in food-contact applications when operated according to its intended use. Although this equipment was cleaned prior to shipment, SAFELINE recommends you re-clean it before using it for the first time. For further cleaning instructions, see page 28.

1.5 Principles of Operation

1.5.1 Introduction

SAFELINE detectors utilise a low power, high frequency, magnetic field coil system that has the ability to sense minute disturbances created by metal particles. A metal particle passing through the aperture of the detector creates changes in the magnetic field inside the detector.

The changes in the magnetic field generate electrical signals in the coil system that can be characterised by the parameters **Phase** and **Amplitude**.

The amplitude or size of the signal is related to the size of the metal particle passing through the field. The larger the metal particle the greater the amplitude of the signal.

Different metals generate different phase angles. The term phase angle is a comparative term and is a measurement of phase relationship relative to some reference.

1.5.2 Vibration Signals

Great care is taken in the design and manufacture of the SAFELINE detectors to minimise the effect of vibration on the performance of the detectors. However, mechanical disturbances do create vibration signals from the coil system.

Vibration signals can be represented in the same way as signals generated by metal particles, i.e. a signal with amplitude and phase.

The vibration signal is used as a reference when comparing the phase angle of signals from the coil system. For example, if we say stainless steel has a particular value of phase angle, the phase angle is the angle relative to vibration. Reasons for selecting vibration as the reference phase will become apparent.

1.5.3 Product Effect

Metal detectors are used to inspect all types of products, such as food, pharmaceuticals, plastics, chemicals and many others.

Some products exhibit a 'product effect'; that is, the product itself generates a signal in the same way as a metal particle. This results from the bulk conductivity of the product at high frequency.

For most products, usually dry products, the product effect is negligible. Wet or moist products, such as meat, sauces, soups etc., generate a large product effect signal which influences the effective operating sensitivity of the detector.

Product effect signals can be represented diagrammatically as a signal with amplitude and phase in the same manner as the signals from metallic particles.

1.5.4 Phase Control

The SAFELINE metal detector contains phase control circuitry which discriminates between the wanted signals from metal particles and the unwanted signals from vibration and product effect. That is, it maximises the detector's response to metal particles while minimising the effects of the unwanted signals.

Probably the simplest way of reducing the vibration or product effect signals would be to adjust the sensitivity control. However, the sensitivity control would reduce the sensitivity to all signals, metallic signals, vibration and product signals alike.

What is required is a more selective adjustment that discriminates between different signals. The phase control does this by selectively reducing the signals from vibration and product effect with minimal effect on the metallic signals.

A comparison can be made with a domestic Hi-Fi system. The volume control of the Hi-Fi increases or decreases the amplitude of all signals just like the metal detector sensitivity control. The bass control of the Hi-Fi selectively controls the low frequency notes only. This is similar to the phase control circuit, however the phase control circuit in a SAFELINE metal detector is very much more selective.

Signals from the detector coil system can be represented as shown in Figure 1.

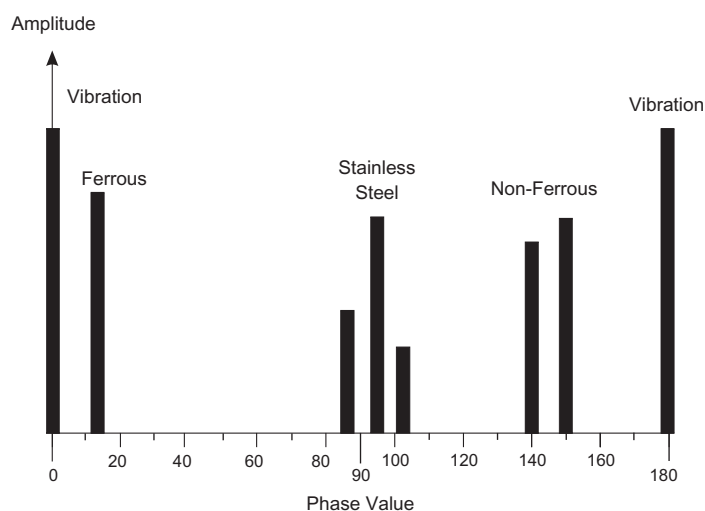


Figure 1: Phase and Amplitude

The characteristic of the phase control circuit is as shown in Figure 2. This shows the position of the phase control aligned to minimise the unwanted vibration signal. All signals which break through the phase control characteristic (the shaded area) will trigger the detector. From this it can be seen that the amplitude of the unwanted vibration signal would have to be increased to trigger the detector.

It can be seen from Figure 2 that the phase control characteristic masks off some of the ferrous signal and has a minimal effect on the Non-Ferrous/Stainless Steel signals.

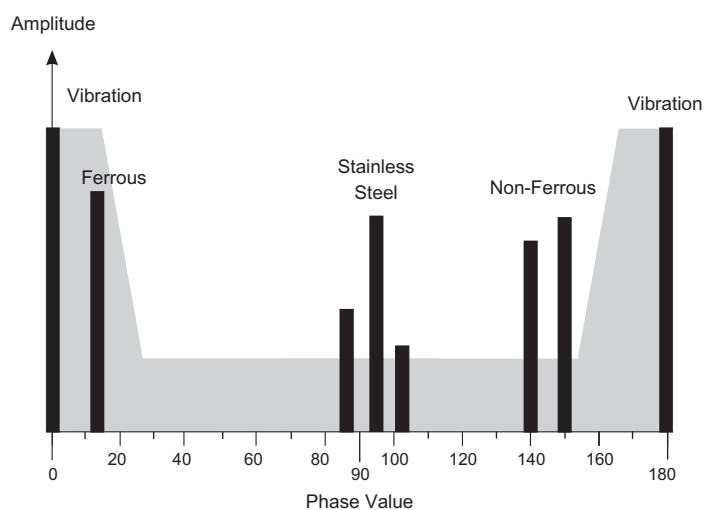


Figure 2: Effect of Phase Control

The phase control is used to minimise unwanted product effect signals. Figure 3 shows a typical example. It can be seen from Figure 3 that the phase control characteristic masks off some of the Stainless Steel signals and has a minimal effect on the Ferrous signal. The detectors phase setting can be adjusted to align the phase control over any unwanted product effect signal.

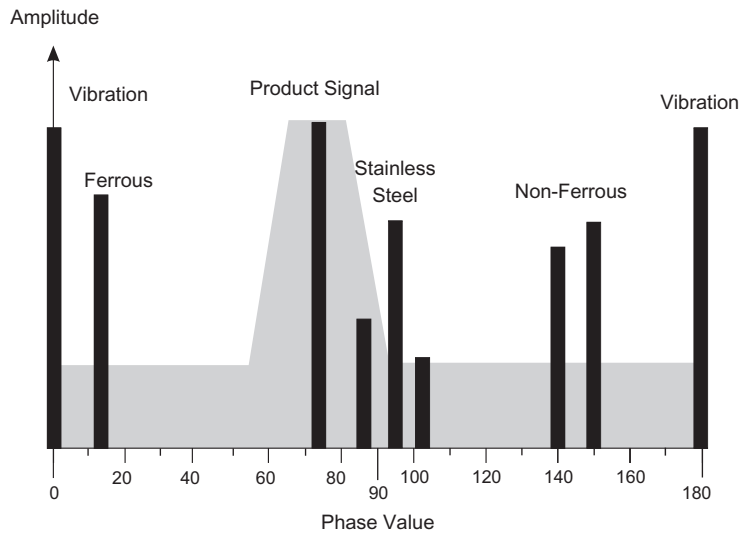


Figure 3: Effect of Unwanted Signals

In general, if operating the detector with any product which exhibits a product effect, the Non-Ferrous/Stainless Steel sensitivity will decrease.

1.6 Product Features

1.6.1 User Interface

The metal detector incorporates a large 145 mm (5.7 inch) colour QVGA display with a touch screen user interface and Windows-style software using icons. These elements help to provide the user with an easy to use interface for setting up and operating the metal detector.

1.6.2 Ultimate Detection Capability

The metal detector utilises Digital Signal Processor (DSP) technology and advanced signal processing techniques in order to optimise detection sensitivity to all types of metal contamination.

1.6.3 Product Numbers

Up to 100 different products can be set up and stored individually in the memory of the metal detector. A product can either be created from new or copied and modified from an existing product. The product's parameters can be set up either by using the Automatic setup routine or manually adjusting the appropriate settings.

1.6.4 Automatic Setup

This feature allows the metal detector's operating frequency, phase and sensitivity controls to be set up automatically to allow reliable inspection of the product, at an optimised performance level.

1.6.5 Operating Frequencies

The R/RB/RZ-Series is capable of operating at two or three different frequencies — usually determined at the time of order. This allows the most appropriate frequency to be selected for a given product.

1.6.6 Clustering

Product Clustering allows the inspection of multiple product types without the need to manually switch or change product settings. This is an automated process, requiring minimal user intervention.

1.6.7 Reject Timers

The unit provides programmable reject timers to cover the variety of reject devices required for different applications. The reject timers are programmable for immediate reject, delayed reject, and gated (or synchronised) reject operation. The reject timers can be set for internally or externally timed operation; external timing is used for variable speed applications where the reject event must be locked to the product's throughput speed.

A semi-automated timer setup routine is provided for gated (or synchronised) reject operation which simplifies the process of setting the reject timers and, more importantly, ensures correct setup for rejecting contaminated product.

1.6.8 Reject Confirmation

The reject confirmation feature verifies the operation of the reject device. It works in parallel with the metal detector reject timer to ensure that a metal detection event successfully operates the reject device at the correct time or that the contaminated product is successfully rejected.

1.6.9 Product Logging

In some cases, the product effect characteristics of a conductive product will vary over time due to temperature differences or variation in product consistency. This variation may necessitate readjustment of product settings for those customers wishing to maintain optimum performance. Product logging collates both long- and short-

term variation in a product's phase and amplitude, and displays it in the form of histograms on the LCD screen. The information provided can be used to assist the operator in optimising the product settings.

1.6.10 Quality Assurance (QA)

The QA facilities allow the setting up and operation of Performance Validation testing and Shift Reports.

Performance Validation testing helps ensure the metal detector system is operating to the user's specified quality standards of performance. Performance Validation can be set up to automatically request testing of the metal detector at regular intervals. Test results can be recorded to paper using a printer, or directly to a PC using Terminal mode and a computer communications software, such as HyperTerminal or HyperACCESS .

The Shift Report facility allows recording of reject events and/or changes in the detector settings. The Shift Report can be set up to be printed out automatically at regular intervals, for example for a company operating 8 hour shifts - once every 8 hours.

1.6.11 Condition Monitoring

This feature monitors a number of metal detector conditions to ensure that, where possible, on-going metal detector performance is sustained. If the monitored conditions reach predefined limits, an early warning condition is displayed. In this condition, the metal detector performance may be compromised and the supplier should be contacted.

1.6.12 Serial Communications

The metal detector has a comprehensive range of physical interfaces to cater for a wide range of host applications. These include RS232, RS422, Ethernet (optional) and, if installed, a wireless Email/SMS Gateway. The interfaces, along with the communication solutions offered by SAFELINE, allow the serial control of metal detector settings and the acquisition of data from the metal detector. This can be carried out via a Direct or Network connection.

1.6.13 Vector Diagrams

Vector Diagrams allow experienced users to visualise product signals in conjunction with the product settings, and is particularly useful for fine-tuning wet-product detection settings and for compensating against inconsistency between products. The display presents a simple, visual representation of the settings so that the operator can better understand the consequences of the changes being made.

1.6.14 LS Models

LS models are basic, high performance Profile metal detectors that have the option to be configured with optional hardware and software bundles, either ready-installed in new detectors or as retro-fittable upgrades at a later date. Installing additional software packs on an LS model can improve product quality and increase operational efficiency.

1.7 Symbol Definitions

Symbols are used within the manual and also on the equipment to draw attention to important information. This section explains what these symbols are and what they mean.

DANGER!

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING!

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION!

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE!

NOTICE is used to address practices not related to personal injury.



IMPORTANT is used to draw the readers attention to information that may affect the operational effectiveness of the Metal Detector.



HINT is used to indirectly reference information that is relevant in the current context.

1.8 List of Abbreviations

The following abbreviations are referenced in this document:

ABBREVIATION	DESCRIPTION
AH	Aperture Height
AWG	American Wire Gauge
BOMS	Bulk Only Mass Storage
CSV	Comma Separated Values
DHCP	Dynamic Host Configuration Protocol
FAT	File Allocation Table
Hz	hertz
in	inch
IP	Internet Protocol
lb	pound
LED	Light Emitting Diode
MAC	Media Access Control
MFZ	Metal Free Zone
ms	millisecond
MSD	Mass Storage Device
Nm	Newton metre
OEE	Overall Equipment Effectiveness
PackML	Packaging Machinery Language
PC	Personal Computer
PLC	Programmable Logic Controller
PMLa	PackML Administration
PMLc	PackML Command
PMLs	PackML Status
ppm	packs per minute
PSU	Power Supply Unit
PVR	Performance Validation Routine
QA	Quality Assurance
RAD	Rectangular Aperture Detector
RC	Reject Confirmation
RCU	Reject Confirmation Unit

ABBREVIATION	DESCRIPTION
SCADA	Supervisory Control And Data Acquisition
SOP	Standard Operation Procedure
TSV	Tab Separated Values
TXT	Text
UL	Underwriters Laboratories
USB	Universal Serial Bus
UTF8	8-bit Unicode Transformation Format
ZMFZ	Zero Metal Free Zone

2 Technical Specifications

This chapter provides an overview of the metal detector models covered within this manual.

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2.1 Technical Specifications

2.1.1 R/RB/RZ-Series Profile

Coil Operation Frequency

R/RB/RZ-Series Profile

Crystal controlled in the range 10 kHz to 1 MHz. Two frequency (2f) and three frequency (3f) options are available, although the 3f option is not available for LS units.

Product Throughput Speed

The operational speed range of the detector is dependent on the detector's aperture height (or smallest aperture dimension) and its speed settings.

The operational speed range and the associated settings can be adjusted via the Install Level menu options, page 107.

Table 1 and Table 2 show the typical minimum and maximum product throughput speed for Fixed and Variable speed settings. The tables show the speed in units of metres/minute/mm of aperture height.

As a general guide, to determine the minimum and maximum throughput speed for a specific detector aperture size, multiply the figure in the table by the smallest aperture dimension.

R/RZ-Series Profile

UNITS	DETECTOR SPEED SETTING			
	Fixed		Variable	
m/min/mm of aperture height	Min	Max	Min	Max
	0.019	1.2	0.009 5	1.8

Table 1:

For a metal detector with a 400 x 200 mm aperture, where the conveyor speed is fixed:

- Minimum throughput speed = $200 \times 0.019 = 3.8$
- Maximum throughput speed = $200 \times 1.2 = 240$

Note: Higher and lower speeds are available on request.

RB-Series Profile

UNITS	DETECTOR SPEED SETTING			
	Fixed		Variable	
m/min/mm of aperture height	Min	Max	Min	Max
	0.03	1.92	0.015	2.88

Table 2:

For a metal detector with a 650 x 300 mm aperture, where the conveyor speed is fixed:

- Minimum throughput speed = $300 \times 0.03 = 9$
- Maximum throughput speed = $300 \times 1.92 = 576$

Note: Higher and lower speeds are available on request.

Power Input

Voltage: 100 to 240 Volts AC (+10% / -15%)

Mains supply voltage fluctuations not to exceed +10% or -15% of the nominal voltage.

Power: 100 VA (Assumes no loads on the switched power outputs.)

Maximum power when the switched power output is loaded to 1A: 340 W.

Frequency: 50 to 60 Hz.

For electrical safety, the system must be earthed.

Humidity Range

Maximum relative humidity: 93% for temperatures up to 45°C.

Temperature Range

R/RZ-Series Profile

Operating: -10°C to +45°C (14°F to 113°F)

Storage: -10°C to +50°C (14°F to 122°F)

RB-Series Profile (painted)

Operating: -10°C to +45°C (14°F to 113°F)

Storage: -10°C to +50°C (14°F to 122°F)

RB-Series Profile (Stainless Steel)

Operating: -10°C to +40°C (14°F to 104°F)

Storage: -10°C to +50°C (14°F to 122°F)

Environmental Protection

To achieve the specified protection, the module and power unit cover must be torqued down to 5 Nm (45 in.lbs).

R/RZ-Series Profile

Painted version, medium duty: IP65, NEMA 12

Stainless steel version, medium duty: IP65, NEMA 12

Stainless steel version, heavy duty: IP69K (Incorporates a protective cover over the User Interface.)

RB-Series Profile

Painted version, medium duty: IP65, NEMA 12

Stainless steel version, heavy duty: IP69K (Incorporates a protective cover over the User Interface.)

Pack Sensor Requirements

SOURCE OF SENSOR'S DC SUPPLY		
	Detector	Independent
Operating voltage	15 VDC	5 to 35 VDC
Operating current	30 mA Max	N/A
Output type*	NPN, PNP or voltage-free contact	NPN, PNP or voltage-free contact

Table 3:

* The selected type (NPN or PNP) must be the same for the Pack, Speed and Reject Confirmation sensors.

Speed Sensor Requirements

Requirements as per the Pack Sensor.

Maximum Output Frequency: 500 Hz

Minimum Output Pulse Width: 1 ms

2.1.2 Other Specifications

Technology

High frequency low power electromagnetic coil system, monitored and controlled by a microprocessor system.

Internal Battery

Battery life: 10 years typical

Nominal voltage: 3 Volts DC

Warm Up Time

No warm up time required at an ambient temperature of 20°C.

Indoor Environmental Operating Conditions

Altitude up to 2000 m.

Pollution Degree 2 in accordance with IEC 664.

Sound Output

Less than 62 dBA at a distance of 1 m (without printer).

Switched Power Output

Switched by detector ON/OFF switch.

Switched live and neutral, non-switched earth.

Not internally fused.

Maximum current: 1 A

Reject Relay

Volt-free changeover contacts. Operated by the Metal Detector's programmable Reject Timer, following the detection of metal.

Maximum power: 500 W

Maximum current: 3 A (non-inductive)

Maximum voltage: 250 Volts AC, or 30 Volts DC (non-inductive)

Minimum load requirement for reliable contact switching: 300mW

Reject Confirmation Relay

Volt-free changeover contacts. Operates if the Reject Confirmation system signals a Reject fault.

Contact rating as per the Reject Relay.

Reject Confirmation Sensor Requirements

SOURCE OF SENSOR'S DC SUPPLY	
	Detector
Operating voltage	15 VDC
Operating current	30 mA Max
Output type*	NPN or PNP

Table 4:

Fault Relay

Volt-free changeover contacts. Operates if the metal detector signals a fault condition.

Contact rating as per the Reject Relay.

Programmable Output 1, 2 and 3

Solid state relay with isolated voltage-free contacts. Output function is selectable from the Metal Detector.

Maximum current: 250 mA

Maximum voltage: 48 VDC or 48 VAC peak

NOTICE!

For the LS unit, the number of programmable inputs and outputs available will depend on the software packs installed.

Detector Inputs

The detector provides isolated inputs for devices connected to the system sensors and programmable inputs. The detector's isolated inputs can be configured for input devices powered from the detector's local 15 VDC supply or alternatively from an independent DC supply, allowing both signal and power supply isolation.

The input devices normally provide a common output switching topology based on NPN and/or PNP transistors, and the detector inputs can be configured for either type. In some instances, the input device may be a voltage-free contact from a relay or switch and again the detector inputs can be configured accordingly.

Programmable Input 1, 2, 3 and 4

SOURCE OF SENSOR'S DC SUPPLY		
	Detector	Independent
Operating voltage	15 VDC	5 to 35 VDC
Operating current	30 mA Max	N/A
Output type*	NPN, PNP or voltage-free contact	NPN, PNP or voltage-free contact

Table 5:

*The selected type (if NPN or PNP) must be the same for Programmable Inputs 1, 2 and 3.

*Programmable Input 4 is fixed at NPN.

NOTICE!

For the LS unit, the number of programmable inputs and outputs available will depend on the software packs installed.

Communications Specifications

The following specifications apply to the Serial Port 1, 2 and 3 interfaces. See Table 6 for interface-specific details.

Make sure that suitable shielded twisted pair cable with screen is used for communications connections.

	RS232	RS422	RS485	ETHER-NET	GSM GATE-WAY
Serial Port 1	✓				
Serial Port 2	✓	✓		✓	
Serial Port 3	✓	✓			✓

Table 6:

Note: Ethernet capability requires an optional plug-in Ethernet adapter.

Note: RS485 is currently not supported.

RS232			
	Min	Typical	Max
Operating voltage swing	±5 VDC	±8 VDC	—
Input voltage	—	—	±30 VDC

Table 7:

RS422			
	Min	Typical	Max
Differential Output (with load)	1.5 VDC	—	5 VDC
Transceivers	—	—	32

Table 8:

RS485			
	Min	Typical	Max
Differential Output (with load)	1.5 VDC	—	5 VDC
Transceivers	—	—	32

Table 9:

Serial Port 1 Communications

RS232 communication interface with optional hardware handshaking.

Serial Port 2 Communications

LK2 on user IO board selects between RS232 and RS485 / RS422 (one jumper link required).

LK3 on user IO board selects between RS485 / RS422 (two jumper links required).

LK3 on user IO board selects RS485 / RS422 120Ω termination (one jumper link required).

The network should be of a "daisy-chain" configuration with the host being the first device on the network. Take care to ensure that only the RS485/422 host and last metal detector in the RS485 chain is 120Ω terminated.

Serial Port 3 Communications

LK1 on user IO board selects between RS232 and RS422 (one jumper link required).

Note: An internal 120Ω termination of RS422 receive pair has been provided.

Quad Band GSM Gateway Stand Alone Unit (If installed)

NOTICE!

Quad Band functionality is not available in all countries. To learn whether this is available in your country, please contact your local SAFELINE service representative.

Input: 100-240 VAC, 0.8 A max / 47-63 Hz, and 25 W max

Bands: 850, 900, 1800 and 1900 MHz

CE Conformity

The Terminal meets the following requirements:

- R and TTE Directive 1999/5/CE
- EMC Directive 89/336/EEC
- EMC EN 301489-7 for fixed use
- EMC EN 55022 (Field Strength)
- Safety standard LVD 73/23/EEC

The Power Supply meets the following requirements:

- EMC Emissions - IEC/EN 61000-3
- EMC Immunity - IEC/EN 61000-4
- EMC EN 55022 class B, FCC part 15, level B
- Safety standards UL 60950-1, IEC 60950-1, EN 60950-1
- Safety approval cUL/UL File E188913

USB Adapter (If installed)

Input Voltage

6.5 VDC

Input Current

100 mA (typical)

500 mA (max)

USB Board Temperature Rating

Same operating temperature as the metal detector. See the original operating manual that accompanied the metal detector.

USB Adapter Formats

FAT & FAT32 supported

USB 2.0: 12 Mbps

Environmental Protection

IP66, (NEMA 4X equivalent)

To achieve the stated IP rating, the USB dust cap must be fitted back over the USB Adapter and fully tightened to ensure that it is sealed.

Serial Comms

RS232: 38.4 kbaud

LED Indicators

LED D1: RTS (Ready To Send) Red Indicator

LED D2: CTS (Clear To Send) Green Indicator

LED D3: +3V3 Red (generated onboard) Indicator

LED D4: +5V Red (generated onboard) Indicator

When the USB Adapter is working and ready to use, all four LEDs should be on. If any of these LEDs fail to work, contact your local SAFELINE Service representative.

3 Installation

This chapter explains what you need to take account of before installing your metal detector, and then covers both mechanical and electrical installation of the equipment.

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3.1 Safety Instructions

Most companies have a code of practice for their employees which is designed to ensure their safety in the working environment. When new equipment is introduced, it is important that operators, maintenance engineers and supervisors are aware of the potential hazards.

The following guidelines must be followed by any person concerned with the operation, installation or handling of the detector to ensure correct operation and to avoid any damage to the detector or to the person concerned.

WARNING!

On no account should any of the electrical panels of your metal detector be opened by anyone other than a qualified electrical engineer. Voltages in excess of 30 volts rms or 50 volts dc can, in certain circumstances be lethal. When working on electrical or electronic equipment, always follow current health and safety practices and observe all other applicable regulations.

NOTICE!

The equipment should only be used in accordance with the instructions given in this manual. Failure to comply with these instructions may lead to the protection provided by the equipment becoming impaired. SAFELINE will not be liable for incidental or consequential damage if the equipment is not installed in accordance with the instructions given.

NOTICE!

For correct operation and to prevent any damage to the detector, follow the safety instructions given in this chapter.

3.2 Detector Precautions

NOTICE!

During installation and operation of the detector, you must consider the following points. Failure to do so may result in difficulties of operation, degradation in the performance or damage occurring to your detector.

3.2.1 Electric Arc Welding

Electric Arc Welding must not be carried out on the detector or on any part of the system.

If Electric Arc Welding must be carried out on any attached systems, disconnect and remove the detector head and detector power supply box prior to welding.

3.2.2 Power Source

It is recommended that the power source should be taken from a source which supplies only low power equipment.

It is recommended that the detector should not be connected to power sources which are supplying varying current loads, e.g. Inverters, variable-speed drives etc.

The power source for the detector should be fitted with an isolation switch and the appropriate circuit breaker and/or fuse.

3.2.3 Electromagnetic Interference

It is recommended that the detector should not be installed in close proximity to any devices which may emit electromagnetic interference, e.g. Radio transmitters.

Ensure all Inverters and variable-speed drives in the proximity of the detector are installed in full accordance with their manufacturers instructions.

Where possible, avoid placing any cables from Inverters, variable-speed drives etc. in close proximity to the detector or the detector cables.

In particular, take care to avoid placing the detector in the proximity of any equipment that generates electromagnetic interference in the same frequency range as the detector.

3.2.4 Avoiding Aperture Damage

At all times, ensure that the product does not come in contact with, or impact onto the detector aperture or aperture lining.

3.2.5 Detector Support Structures

Avoid supporting the detector on vibrating structures and/or machines subject to mechanical shock.

No part of the supporting structure should rely on the detector for structural integrity.

No part of the supporting structure should be attached to the detector other than through the detector mounting blocks supplied.

3.2.6 Belt Maintenance

Certain substances (e.g. metal fragments, liquids etc.), which can be detected by the metal detector, are likely to cause unexpected detections (often giving the appearance of erratic/incorrect operation) if they adhere to the conveyor belt. To minimise the chance of this occurring:

- Avoid any operations that may cause metal fragments to come into contact with the conveyor belt e.g. welding, metal drilling or cutting in the vicinity of the conveyor belt.
- Clean the conveyor belt regularly.

3.2.7 Orientation of Contaminants

Metal detector sensitivity is expressed as the diameter of the smallest spherical object that can be detected. (i.e. diameter of a ball).

Sensitivity to non-spherical objects of the same material (e.g. wire fragments) will vary according to the orientation of the object as it passes through the detector aperture. If the diameter of the object is less than the stated spherical sensitivity, the object may not be detected.

3.2.8 Product Packaging Materials

To achieve the optimum detector performance in applications where the product being inspected is packaged, ensure that the packaging materials used are free from metal contamination. For example, recycled cardboard.

3.2.9 Continuous Maintenance and Testing

It is recommended that at regular intervals testing with an appropriate test sample is performed to ensure the detector and any attached reject mechanism is functioning correctly.

It is recommended that inspection and cleaning of the detector system should be carried out at regular intervals.

3.2.10 Static Electricity Precautions

Depending on the products being inspected and the operating environment, static electricity may accumulate on or around the non-conductive areas of the product transport system. To help prevent accumulation of static, ensure that the product transport system has a conductive path to earth/ground.

For belted conveyors, this can be facilitated by ensuring that one or more of the rollers are of metallic construction with a conductive path through to their fastening points to the framework. To avoid magnetic loops, only one end of the roller should be connected to earth/ground via the support framework. See page 28 for more details.

3.2.11 Cleaning The Detector

When Cleaning the Metal Detector:

- Use a damp, non-abrasive cloth.
- Do not use any solvent-based or chloride-based cleaners/disinfectants as they may cause the surface to rust and the aperture lining to corrode.
- Do not use soap as it may contain chloride.

Stainless steel surfaces must be kept clean in order to receive an adequate supply of oxygen, which maintains its passive surface layer and ultimately prevents rusting. If surfaces are not kept clean, corrosion can occur to cause brown blemishes, rusty markings or severe pitting on the Metal Detector.

These effects are usually due to surface contamination from contact with chemicals containing chlorides, or from non-stainless steel items such as scouring pads or mechanical equipment made from iron or carbon steel. Scratching a stainless steel surface, for example, with iron will introduce moisture and initiate rusting.

Please be aware that even a simple mixture of kitchen salt and water (or even seawater) will be enough to start corroding a stainless steel surface.

3.3 Magnetic Loops

The design and Construction of the metal detector support framework can influence the performance of the detector. The following must be considered:

- A metal detector with excellent vibration characteristics, if mounted on a structure containing magnetic loops, can be made to look extremely poor and very sensitive to vibration.
- Metalwork, even though positioned outside the normal metal free zone, can still act as an aerial or receiver for the magnetic field from the detector, making the whole framework susceptible to loop effects.
- The leakage magnetic field from the aperture of the detector can generate minute electrical currents that flow in the surrounding metalwork. They in turn influence the detector. An electric current will flow if a closed electrical path or loop exists.
- Problems with loops can be avoided by opening or closing the loop in a permanent manner. It is the intermittent nature of a loop path that causes intermittent triggering of the metal detector.
- A typical installation could be a metal detector mounted on a metallic conveyor frame with rollers positioned across the frame as shown in Section 3.6.
- The magnetic field from the detector can radiate into the conveyor frame. This in turn would create minute electrical currents which would flow through the closed path or loop created by the rollers mounted across the conveyor frame.
- The problem with the rollers on the conveyor can be overcome by insulating one end of the roller from the conveyor frame. This may take the form of plastic insulation plate and washers on the bearing mounting block or supply a plastic extension to end of the roller shaft, as shown in Section 3.6. By insulating the roller in this way, the loop is opened permanently.

- The conveyor frame itself should be of welded construction rather than bolted sections. A welded construction is an example of a permanently closed loop.
- Any items bolted to the conveyor frame, particularly items positioned across the conveyor (e.g. guards) potentially create loops. To avoid difficulties, insulate/isolate all items bolted to the frame.

3.4 ATEX Directive

This is only applicable if the ATEX Option is ordered.



Figure 4: ATEX Fixing Bolts

KEY	DESCRIPTION
1	Power Supply Lid Fixing Bolts
2	Module Cover Fixing Bolts
3	EX Label

This product complies with ATEX Category 2D, zone 21 requirements.

A static hazard may exist: do not clean non-metallic parts with a dry cloth.

Ensure the torque setting on the fixings highlighted conform to the values stated in the Technical Specification section.

Do not open any electrical enclosures when the product is energized or when an explosive dust atmosphere is present.

Regular inspection of plastic and gasket materials should be made to ensure no wear or damaged has occurred that may affect the ingress integrity of the system.

The power supply/module enclosure can in some cases accommodate additional glands that can be fitted by the end user. If new glands or blanking plugs are fitted by the end user they must ensure that the fitting are of metal construction and that the ingress integrity of the enclosure is maintained. (Must be sealed to IP6X or better).

There are no chemical hazards on the equipment. However, there may be a chemical hazard resulting from the product passing through the unit, fine dust, dangerous chemicals or pharmaceutical products. All applicable precautions required by the nature of the product should be taken during maintenance of the valve assembly.

3.4.1 ATEX System Labels

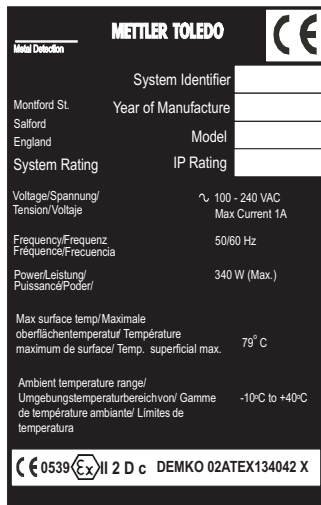


Figure 5: EX Label



Figure 6: Static Warning Label

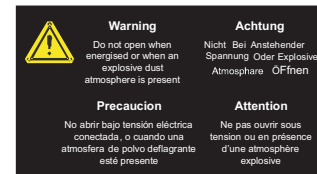


Figure 7: Enclosure Warning Label

3.5 Handling Instructions

The detector does not contain any exposed noxious or dangerous substances.

Never pass any lifting or supporting equipment through the detector aperture.

When transporting and handling the detector, damage to the equipment may result if the lifting method causes anything (such as a sling, cable assembly or a hand) to pass through the aperture of the detector.

Always observe best practices for handling heavy items when lifting or moving the detector.

If you are supporting the detector in a sling or other lifting apparatus, always ensure that the detector is securely held and is not likely to unbalance during lifting.

Figure 8 shows the correct way and the incorrect way to lift and support the detector during transportation.

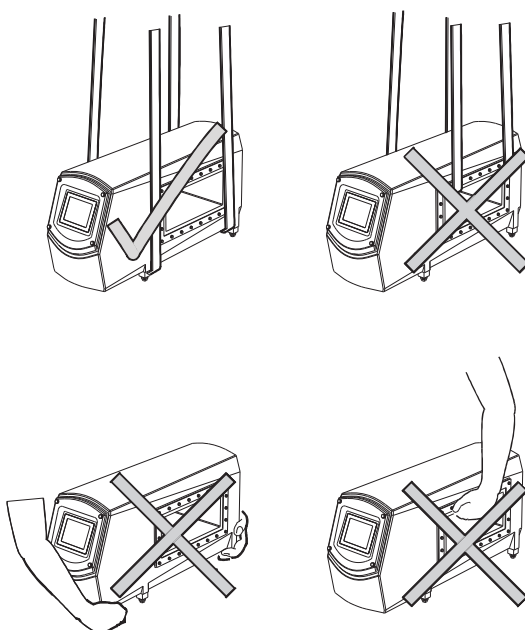


Figure 8:

⚠ CAUTION!

SAFELINE does not recommend the lifting or supporting of the detector by a person. Always use suitable lifting or supporting apparatus. Applicable safety regulations should be observed at all times prior to and during lifting operations. This should involve an appropriate risk assessment. SAFELINE will accept no liability for personal injury caused by attempting to lift or move the equipment.

3.6 Installing the Metal Detector

Carefully study the installation advice in the following sections; a little care taken during installation will avoid the detector's performance becoming severely impaired.

Most of the detector's high frequency magnetic field is contained within the metal case of the detector head. Unavoidably there is some leakage of the magnetic field from the aperture of the detector.

It is the effect of the leakage magnetic field on the surrounding metalwork that may influence the detector's performance and can give rise to inconsistent performance.

A little care when installing the detector will be rewarded by a consistent, highly reliable metal detector performance.

3.6.1 The R/RB/RZ-Series Profile Detector

Metal Free Zone (MFZ)

To achieve optimum metal detector performance, an area surrounding the aperture of the detector known as the MFZ should be kept free of metal. The metal detector utilises SAFELINE's patented technology to minimise the MFZ, enabling it to be installed in extremely restricted spaces.

The size of the MFZ is dependent upon the aperture height (AH), the type of detector, the operating sensitivity and the operating phase.

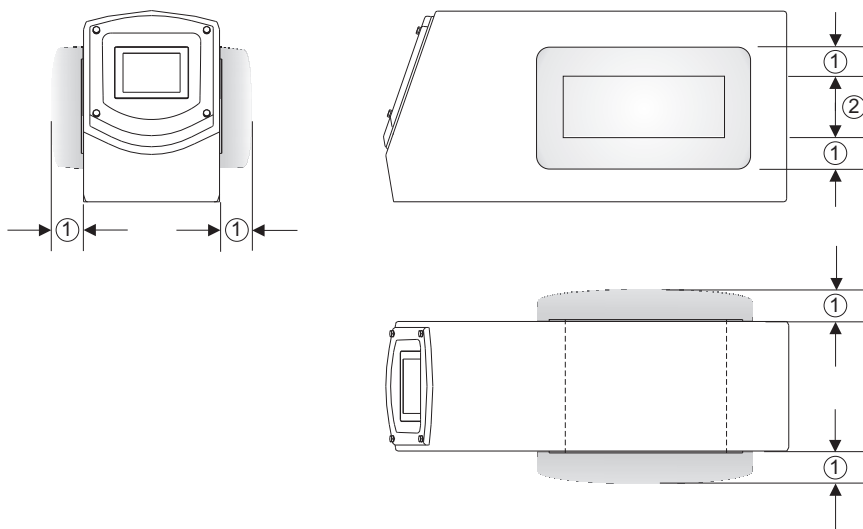


Figure 9:

KEY	DESCRIPTION
1	MFZ
2	AH



Stationary metal can be positioned closer to the detector than moving metal.

R/RB-Series Profile MFZ

For stationary metal, the MFZ = 1.5 x aperture height.

For moving metal, the MFZ = 2.0 x aperture height.

RZ-Series Profile MFZ

The RZ model utilises SAFELINE's patented Zero Metal Free Zone (ZMFZ) technology to minimise the MFZ. This head is designed to be used where space is restricted, such as with a short conveyor, and allows moving metal to be positioned at the aperture edge without it significantly affecting the performance.

The MFZ = 0.5 x aperture height.

Detector Information

The design and construction of the metal detector support framework will influence the performance of the detector. A typical installation is shown in Figure 10.

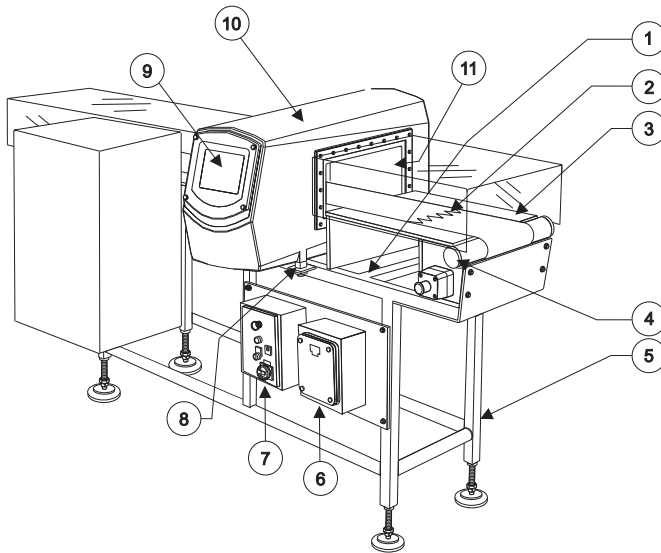


Figure 10: A typical installation

KEY	DESCRIPTION
1	Frame Cross-member
2	Z Finger Joint
3	Non-metallic Skidplate
4	Insulated Bearings
5	Welded Metal Frame
6	User Input/Output Terminals & Power Supply
7	Conveyor Belt Control Unit
8	Plastic Mounting Feet

KEY	DESCRIPTION
9	Keypad/Display
10	Metal Detector Head
11	Aperture

Follow the guidelines below to obtain the best performance:

- Make sure the frame cross-members (item 1, in Figure 10) are the maximum possible distance from the detector aperture.
- Insulate one end of the roller from the conveyor frame. This can take the form of a plastic insulation plate and washers on the bearing mounting block or a plastic extension to the end of the roller shaft. This is shown in Figure 11.
- The conveyor frame should be of welded construction rather than bolted sections.
- Insulate/isolate all conductive/metal items bolted to the frame, particularly items positioned across the conveyor (e.g. guards), using non-conducting insulators. Always maintain a ground/earth connection.
- Mount the detector to its support framework using the four plastic insulation sets supplied with the detector.
- Avoid passing metal conduit or electrical cables through the metal free zone or near the aperture of the metal detector.

Note: see Section 3.3 "Magnetic Loops", page 28 for the reason behind many of the above guidelines.

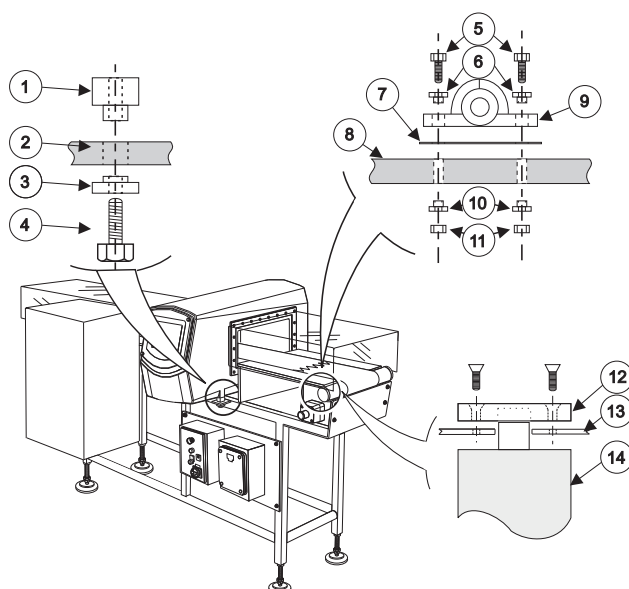


Figure 11: Bearing Block and Mounting Foot Insulation

KEY	DESCRIPTION
1	Plastic mounting foot
2	Metal mounting bar
3	Plastic washer
4	Metal bolt

KEY	DESCRIPTION
5	Metal bolt
6	Plastic cup
7	Plastic shim
8	Metal support
9	Metal bearing block
10	Plastic cup
11	Metal nut
12	Nylon roller support
13	Metal support
14	Roller

Conveyor Belt Joints

The Finger or "Z" Joint type is the preferred type of belt joint. Diagonal Lap joints are also satisfactory, but straight lap joints are not recommended. These joint types are shown in Figure 12.

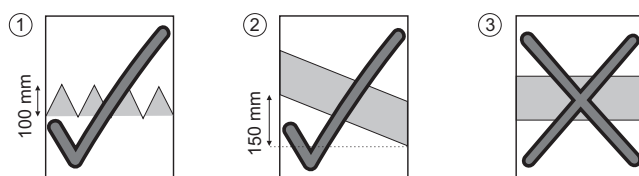


Figure 12:

KEY	DESCRIPTION
1	"Z" finger joint
2	Diagonal lap joint
3	Straight lap joint

Detector Positioning

Every effort is made to minimise the effect of mechanical vibration on the detector head. However better sensitivity may be achieved if vibration from other machines is isolated from the detector.

Take the following points into account when positioning the detector:

- Avoid supporting the detector head on or near vibrating structures and/or machines subject to mechanical shock.
- Position the detector to allow removal of the User Interface for servicing.
- Make sure the floor is flat and level.
- Do not run any metal detector cable next to other cables carrying switched or heavy loads. This will reduce the possibility of problems with electrical interference.

Power Unit Installation

NOTICE!

If the detector is supplied as part of a system, read all of the system literature before commencing installation.

The Power Unit is made up from a power source for the detector head and a User Input/Output Board where all necessary connections to and from the detector head, and for controlling the system, are connected. All customer/user connections to and from the detector head are located within this unit.

The metal detector will usually be shipped with an Enclosed Unit, where the Power Unit is already fitted inside a standard Enclosure. However, the metal detector can also be dispatched with a Non-enclosed Power Unit, meaning the Power Unit is not fitted into anything at the time of manufacture and must be installed inside a non-standard Enclosure at the final destination.

The model number of the Metal Detector with an Enclosed Power Unit is V4-RAD. This is a UL Listed Product.

The model number of the Metal Detector with a Non-enclosed Power Unit is V4-RAD-1. This is a UL Recognised Component.

Before either of the Power Units are installed, the following must first be considered:

- Ensure all power has been disconnected from the detector before attempting to work on any electrical components of the detector.
- The power unit can be situated at a convenient position remote from the detector head. Detector heads are normally shipped from the factory with a cable length of three metres.
- In order to reduce the possibility of problems with electrical interference, do NOT run any metal detector cable next to other cables carrying switched or heavy loads.
- For electrical safety the power unit must be earthed.

NOTICE!

When installed correctly, the detector head should be electrically insulated/isolated from the support structure and connected to earth/ground only through its own electrical connections.

The Enclosed Power Unit (Model V4-RAD)

Figure 13 shows the Power Unit installed for a standard detector.

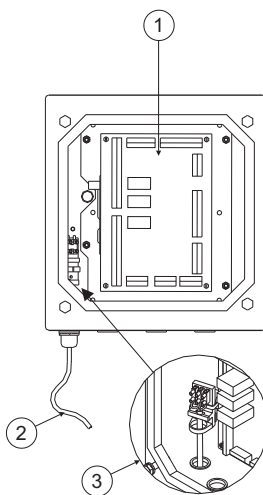


Figure 13: The Enclosed Power Unit

KEY	DESCRIPTION
1	Power Unit and User Input/Output Board
2	Power Lead
2	Conclamp/Power Lead Connection Point

Figure 14 shows the Power Unit installed for a remote detector.

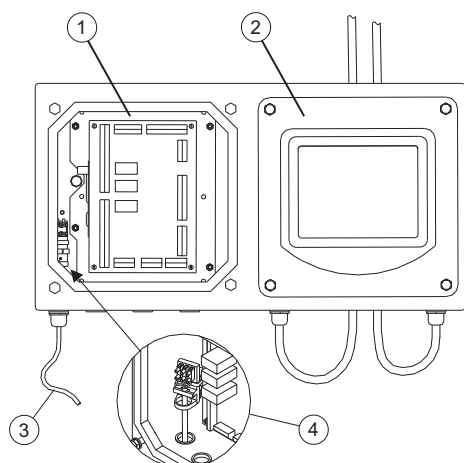


Figure 14: The Enclosed Power Unit

KEY	DESCRIPTION
1	Power Unit and User Input/Output Board
2	Control Module
3	Power Lead
4	Power Lead Connection Point

The Non-Enclosed Power Unit (Model V4-RAD-1)

Figure 15 shows the Power Unit not installed in any kind of Enclosure.



The power supply must be fitted into an enclosure prior to installation.

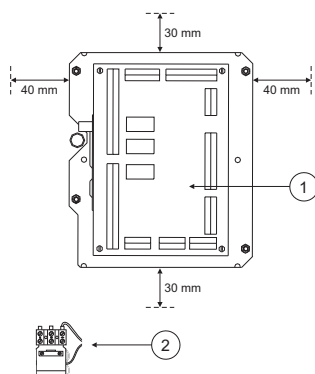


Figure 15: The Non-Enclosed Power Unit

KEY	DESCRIPTION
1	Power Unit and User Input/Output Board
2	Conclamp/Power Lead Connection Point

When fitting a Non-enclosed Power Unit into a non-standard Enclosure, the following must also be considered:

- The Enclosure must provide a protective conductor terminal for connection to the external safety earthing system.
- The Power Unit must be mounted in a vertical position, maintaining minimum clearance around the supply, as shown in Figure 15. Furthermore, the Enclosure must be deep enough to provide at least 50 mm of clearance behind the Power Unit once it is fitted.
- The internal operating temperature of the enclosure must not exceed 65° C (149° F).
- To ensure proper operation of the metal detector, it is recommended that variable speed drives and other high voltage switch gear are not installed within the same enclosure as the power unit.

Mounting the Enclosure Unit

Figure 16 provides details on how to mount the Enclosure Unit on the metal detector's support framework.

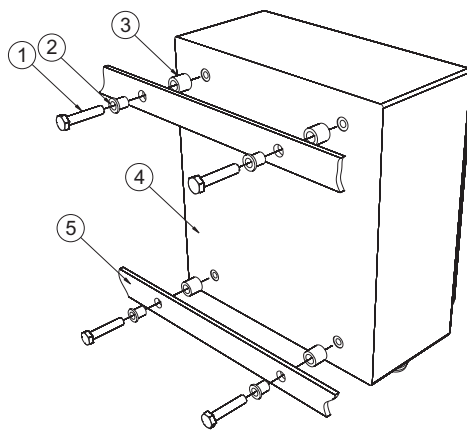


Figure 16: Mounting the Enclosure Unit

KEY	DESCRIPTION
1	Suitable M8 Screw
2	M8 Screw Insulator
3	Insulator Spacer
4	Enclosure Unit
5	Support Framework

Removing the Power Unit Box Lid

⚠ WARNING!

Ensure all power has been disconnected from the metal detector before work is attempted on any electrical component of the metal detector.

Any electrical work carried out on the metal detector must be performed by a qualified electrical engineer.

The following instructions, whilst intended for the Enclosed Power Unit, should also be considered when removing the lid from a non-standard Enclosure Unit.

To remove the power unit box lid:

Procedure

1. Remove the four screws.
2. Raise the power unit box lid.
3. Remove the box lid earth wire (if fitted).
4. Lift the power supply box lid completely away from the power supply box.

To refit the power unit box lid:

Procedure

1. Ensure that the seal around the box lid is in place and undamaged.
2. Carry out the above procedure in reverse order.

3.7 Power Lead Connections

3.7.1 Power Lead

The recommended power lead ratings are as follows:

POWER LEAD CROSS SECTION AREA	0.75 MM ² / 18 AWG
Construction	24 x 0.2 mm
Current rating	6 Ampere
Live wire colour	Brown
Neutral wire colour	Blue
Earth wire colour	Green/Yellow

Table 11:

Figure 17 shows the recommended preparation of the power lead before connection.

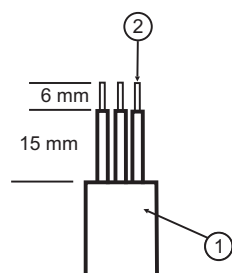


Figure 17: Power lead preparation

KEY	DESCRIPTION
1	Power lead sheath
2	Earth wire

Power Circuit Protection and Isolation

For power circuit protection and isolation, power to the metal detector should be supplied via a double pole isolation switch and correctly fused; we recommend either of the following:

- Double pole circuit breaker, current rating 3 Amp or 4 Amp, Type C, 240 Vac.
- Time-lag fuse, current rating 4 Amp or 5 Amp, 250 Vac.

The protective device should be:

- Installed close to the equipment.
- Within easy reach of the operator.
- Marked as the disconnecting device.



To meet UL requirements, the protection device must be UL listed.

3.7.2 Conclamp Wiring

Enclosed Conclamp Wiring (Model V4-RAD)

The wiring showing how to connect the power lead to the Conclamp in an Enclosed Power Unit is shown in Figure 18.



The recommended torque settings for the screw terminals are 0.8 Nm (7 lb in).

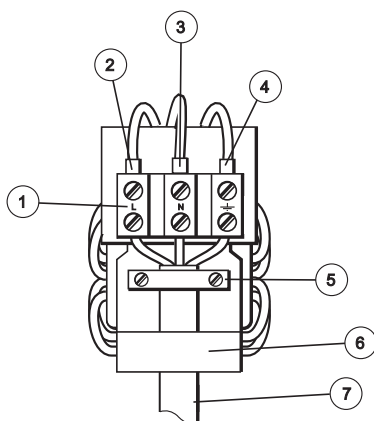


Figure 18: Conclamp Wiring

KEY	DESCRIPTION
1	Terminal Block
2	Brown: Live wire (L)
3	Blue: Neutral wire (N)
4	Green/Yellow: Protective Earth wire
5	Sheath clamp
6	Conclamp and Ferrite Sleeve Assembly
7	Incoming Mains Cable

Non-Enclosed Conclamp Wiring and Installation (Model V4-RAD-1)

The wiring showing how to connect the power lead to the Conclamp in a Non-Enclosed Power Unit is shown in Figure 19.

This diagram shows the Conclamp secured to the Enclosure by a M20 Gland. An alternative way is to fix the Conclamp to a suitable Enclosure bracket using the Mounting holes.



The recommended torque settings for the screw terminals are 0.8 Nm (7 lb in).

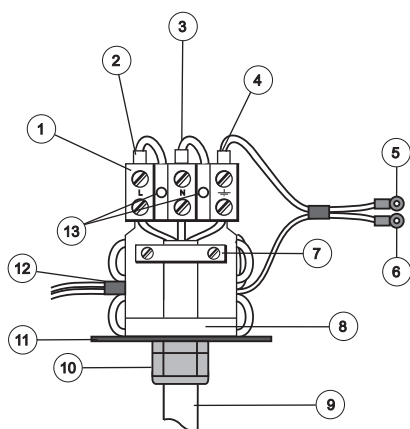


Figure 19: Conclamp Wiring

KEY	DESCRIPTION
1	Terminal Block
2	Brown: Live wire (L)
3	Blue: Neutral wire (N)
4	Green/Yellow: Protective Earth wire
5	Earth Wire 'A'
6	Earth Wire 'B'
7	Sheath clamp

KEY	DESCRIPTION
8	Conclamp and Ferrite Sleeve Assembly
9	Incoming Mains Cable
10	M20 Gland
11	Enclosure Wall or Gland Plate
12	To Power Supply Unit
13	Conclamp Mounting Holes

If the safety earth is provided through the Conclamp, terminate the Earth Wires 'A' and 'B' as shown in Figure 20.

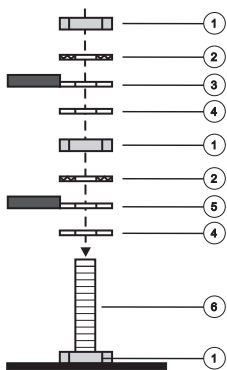


Figure 20: Protective Earth Termination

KEY	DESCRIPTION
1	M5 Nut
2	M5 Shake-proof Washer
3	Earth Wire 'B'
4	M5 Flat Washer
5	Earth Wire 'A'
6	M5x25 Mechanical Stud bonded to Enclosure Frame (Protective Conductor Terminal)

3.7.3 Cable Gland Assembly

Details of the cable gland assembly for connecting the detector head cable to the power unit are shown in Figure 21.

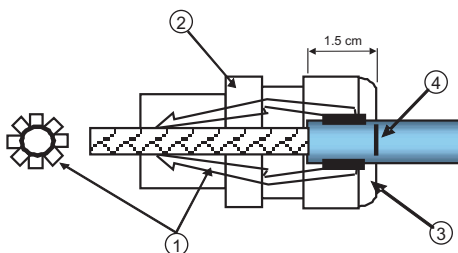


Figure 21: Detector Head Cable Gland Assembly to Power Unit

KEY	DESCRIPTION
1	Metallised prongs provide screen termination
2	Main body of gland
3	Nut (torque = 5.5 Nm)
4	Location mark on cable, lined up with outer face of nut

3.8 Detector Head and System Connections

Access to the detector connections is gained by removing the power unit box lid, as detailed earlier in this section. The layout of the User Input/Output Board showing connection terminals and other key components is shown in Figure 22.

⚠ WARNING!

Live terminals exist in the hatched area of the board.

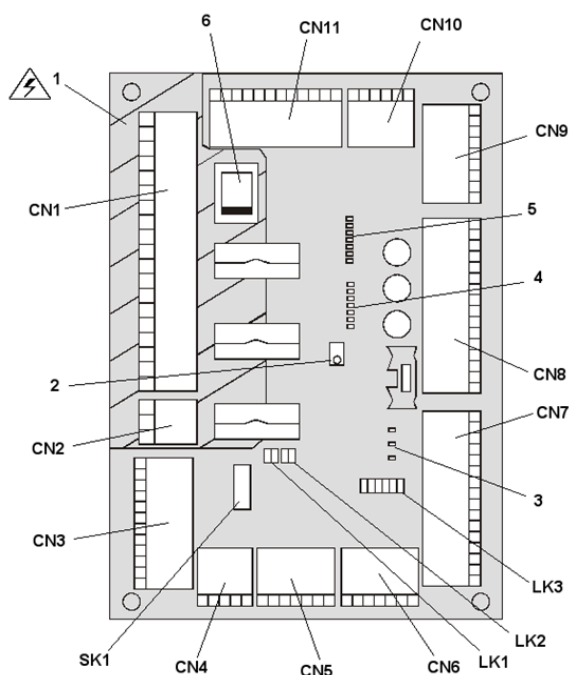


Figure 22:

KEY	DESCRIPTION
1	Warning: Live terminals exist in the hatched area of the board
2	Reset switch
3	Power supply LEDs
4	Output LEDs
5	Input LEDs

KEY	DESCRIPTION
6	On/Off switch
SK1	Ethernet board connector
CN1	Power input
	Switched power output
	Reject Relay output
	Reject Confirmation
	Relay output
CN2	Fault Relay output
CN3	Reject Relay
	Latch/Reset
	Programmable input 4
	Programmable outputs 1-3
CN4	Serial Port 1
CN5	Serial Port 2
CN6	Serial Port 3
CN7	Detector Head cable
CN8	Detector Head cable
CN9	Programmable inputs
CN10	Input Configuration
	CPU Fault Enable
CN11	System Sensors



The minimum recommended torque settings for CN1 and CN2 screw terminals are 0.56 Nm (5 lb in). The maximum recommended torque settings are 0.6 Nm (5.3 lb in).

The minimum recommended torque settings for CN3 to CN11 screw terminals are 0.22 Nm (2 lb in). The maximum recommended torque settings are 0.25 Nm (2.2 lb in).

3.8.1 Connector Descriptions

CN1	
Power in	
1	Live input from Mains Filter board
2	Neutral input from Mains Filter board
3	Earth
4	Earth
5	Switched live output
6	Switched neutral output
Reject relay — volt-free changeover contacts	
7	N/O
8	COM
9	N/C
Reject relay — volt-free changeover contacts	
10	N/C
11	COM
12	N/O
13	Not used
Reject Confirmation relay — volt-free changeover contacts	
14	N/O
15	COM
16	N/C
Reject Confirmation relay — volt-free changeover contacts	
17	N/C
18	COM
19	N/O

Warning: Live terminals in hatched area of the board, including CN1 and CN2.

Caution: All CN1 and CN2 relays are operated in a normally energised state, to maintain failsafe operation.

For example, N/O means the contacts are normally open when the power is ON, but will be closed when the power is OFF.

All contact ratings are: 3A, 250VAC or 30VDC max

The Reject relay is 2-pole changeover and normally operates according to the reject timer settings, but it can operate in a latched mode.

See CN3 pins 23-26 and diagrams (Figure 23 and Figure 24).

The Reject confirmation relay is 2-pole changeover and always operates latched.

See CN3 pins 27 and 28 (Figure 23 and Figure 24).

Table 12:

CN2		
Fault relay — volt-free changeover contacts		Note: The Fault relay is single pole changeover and operates until the fault is cleared.
20	N/O	
21	COM	
22	N/C	

Table 13:

CN3		
Reject Relay		Note: The Reject relay can operate according to the reject timer settings, or in latched mode, as shown in Figure 23 and Figure 24. Note: For the Programmable outputs the contact ratings are: 250mA, 48VDC or 48VAC peak max.
23	Normally wire linked; remove link for latched mode	
24		
25	External reset input for latched reject relay; short to reset	
26		
Programmable input 4		
27	Programmable input 4; 0V	
28		
Programmable output 1		
29	Solid state relay; isolated contacts	
30		
Programmable output 2		
31	Solid state relay; isolated contacts	
32		
Programmable output 3		
33	Solid state relay; isolated contacts	
34		

Table 14:

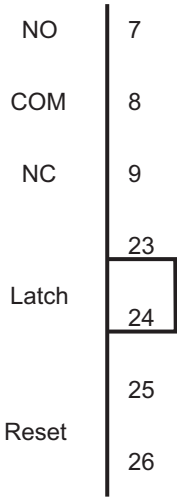


Figure 23: Reject Relay: Unlatched Mode

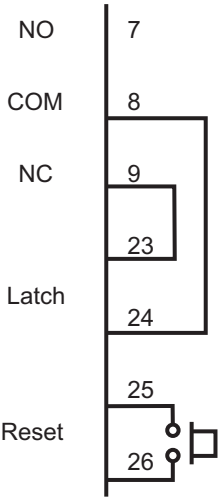


Figure 24: Reject Relay: Latched Mode

CN4		
Serial Port 1		
35	TXD	
36	RXD	
37	RTS	
38	CTS	
39	OV	

Table 16:

CN5		
Serial Port 2 — RS232 data terminals		Note: The Serial Port 2 CN5 can be configured for a number of alternative interfaces, as shown in Figure 25.
40	TXD	
41	RXD	
42	OV	Note: For Ethernet, remove CN5 and fit Ethernet card to connector SK1. See Figure 22.
Serial Port 2 — RS422/485 data terminals		
43	TX / Y	Note: RS485 is currently not supported.
44	TX / Z	
45	RX / A	
46	RX / B	

Table 17:

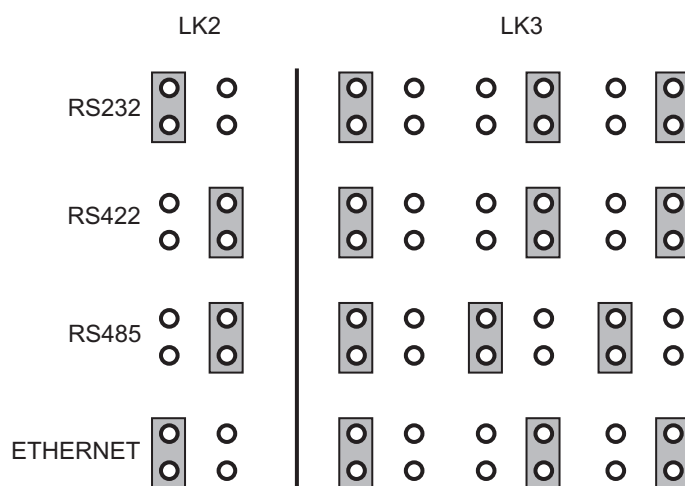


Figure 25: Link connections for network alternatives

CN6	
Serial Port 3 — RS232 data terminals	
47	TXD
48	RXD
49	OV
Serial Port 3 — RS422 data terminals	
50	TX / Y
51	TX / Z
52	RX / A
53	RX / B

Note: The Serial Port 3 CN6 can be configured for two alternative interfaces, as shown in Figure 26.

Table 18:

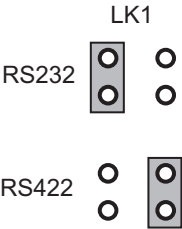


Figure 26:

CN7		
Detector Head cable connections		Note: Ensure the Head Cable gland is correctly assembled as shown in Figure 21.
54	GND — No Colour	
55	Grey/Blue	
56	Red/Blue	
57	Green/Blue	
58	White/Blue	
59	Orange/Blue	
60	Yellow/Brown	
61	Green/Red	
62	Red/Brown	
63	White/Brown	
64	Brown/Black	
65	Blue/Black	
66	Red/Black	
67	Green/Black	
68	White/Red	
69	White/Green	

Table 19:

CN8		
Detector Head cable connections		Note: Ensure the Head Cable gland is correctly assembled as shown in Figure 21.
70	Yellow/Blue	
71	Yellow/Red	
72	Grey	
73	Yellow	
74	Turquoise	
75	Grey/Green	
76	Orange	
77	Green	
78	Pink	
79	Brown	
80	Brown/Green	
81	Blue	
82	Blue/Green	
83	White	
84	Black	
85	Red	

Table 20:

CN9		
Programmable Inputs		See also pins 97, 99 and 100 in CN10. Note: For more information about using the programmable inputs, refer to Figure 27 which shows alternative connections to programmable input 1. Note: All sensors connected to the programmable inputs must be the same output type, i.e. PNP or NPN.
86	Programmable Input 3	
87	0V	
88	+15V	
89	Programmable Input 2	
90	0V	
91	+15V	
92	Programmable Input 1	
93	0V	
94	+15V	

Table 21:

CN10		
Input Configuration / CPU Fault Enable		
95	Not fitted	
96	Not fitted	
97	COM2 — common terminal for programmable inputs	
98	COM1 — common terminal for sensor inputs	
99	0V — reference for COM1, COM2	
100	+15V — reference for COM1, COM2	

Table 22:

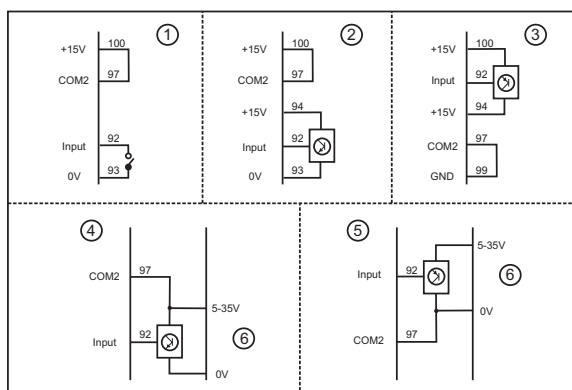


Figure 27: Examples of connections to programmable inputs

KEY	DESCRIPTION
1	Volt-free contacts
2	NPN
3	PNP
4	NPN Isolated
5	PNP isolated
6	External supply

CN11		
Reject Confirmation Sensor		See also pins 98, 99 and 100 in CN10. Note: For more information about using the sensor inputs, refer to Figure 28 which shows alternative connections to the Pack Sensor. Note: All sensors connected to the programmable inputs must be the same output type, i.e. PNP or NPN.
101	Input	
102	0V	
103	+15V	
104	Not Used	
Speed Sensor		
105	Input	
106	0V	
107	+15V	
108	Not Used	
Pack Sensor		
109	Input	
110	0V	
111	+15V	
112	Not Used	

Table 23:

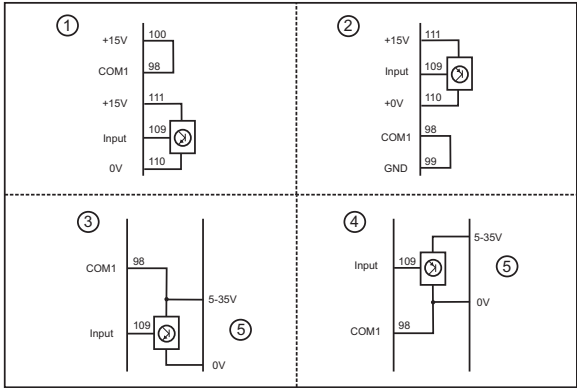


Figure 28:

KEY	DESCRIPTION
1	NPN
2	PNP
3	NPN Isolated
4	PNP Isolated
5	External Supply

Table 24 explains the function of the LED Indicators on the Input/Output board.

LED INDICATORS	COLOUR	
Power supply	Red	+24V status indicator — not used
		+6.5V output from switch mode supply — normally ON
		+15V output from switch mode supply — normally ON
		-15V output from switch mode supply — normally ON
Input	Green	RCU: Reject Confirmation sensor indicator
		SPEED: Speed Sensor Indicator
		PACK: Pack Sensor Indicator
		PROG1: Programmable Input 1 indicator
		PROG2: Programmable Input 2 indicator
		PROG3: Programmable Input 3 indicator
		PROG4: Programmable Input 4 indicator (Defaults to RESET: Reject Confirmation Fault reset indicator)
Output	Red	REJECT: Reject relay drive indicator — normally ON
		RCU: Reject Confirmation relay drive indicator — normally ON
		FAULT: Fault relay drive indicator — normally ON
		PROG1: Programmable Output 1 drive indicator — normally OFF
		PROG2: Programmable Output 2 drive indicator — normally OFF
		PROG3: Programmable Output 3 drive indicator — normally OFF
		CPU FAULT: CPU fault indicator — normally OFF
Fuse(s) and fuse status	Red	F1: Auto-reset fuse
		F2: Auto-reset fuse (optional)
		D12: Normally OFF

Table 24:

4 Basic Operating Instructions

This chapter explains the generic aspects of operating your metal detector.

SECTION	TITLE	PAGE
4.1	Overview of The Metal Detector's User Interface	54
4.2	Introduction to the User Interface	54
4.3	Navigation, Edit and Information Keys	55
4.4	Running Mode Displays	57
4.5	Information Screens	64
4.6	Condition Monitoring	67
4.7	Logging into the User Menus	69
4.8	Logging out from the User Menus	72
4.9	Editing Parameters	72

4.1 Overview of The Metal Detector's User Interface

When the metal detector is powered on, the User Interface will appear after a few seconds. The diagram below gives a general overview about the structure of the Interface, from viewing the Running Mode displays at the front of the interface to entering a pass code and accessing a different section.

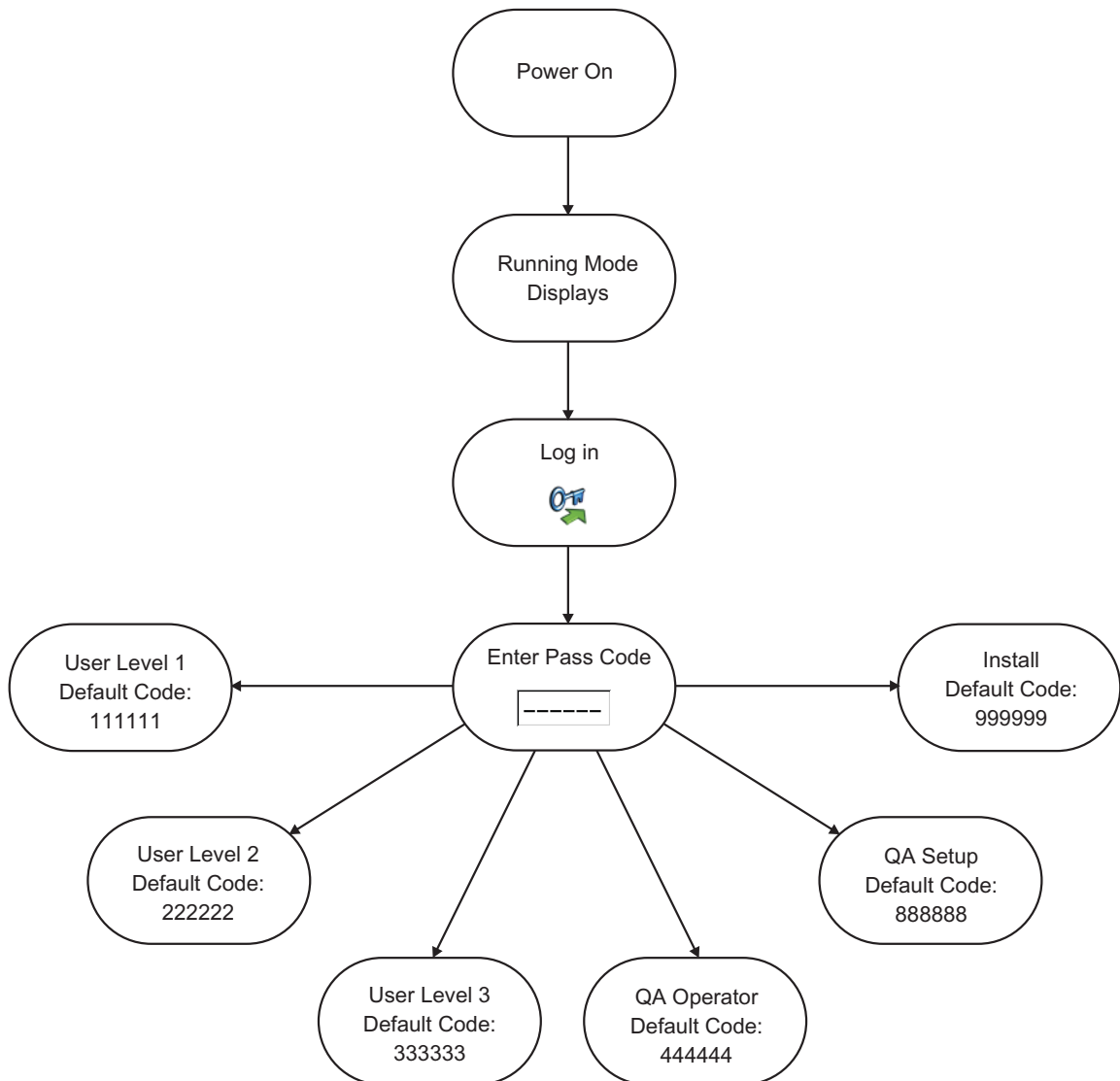


Figure 29:

4.2 Introduction to the User Interface

The Profile User Interface is the means by which you can observe and control the operation and performance of the metal detector. You can program all of the metal detector's operating characteristics through the user interface. The large colour display and touch screen interface provides you with clear and intuitive control and monitoring.

Access to the menus is controlled by a six-digit pass code. There are three levels of user access that an operator can be assigned. The level of access determines which controls and features you can view or adjust.

When the machine powers up, or no user has logged into their particular access level, the screen shows the Running Mode displays, where information on the detector can be viewed but not adjusted.



Figure 30:

KEY	DESCRIPTION
1	Bargraph
2	Main display area
3	Navigation bar

The bargraph (at the top of the screen) is used to display the signal strength of the product as it passes through the metal detector. With increasing signal strength, segments are illuminated from left to right. There are 10 Green segments and 20 Red segments. Only when the detection threshold has been reached do the red segments and the detect bar (situated below the red segments) become illuminated.

Note that when you are logged in to a secure access level, the bargraph reduces in size.

The main display area of the screen is used to display text and graphical information as well as the icon-based menu system.

In the navigation bar at the bottom of the display screen, the numbers such as 1/7 or 4/12 indicate the current screen and the number of screens available. The number of screens displayed can vary and depends upon whether the screen has been enabled in the software. You can use the Left and Right Keys to navigate between screens.

The navigation bar also shows the status of condition monitoring when in the running mode displays, and the Information key gives access to context-sensitive information and help.

The Login key is available in each of the running mode displays. When you press this, you are taken to the Pass code entry screen. When you enter a valid pass code, you can then access the controls and features available at your particular access level.

When you want to change the value of a detector control setting, the screen display changes to provide keys that allow you to alter the setting. Settings that are not editable are shown greyed out (disabled).

4.3 Navigation, Edit and Information Keys

The User Interface screens provide a common set of keys to enable you to navigate the screens of the menu system, make adjustments to numerical values and, where appropriate, supply information. The keys appear in the bottom part of the screen, known as the navigation bar, when their use becomes applicable. The most common keys and their functions are listed in Table 25. Other keys that have particular functions on specific screens are explained in the sections of this manual where their use is described.

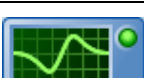
KEY	FUNCTION
	The Left and Right keys allow you to navigate sequentially between screens. The numbers tell you which screen is displayed, and how many there are.
	When numerical values are displayed, use the Left and Right keys to move along the digits of the value, and the Up and Down keys to increase or decrease the value of the currently highlighted digit.
	Press the Information key to display the information screens.
	Press the Login key to display the screen where you enter your security pass code to gain access to the control screens applicable to your access level.
	Press the Logout key to log out and return to the Running Mode displays.
	Press the Unlock Bin key (if enabled) to open the reject bin for a defined period of time.
	Press the Return key to return to the previous level in the menu.
	When the Parameter key is shown next to a field, press the key to select or adjust the setting.
	Press the Confirm key to accept or confirm the selection you have made.
	Press the Cancel key to reject or cancel the selection you have made.
	Press the Condition Monitor icon to display the current detector condition.
	Press the Zoom In key to manually zoom into and magnify a Vector Diagram.
	Press the Zoom Out key to manually zoom out from a Vector Diagram.

Table 25:

NOTICE!

Do not press the keys on the touch-screen with anything other than your finger, otherwise you risk damaging the screen.

4.4 Running Mode Displays

Running Mode is the default mode of operation for the metal detector. When the metal detector is powered up, the Running Mode screens are automatically displayed. The detector remembers which Running Mode screen was being displayed when it was powered off, and automatically displays this screen again when it is next powered on.

The Running Mode displays are the screens that you will normally see on the User Interface, except for when it is being used to manage or change some aspect of the detector's operation. Running Mode is not security protected and the information shown can be observed but not altered. These displays show information relating to the current running product as well as additional system information.

The number of Running Mode displays is dependent on the detector's install settings and the current product settings. If the settings on the detector mean that some of the Running Mode screens are not shown, the screen numbers of the remaining screens will vary from those shown here. Up to 12 Running Mode displays can be enabled and all the screens are shown below.

4.4.1 Metal Detector Model

This screen displays the name of the metal detector model.



Figure 31:

4.4.2 Product Name

This screen displays the name of the currently running product. You can configure the actual names of the products from the User Level 3 functions.



Figure 32:

When a product is set up on the metal detector, a Product Code and a Batch Code can also be enabled to display on this screen.



This screen is only displayed if it is enabled in the Running Displays menu, page 138.

4.4.3 Reject Count and Pack Count

This screen displays the number of times the reject relay has operated for the current running product. If a Pack Sensor is installed, the number of packs counted for the current product is also displayed.

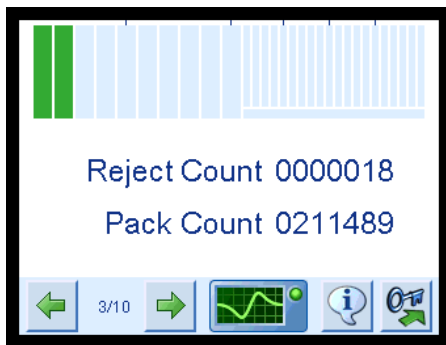


Figure 33:

You can reset the Reject Counter and Pack Counter from User Levels 2 and 3.

4.4.4 Phase Histogram



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

This screen displays a histogram of phase values for the current running product and is beneficial if the running product exhibits a product effect. Samples may be pack or time based. The graphical information displayed shows the long term phase trend and can be used by the operator to make better informed decisions on the most suitable phase setting for the product.

A display event will only occur if the product signal is below the detection level. If a black bar is displayed at the extreme left or right, it means the recorded value is outside the displayed range.

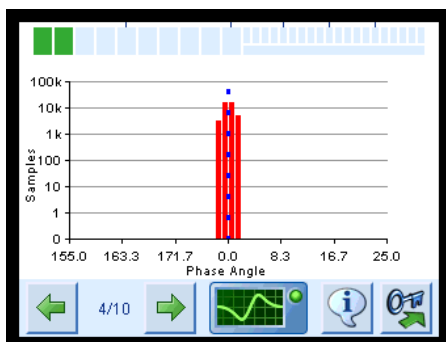


Figure 34:

You can clear histogram information from User Levels 2 and 3.

You can configure histograms from the Install Access Level.



This screen is only displayed if Phase Display is enabled in the Advanced Settings menu, page 115. The rate of sampling can also be configured in this section.

4.4.5 Product Signal Strength Histogram



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

This screen displays a histogram of signal strength values for the current running product. Samples may be pack or time based. The graphical information displayed shows the long term signal strength trend and can be used by the operator to make better informed decisions on the most suitable sensitivity setting for the product.

The signal strength will only be displayed if the signal is below the detection level.

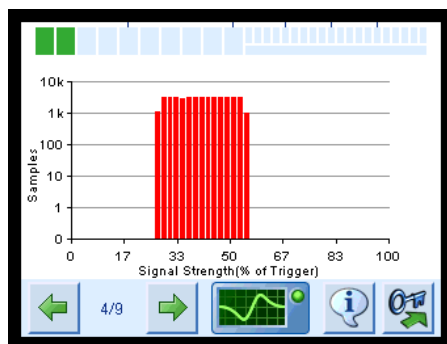


Figure 35:

You can clear the histogram information from User Levels 2 and 3.

You can configure histograms from the Install Access Level.



This screen is only displayed if Product Logging is enabled in the Advanced Settings menu, page 115. The rate of sampling can also be configured in this section.

4.4.6 Short-Term Monitoring Histogram



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

This screen displays the combined measured signal strength on the left axis and measured phase on the right axis.

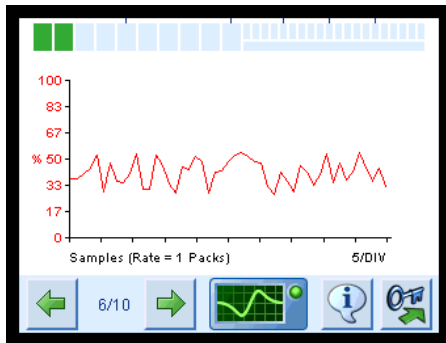


Figure 36:

Whereas the individual phase and signal strength histograms provide long term statistical information, this screen provides shorter term trend information and displays the last 50 samples.

You can clear histogram and monitoring information from User Levels 2 and 3.



This screen is only displayed if Product Logging is enabled in the Advanced Settings menu, page 115. Note that the Phase axis is only displayed if Phase Display is enabled in the same section. The rate of sampling can also be configured in this section.

4.4.7 Performance Test Status

This screen displays information about the Performance Test status. A traffic light system indicates the status of the Performance Test.

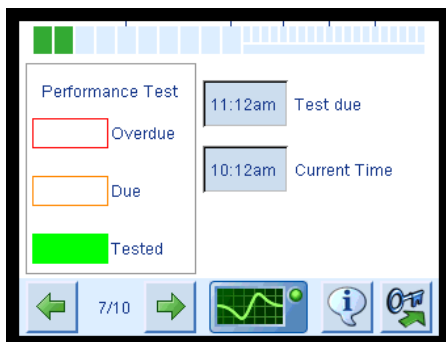


Figure 37:

KEY	DESCRIPTION
Green	Tested
Amber	Due
Red	Overdue
Flashing Red/Amber	Due
Clear/No colour	Untested

The Test Mode is configured to be time based.

The Performance Testing history can be viewed by pressing the **View Test Log** icon.

You can configure Performance Testing from the QA Setup Access Level.

This screen is only displayed if Performance Testing is enabled in the QA Setup access level, Section 7.2.



Flashing red and amber indicators mean that a request for a Performance Validation Routine (PVR) has been instigated by the metal detector, based on the features enabled in Figure 182 in page 149.

4.4.8 Condition Monitoring

This screen works in conjunction with Condition Monitoring  and presents a highly visible representation of the status of the metal detector. Condition Monitoring constantly monitors the key elements of the detector's functionality and gives an Early Warning if any of the monitored parameters exceed predefined limits. The benefit is that corrective action can be taken through preventative maintenance before the detector fails or loses its performance level.



Figure 38:

KEY	DESCRIPTION
Green	Healthy
Amber	Early Warning
Red	Fault

For more information about Condition Monitoring, see Section 4.6.



This screen is only displayed if it is enabled in the Running Displays menu, page 138.

4.4.9 Access Log



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

This screen is a filtered version of the Access Log found in page 130, and displays the last 25 successful and failed login attempts. Logout and Timed-out events are not shown.

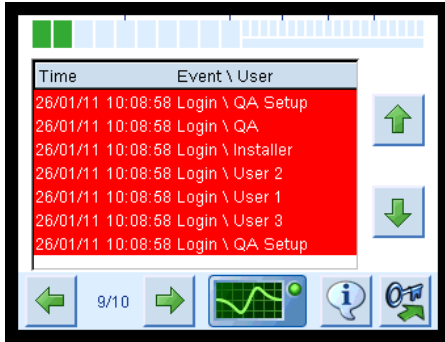


Figure 39:

Access Log events where a PVR test was performed are displayed in GREEN. All other Access log events are displayed in RED and highlights any potential unnecessary user access.



This screen is only displayed if it is enabled in the Running Displays menu, page 138.

4.4.10 Peak Hold Log (Discriminated Detection Events)



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

The Peak Log displays a list of detection events and captures the time and the date of when they occurred. The peak signal gives an indication as to the size of the metal contaminant — the larger the peak signal, the larger the contaminant.

The Peak Hold Log captures and displays the last 20 detection events, with the most recent event displayed at the top, whilst the largest product Peak signal is permanently displayed on the left hand side of the screen until it is over-ridden by a larger signal or reset.

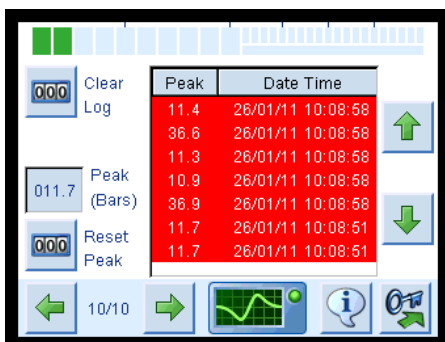


Figure 40:

Peak Hold Log entries that are the result of Performance Validation Routine (PVR) testing, using in-built PV routines, will be displayed in GREEN. All other detections shall be displayed in RED.

Both the Peak Hold Log and the current Peak can be cleared.



This screen is only displayed if it is enabled in the Running Displays menu, page 138.

4.4.11 PackML V3.0

This screen presents a PackML representation of the status of the metal detector. From here, the current mode and state of the metal detector can be established.

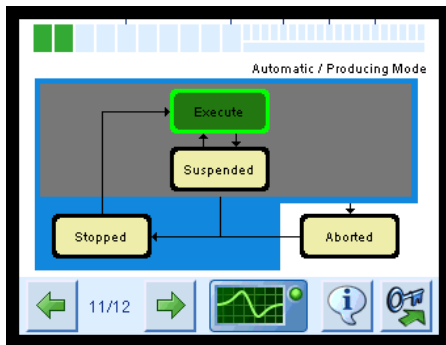


Figure 41:

Each mode represents a specific operating scenario of the device. Possible modes that can be viewed on the State Machine Running Mode include:

- Undefined Mode
- Automatic/Producing Mode

Additional modes can also be enabled on the metal detector however, they cannot be viewed on this screen as it is required by the user to log into the metal detector and make the appropriate adjustments. These modes include:

- Maintenance Mode
- Setup Mode
- PVR Mode

Within each mode a number of states exist that the equipment can be operate in. These states include:

- Aborted
- Undefined
- Stopped
- Suspended
- Execute

To enable or disable this display, see page 139.

To configure the PackML settings, see page 141.

For more information on PackML and for descriptions of the modes and states available, see Section 11.1.

4.4.12 Overall Equipment Effectiveness (OEE)

This display presents information about how efficiently the metal detector is performing on the production line. The Overall Equipment Effectiveness (OEE) is determined by how the metal detector is configured however, it is also influenced by additional factors that exist on a production line. OEE allows a user to determine whether the performance of the metal detector, or even that of the production line, can be improved.

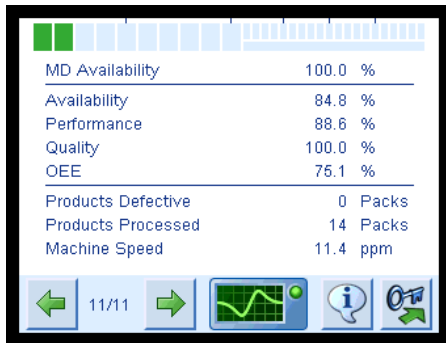


Figure 42:

NOTICE!

If no pack sensor is fitted or calibrated, the Machine Speed and the Products Processed parameters are hidden from the display.

To enable or disable this display, see page 139.

For more information about OEE, see Section 11.4 "Overall Equipment Effectiveness (OEE)", page 237.

4.5 Information Screens



Press the Information key at any time to display the first of the following Information screens. These screens are displayed unless any context sensitive help is available at the time.

4.5.1 Metal Detector Information

This screen displays basic information about the Metal Detector such as the product software version, serial number, the time and the date.

Note that the Performance Verification (PV) feature will only appear if it has been enabled. If this feature has not been enabled and you require it, contact your SAFELINE Service Organisation. An overdue PV will cause the text to be highlighted in red.

Similarly, the detector can be scheduled to indicate when an annual PV Audit is required, which verifies that the detector is operating as it should.



Figure 43:

4.5.2 Current Product Information

This screen displays basic information about the current running product.



Figure 44:

4.5.3 Reject Setup Information

This screen displays basic information about the current Metal Detector reject settings. Failure to install or calibrate any of the sensors correctly will cause the text to be highlighted in red.

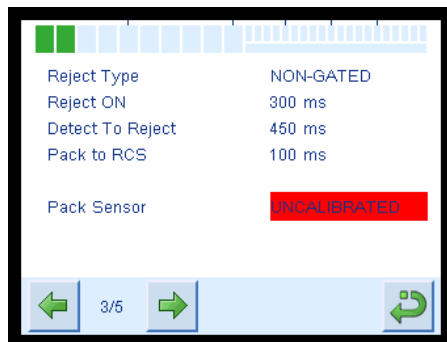


Figure 45:

4.5.4 Option Code Status

This screen is used to determine which software options are currently installed on the metal detector, and is present from software version F4.8.0. See Figure 46.

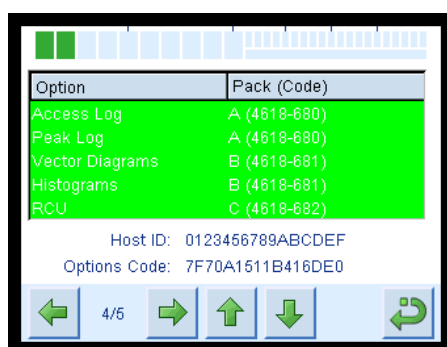


Figure 46:

COLOUR	CONDITION
Red	Option not installed
Green	Option installed
Amber	Option currently being trialled

Table 26:

For more information about installing further options, see Section 6.4.

4.5.5 Firmware Information

This screen is used to provide information on all of the devices installed on the metal detector and their respective firmware versions.

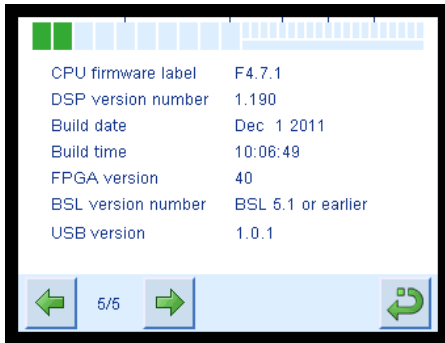


Figure 47:



The **USB Version** firmware will only appear if a USB Adapter is installed, fitted and powered-up on the metal detector. The Printer Type parameter must also be set to USB MSD. See Chapter 10 "Setting Up the USB Adapter", page 207 for further details.

4.5.6 Fieldbus Information

This screen will only appear if a Fieldbus Interface Module is installed on the metal detector. This screen provides information about the type of module installed and its status.

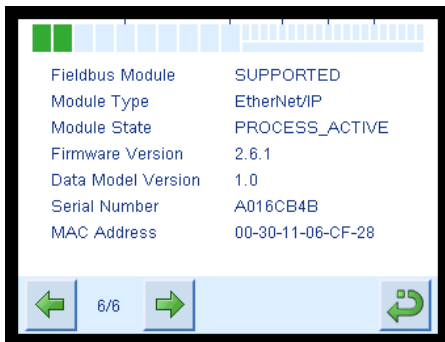


Figure 48:

Fieldbus Module

This shows whether the Fieldbus Interface Module is SUPPORTED or NOT SUPPORTED:

FIELDBUS MODULE	DESCRIPTION
SUPPORTED	The Fieldbus Interface Module will be identified as a type supported by the metal detector, resulting with all of the parameters being displayed as in Figure 48.
NOT SUPPORTED	The Fieldbus Interface Module will be identified as a type not supported by the metal detector, resulting with only the Module Type parameter being displayed as in Figure 49.

Table 27:

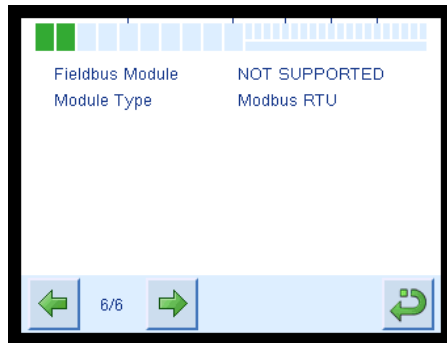


Figure 49:

Module Type

This shows the type of Fieldbus Interface Module installed.

Module State

This indicates the current state of the Fieldbus Interface Module. However, as the states vary for each Fieldbus Interface Module, refer to the manual that accompanied the Fieldbus Interface Module for specific explanations.

Firmware Version

This is the current firmware installed on the Fieldbus Interface Module.

Data Model Version

This is the current data model version supported by the metal detector.

Serial Number

This is the serial number of the Fieldbus Interface Module.

MAC Address

This is the MAC address of the Fieldbus Interface Module and is only visible when Ethernet-based Fieldbus modules are installed.

4.6 Condition Monitoring



Condition Monitoring constantly monitors the key elements of the detector's functionality and gives an Early Warning (EW) if any of the monitored parameters exceed predefined limits. The benefit is that corrective action can be taken through preventative maintenance before the detector fails or loses its performance level.

The Condition Monitoring icon indicates by colour the current state of the detector. Press the icon to display a screen showing details of the monitored state. The condition monitor animated icon is located on the navigation bar and appears on all running mode displays.

The feature monitors the following metal detector conditions:

1. Power Drive (EW-01)
2. Balance (EW-02)
3. Self Check Phase (EW-03)
4. Self Check Magnitude (EW-04)

A second set of limits is also monitored for the above conditions that, if exceeded, will generate a FAULT condition.

If no key is pressed after several seconds, the display automatically reverts to the Running Mode.



If any of these warnings appear, contact your SAFELINE Service Organisation.

4.6.1 Green: Healthy



If you press the **Condition Monitoring** icon when it is in the green state, the screen gives confirmation that the condition is satisfactory.



Figure 50:

4.6.2 Amber: Early Warning



If an Early Warning condition is present, the indicator lamp flashes amber and the animated icon changes state to amber.

Pressing the amber Condition Monitoring icon displays the status of the monitored conditions and advises you to contact the supplier.

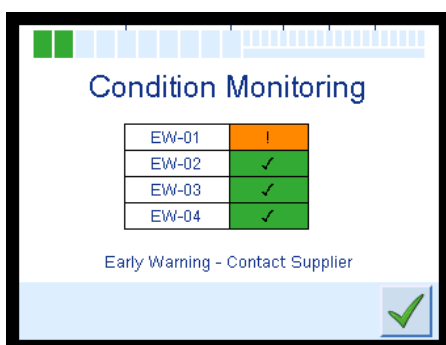


Figure 51:

In the example shown, the Power Drive condition has reached or exceeded its Early Warning limits.

4.6.3 Red: Fault



If a FAULT condition occurs, the indicator lamp flashes red and the animated icon changes state to a steady horizontal red line.

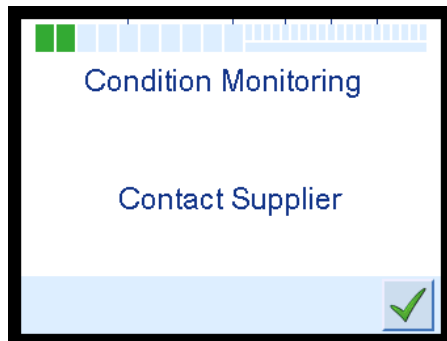


Figure 52:

Under this condition, a message window is displayed to specify the FAULT condition. The condition will remain until the FAULT is cleared. The FAULT could be due to one or more of the Early Warning conditions reaching or exceeding their limits. Alternatively, the FAULT could be another condition not covered under the Condition Monitoring.

4.7 Logging into the User Menus

4.7.1 Pass Codes



In order to change any operational or control settings for the metal detector, you must first gain access to the user menus. To log into the menu system, press the **Login** key on any of the Running Mode displays.

The screen will display the security pass code entry screen. Either the Standard Authentication screen (Figure 53) or Advanced Authentication screen (Figure 54) will appear. The screen that appears will depend on how the Access Settings have been configured on the metal detector. By default, Figure 53 will appear.

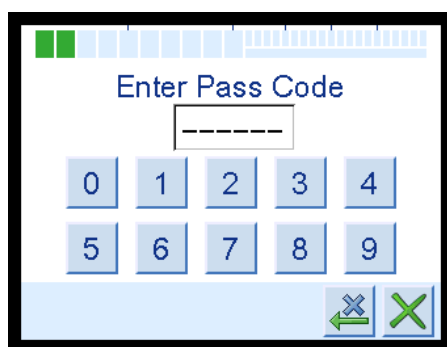


Figure 53: Standard Authentication

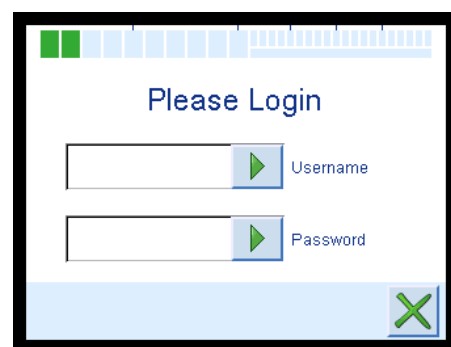


Figure 54: Advanced Authentication

Standard Authentication

The Standard Authentication screen requires the user to log into the metal detector by entering a six digit Pass Code. The default pass codes are shown in Table 29.

USER LEVEL	1	2	3	QA OPERA-TOR	QA SETUP	INSTALL
Default Pass Code	111111	222222	333333	444444	888888	999999

Table 29:

Procedure

1. Use the keypad to enter your six digit pass code. If you make a mistake whilst entering the pass code, use the **Backspace** key to delete the digits one at a time.
 2. Press the **Cancel** key if you want to cancel the procedure and return to the Running Mode.
- When you have entered a valid pass code, the detector gives you access to the menu appropriate to the access level associated with your pass code. See Table 31 for details on the access levels available.

Advanced Authentication



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

The Advanced Authentication screen requires the user to log in with a Username and a Password, and can be used as part of a 21CFR Part 11 compliant system.

The default usernames and passwords (shown in Table 30) are not case sensitive however, any password created by a user will be case sensitive. Please note that spaces are inserted in the default usernames **User 1**, **User 2**, **User 3** and **QA Setup**.

USER LEVEL	1	2	3	QA OPERA-TOR	QA SETUP	INSTALL
Default User-name	User 1	User 2	User 3	QA	QA Setup	Installer
Default Password	111111	222222	333333	444444	888888	999999

Table 30:

Procedure

1. Press the **Username** parameter to enter a Username. The display shows the alphabetic keypad — the operation, of which, is described in Section 4.9.
 2. Press the **Password** parameter then enter a password — again, using the keypad.
If you make a mistake while entering your code, use the **Backspace** key to delete the digits one at a time.
Note: The Password is encrypted, therefore a series of asterix will appear instead of any numerical or alphanumerical characters when the Password is entered into the keypad.
 3. Press the **Cancel** key if you want to cancel the procedure and return to the Running Mode.
- When you have entered a valid Username and Password, the detector gives you access to the menu appropriate to the access level associated with the Access Account. See Table 31 for details on the access levels available.



For more information on setting up and maintaining user access accounts, see the Access Settings menu in page 130.

4.7.2 Accessing the User Levels

The table below shows the operational functions that you can access at each level:

FEATURES	USER LEVEL 1 DEFAULT CODE: 111111	USER LEVEL 2 DEFAULT CODE: 222222	USER LEVEL 3 DEFAULT CODE: 333333
Select product	✓	✓	✓
Perform Auto setup		✓	✓
Reset Counters		✓	✓
Reset Histograms		✓	✓
Performance Test (optional) *		✓	✓
Modify Basic Product Set- tings		Sensitivity only	Frequency, Sensitivity & Phase
Modify Reject Inhibit Setting			✓
Create Product			✓
Copy Product			✓
Delete Product			✓
Perform Auto Cluster			✓
Set up Reject Timers			✓

Table 31:

* Performance Test functions are normally accessed through the QA access level, but accounts can be set up to allow access for User Level 2 or 3 in situations where dedicated QA operators are not used. QA Performance Test procedures are described in Chapter 7 of this manual.

Detailed descriptions of the functions available at each of the three User Levels are provided in Chapter 5 of this manual.

4.7.3 Accessing the Quality Assurance and Installation Levels

There are additional security pass codes that give access to secure menus which are used for initial set up of the detector control parameters at installation, for managing user account details, and for setting up and running Quality Assurance (QA) test procedures. These additional levels of secure menus are referred to as the Install Level and the QA Level. The functions you can use at these levels are described in Chapter 6 and Chapter 7.

The default security codes for the Install Level and QA Level functions are as follows:

FEATURES	QA OPERATOR DEFAULT CODE: 444444	QA SETUP DEFAULT CODE: 888888	INSTALL DEFAULT CODE: 999999
Run Performance Tests	✓		
Set up QA and Performance Tests		✓	
Set up Install and Advanced Settings			✓

Table 32:

4.8 Logging out from the User Menus



To log out from the user menus, press the **Logout** key on any of the displays. Additionally, if you are logged in but if no activity occurs for approximately 5 minutes, you will be automatically logged out.

4.9 Editing Parameters

This section allows you to edit a product name, change a numerical value, select an item from a list and enable a specific feature.

4.9.1 Editing Text



Press the **Parameter** key to edit the text. For example, in Figure 55, press the **Name** parameter key to amend the information. An alphabetic keypad will be displayed, allowing text and numbers to be entered by pressing the appropriate character. See Figure 56.

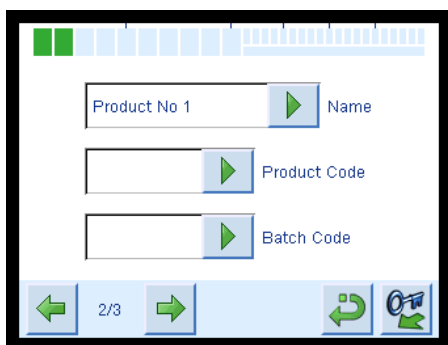


Figure 55:



Figure 56:

See Table 34 for more information on how to use the keypad.

KEY	FUNCTION
	The Left and Right Arrows move the cursor through the existing name.
	Press the Confirm key to save the process.
	Press the Cancel to abandon the process.
	The backspace key deletes the character to the left.
	This represents the keyboard space bar.
	Press the upper and lower case keys to switch between the upper and lower case keypads.
	Press this key to switch between the standard and the alternative keypad containing additional characters.

Table 34:

4.9.2 Editing Numerical Values



Press the **Parameter** key to change a numerical value. For example, after pressing the Time parameter key in Figure 57, the screen changes to show the adjustment keys. See Figure 58.

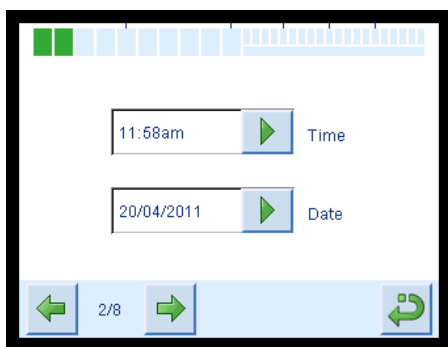


Figure 57:

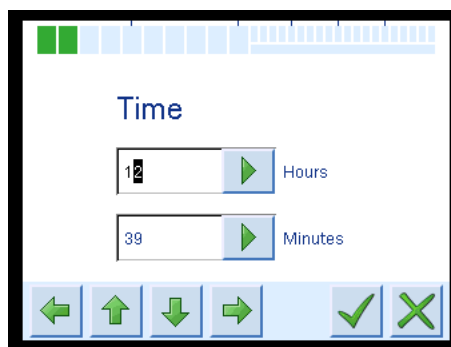


Figure 58:



When editing one parameter, other parameters will usually become inactive. However, if Fast Editing is available, you can jump from one parameter to the other before pressing the Confirm key.

Example: To change the Time

Procedure

1. Select either the **Hours** or **Minutes** parameter.

2. Use the **Arrow** keys to highlight and change the time.
3. Press the **Confirm** key to store the new time, or **Cancel** to abandon the settings and return to the previous screen.

4.9.3 Selecting from a List



Press the **Parameter** key to select an item from a list. For example, after pressing the Language parameter key in Figure 59, the screen changes to show the list of languages available and the **Up** and **Down** Arrow keys with which to highlight the language.

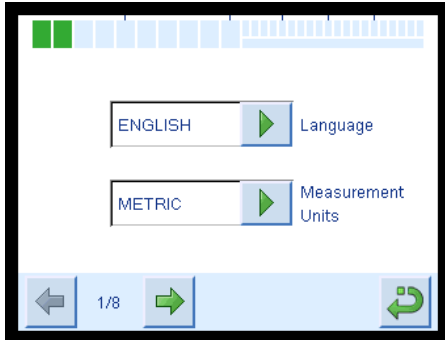


Figure 59:

Example: To change the Language

Procedure

1. Select the Language parameter.
2. Use the **Up** and **Down** Arrow keys to highlight the language.
3. Press **Confirm Selection** to accept the selection, or **Cancel Selection** to cancel it and return to the previous screen.

4.9.4 Enabling and Disabling a Feature



Additional features can be enabled and disabled on the metal detector by pressing a tick box. For example, to enable the **RCU Sensor Calibrated** feature in Figure 60, press the box so that a tick appears in it.

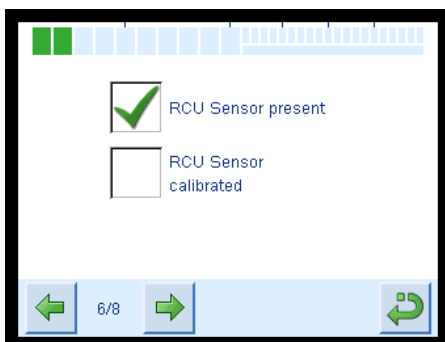


Figure 60:

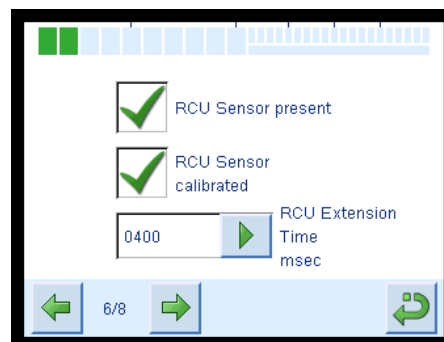


Figure 61:

Figure 61 shows that by enabling the **RCU Sensor Calibrated** feature, a short routine will run to calibrate the RCU sensor before the **RCU Extension Time** parameter is displayed. To disable the feature, press the box again to clear the tick.

5 User Level 1, 2 and 3 Operating Instructions

This chapter explains how you set up and control your metal detector using the options available from User Levels 1 to 3.

SECTION	TITLE	PAGE
5.1	User Level 1	76
5.2	User Level 2	76
5.3	User Level 3	80

5.1 User Level 1



The default pass code for User Level 1 is 111111. For additional information on entering pass codes, see page 69.

Users logging in at this level will only be allowed to change the current running product. Upon logging in, the current running product is shown at the top of the screen, highlighted in the green box.



Figure 62:

To select a product:

1. Press the **Up** and **Down** Arrow keys from the product list to scroll to the desired product.
2. Press the **Confirm Selection** key when the desired product is highlighted. Alternatively, press the **Log-out** key to log out without changing the selected product.



Either discrete products or multi-product clusters can be selected (if your detector is set up to use product clusters). Clusters are shown above discrete products in the product list.

5.2 User Level 2



The default pass code for User Level 2 is 222222. For additional information on entering pass codes, see page 69.

Upon logging into User Level 2, the screen displays one of two graphic menus, depending on the current product settings.

One of either two menus will be shown, depending on whether the product selected is a discrete product or a clustered product. The two menus are shown below. Note that the **Auto Setup** and **Product Settings** options are not available for clustered products.

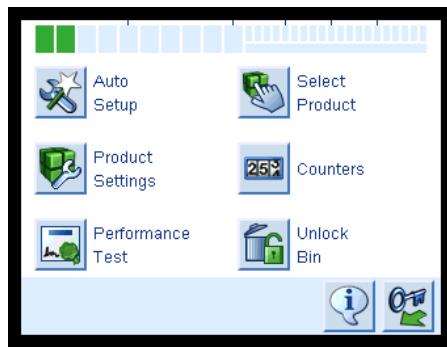


Figure 63: Menu for a discrete product

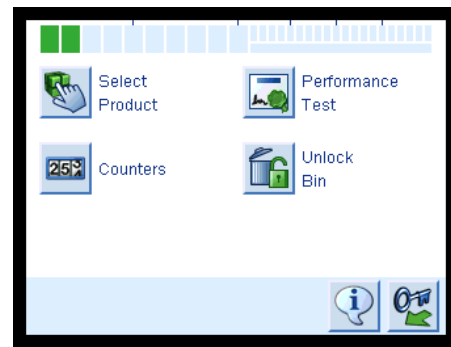


Figure 64: Menu for clustered products

The **Select Product** option operates as described in Section 5.1. The **Auto Setup**, **Product Settings**, **Counters**, **Performance Test** and **Unlock Bin** options are described in this section.

5.2.1 Auto Setup



This section explains the options available that help you set up a product on the metal detector. For more information on how to set up and perform an actual Auto Setup, refer to Section 8.2.



Press the **Auto Setup** key to display the Setup options. Figure 65 appears.

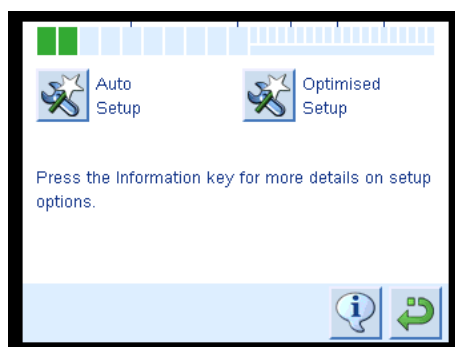


Figure 65:

You can use this feature to automatically set up the product on the metal detector. By passing product through the aperture, the metal detector will determine the:

- Sensitivity
- Phase
- Frequency

This feature is designed to make the setting up of your metal detector as easy as possible, reducing the need to adjust any of the controls as the product passes through the aperture. There are two procedures available to help set up the product:

- Auto Setup
- Optimised Setup

The Auto Setup Procedure

The Auto Setup procedure requires an operator to pass the product through the metal detector's aperture at specific intervals, either once or several times, while the product line is temporarily halted.

Auto Setup should be selected:

- If the Operating Frequency has not been determined.
- For single product setup.
- For dry products or for products with minimal moisture content variation.

The Optimised Setup Procedure

Optimised Setup can analyse multiple samples over a prolonged period of time on a continuously running product line to reduce the downtime on a production line. Using Optimised Setup can also establish an improved level of sensitivity due mainly to the refined shape of the detection envelope.

Optimised Setup should be selected:

- When an existing Auto Setup needs improving, where the Operating Frequency is known and the production line is active.
- When no Auto Setup has been performed but the product has been created, the Operating Frequency has been set and the production is active.
- For products with a high moisture content or a known moisture content variation.



Optimised Setup will not be available for selection if Inverse Detect is enabled.

Additional Information

When you have selected the appropriate procedure, follow the instructions shown on the display. A sequence of messages guides you through the process. Most of the displays are simply to inform you of what is happening and require no intervention. Where any intervention is required, the display will explain what needs to be done.

For more information, refer to Section 8.2 "Automatic Product Setup", page 170.

5.2.2 Product Settings



Press the **Product Settings** key to view or alter the Sensitivity setting for the current running product.

Only the Sensitivity setting can be altered at User Level 2. The field shows the current value of the Sensitivity setting.

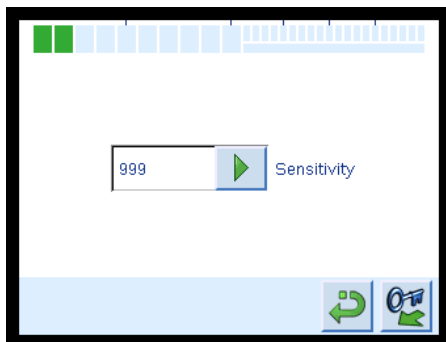


Figure 66:

To Adjust the Sensitivity:

Procedure

1. Press the **Sensitivity** parameter to change the setting. The screen changes to show the adjustment keys.

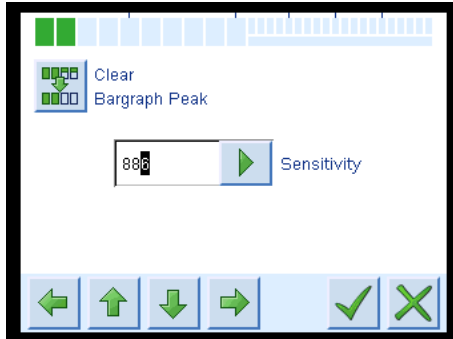


Figure 67:

2. Pass the product. As the product passes through the metal detector, the product signal is displayed on the bargraph. The peak signal measured is displayed, as shown above.
3. Use the Arrow keys to change the sensitivity. As sensitivity is adjusted, the peak signal measured will change to reflect the new peak signal strength.
4. Once set to the desired number of bargraph segments, clear the peak (by pressing the **Clear Bargraph Peak** key), pass the product again and confirm the new setting. Repeat the process as required.
5. Press the **Confirm** key when you have finished adjusting the value to save the new Sensitivity setting. Alternatively, press the **Cancel** key to abandon the change and leave the setting unaltered.
6. Press the **Return** key to return to the User Level 2 menu.

5.2.3 Counters



Press the **Counters** key to reset the metal detector's counters. Resetting the Product Logging resets the current product's histograms and short-term monitoring data.

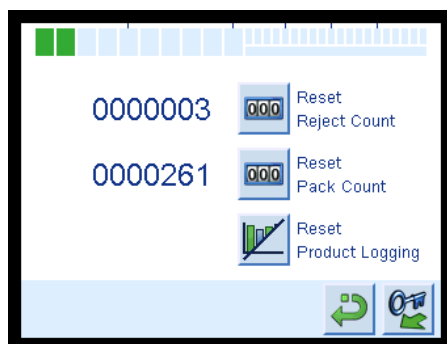


Figure 68:

1. Press the appropriate key to clear the current product's Reject Count, Pack Count and the Product Logging (Histogram and Short Term Monitoring) data.
2. Press the **Return** key to return to the User Level 2 menu.

5.2.4 Performance Test



Press the **Performance Test** key to run a Performance Test.

The performance test procedures help your company comply with Quality Assurance standards (such as ISO 9001) by ensuring that the detector system is tested and operating to your company's specified quality assurance standards of performance.

Performance tests can only be run for the current running product. It is also necessary for the Test Sample Setup option to have previously been set to specify the sample sizes to use for the performance tests for the product. If the Test Sample Setup option has not been set for the product, the Performance Test icon is disabled. When the tests have been set up and you press the Performance Test key, the product test screen is displayed and you are requested to pass the product with the appropriate test sample.

See Chapter 7 for further details on setting up and running performance tests.

5.2.5 Unlock Bin



The Unlock Bin key will only appear if the Unlock Bin programmable output function has first been assigned in the **Customer Outputs** section (page 119) and permission granted to the user.



If enabled, press the **Unlock Bin** key to unlock the Reject Bin for a predetermined length of time and remove rejected products or test samples.

A Reject Bin can be fitted with an electro-mechanical lock to ensure that products cannot be removed from the Reject Bin by unauthorised employees. This reduces the potential for rejected products being fed back into production.

This type of lock (if fitted to the Reject Bin) is routed into the metal detector's Power Supply Unit and controlled via the User Interface by authorised personnel. When pressed, the bin will open for a period of 10 seconds (default value). During this period, the Unlock Bin button will be inactive and will only be reactivated when the time has elapsed.

For details on enabling the Unlock Bin programmable output option, see page 119. Once enabled, Unlock Bin access rights can then be granted to User 2 and User 3 access level at the **Install** access level (page 132), and to QA Users at the **QA Setup** access level (page 153).

5.3 User Level 3



The default pass code for User Level 3 is 333333. For additional information on entering pass codes, see page 69.

When you enter a pass code that gives access to User Level 3, the screen displays one of two graphic menus, depending on the current product settings.

One of either two menus will be shown, depending on whether the product selected is a discrete product or a clustered product. The two menus are shown below.

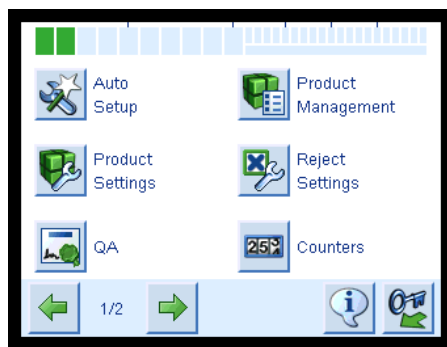


Figure 69: Menu for a discrete product

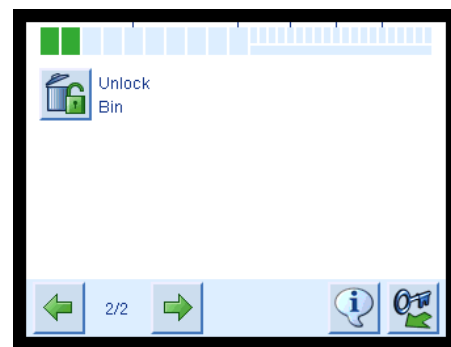


Figure 70: Menu for a discrete product

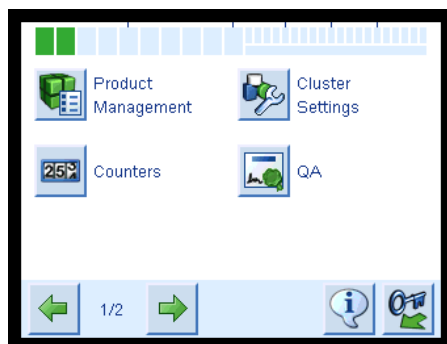


Figure 71: Menu for clustered products



Figure 72: Menu for clustered products

Note that the **Auto Setup** and **Reject Settings** options are not available for clustered products. Also, the **Product Settings** option is replaced with the **Cluster Settings** option, which is described later in this section.

The **Auto Setup**, **Counters** and **Unlock Bin** options operate as described in Section 5.2. The **Product Settings**, **Reject Settings**, **Product Management** and **QA** options are described in this section.



Performance Test functions are normally accessed through the QA access level, but accounts can be set up to allow access for User Level 2 or 3 in situations where dedicated QA operators are not used.

In this case, the menu will also include a Performance Test option. The QA Performance Test procedures are described in Chapter 7 of this manual.

5.3.1 Auto Setup



Refer to the Auto Setup description in Section 5.2.

5.3.2 Counters



Refer to the Counters description in Section 5.2.

5.3.3 Product Settings



Press the **Product Settings** key to view or alter the settings for the current running product.

Please note that the Product Settings option is not available for product clusters.

The first screen from the Product Settings allows you to adjust Frequency, Sensitivity and Phase. Frequency adjustment is only available for multi-frequency units.

The second screen allows you to change the Product Name and add additional identification details.

The third screen allows you to enable or disable the Reject Inhibit and the Inverse Detect features.

Adjusting the Frequency, Sensitivity or Phase

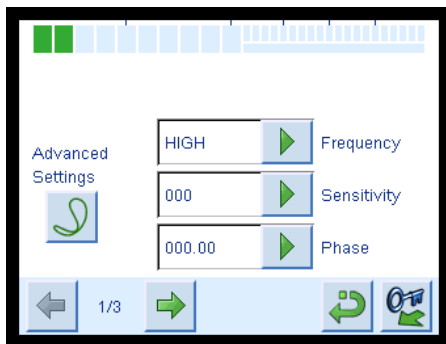


Figure 73:

To adjust the Frequency:

Procedure

1. Press the **Frequency** parameter. The screen changes to show the available options.
2. Select **Low**, **Medium** or **High** from the option list then press the **Confirm** key.



The frequency options are for a detector with three frequencies. A detector with two frequencies will only have Low and High options to choose from.

To adjust the Sensitivity or Phase:

Procedure

1. Press either the **Sensitivity** or **Phase** parameter. The screen changes to show the adjustment keys. See Figure 74.

Note: The bargraph peak facility does not operate when adjusting Phase.

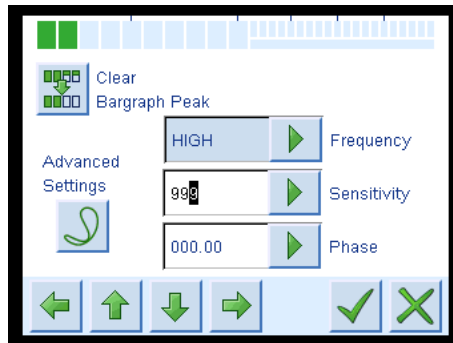


Figure 74:



Sensitivity and Phase can be conveniently adjusted together by selecting either of the settings, without the need to select the Confirm Key in between.

2. To adjust the Sensitivity, pass the product. The product signal is displayed on the bargraph as the product passes through the metal detector.
3. Use the **Arrow** keys to change the sensitivity. As sensitivity is adjusted, the peak signal measured will change to reflect the new peak signal strength.
4. Once set to the desired number of bargraph segments, clear the peak by pressing the **Clear Bargraph Peak** key, pass the product again and confirm the new setting. Repeat the process as required.
5. Press the **Confirm** key when you have finished adjusting the product settings to save the new settings. Alternatively, press the **Cancel** key to abandon the changes and leave the settings unaltered.
6. When you have adjusted the Sensitivity or Phase, press the **Right Arrow** key to move onto the next screen, Figure 75.



If it is proving difficult to set either the Sensitivity or Phase, you can gain assistance by pressing the Advanced Settings key to access the Vector Diagrams display screen. For more information on Vector Diagrams, refer to page 85.

Changing the Product Name



Figure 75:

To change the Product Name:

1. Press the **Name** parameter to edit the product name. The alphabetic keypad is displayed for you to edit the product name — the operation, of which, is described in Section 4.9.
2. Enter the name of the product then press **Confirm** to accept the new product name. The previous screen is displayed showing the new name.

Product and Batch Codes



Additional information, such as a Product Code and Batch Code, can be entered to help differentiate between similar products and to make them be traced more easily if there is a need to evaluate previously inspected product.

A Product Code can be a variant of the main product, a barcode or a similarly unique product number and is unique to the current running product.

The Batch Code can be used to name the current batch of products running, and may help isolate when the consignment was originally inspected.

These codes, if entered, will appear with the product name in the Running Mode Display.

To change the Product Code or Batch Code:

1. Press the **Product Code** and **Batch Code** parameters to enter a code.
2. When you have entered the appropriate product name and codes, press the **Right** Arrow key to move onto the next screen, Figure 76.

Reject Inhibit and Inverse Detect

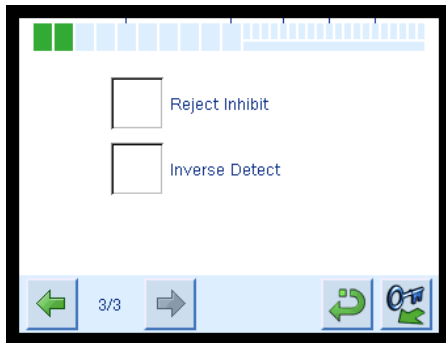


Figure 76:

Reject Inhibit

Enabling **Reject Inhibit** disables the operation of the reject device. The top five red segments on the right side of the bargraph flash to highlight this activation.

To enable/disable Reject Inhibit:

1. Tick the **Reject Inhibit** box to enable the feature, or untick the box to clear the tick and disable the feature.
2. If there are no more changes to be made to this section, press **Return** to return to the User Level 3 menu.

Note: **Reject Inhibit** should not be confused with the **Reject Inhibit (Setup)** feature found on page 112 which temporarily disables the reject device during an Auto Setup.

Inverse Detect

If the Inverse Detect feature is available, usually determined at the time of manufacture or by your service representative, tick the box if the absence of a metal premium, rather than the presence of one, needs to be detected.

Enabling Inverse Detect reverses the action of the reject timer. It rejects any products missing a metal premium but allows products containing a metal premium to pass through.



To use this feature, a pack sensor must be fitted and a gated timer used.

To enable/disable Inverse Detect:

1. Tick the **Inverse Detect** box to enable the feature, or untick the box to clear the tick and disable the feature.
2. If there are no more changes to be made to this section, press **Return** to return to the User Level 3 menu.

5.3.4 Vector Diagrams



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



This section explains the basic function of Vector Diagrams. For a more comprehensive overview on how they operate, see Section 8.4.



Press the **Product Settings** key to view or alter the settings for the current running product. Figure 77 appears.

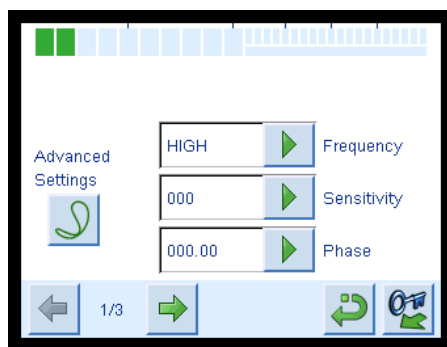


Figure 77:

Vector Diagrams allow experienced users to visualise product signals in conjunction with the product settings. It is particularly useful for fine-tuning wet-product detection settings and for compensating against inconsistency between products, or when there is difficulty obtaining an optimum setting. The display presents a simple, visual representation of the settings so that the operator can better understand the consequences of the changes being made.

The Vector Diagrams display can be enabled or disabled from the Advanced Settings menu (see page 137) and are normally employed after the product has been set up for the metal detector.

With Vector Diagrams enabled, User Level 3 operators will see the Advanced Settings key on the Product Settings screen. Without Vector Diagrams enabled, or if the software version is earlier than F4.2.0, the Advanced Settings key will not be displayed.

Advanced Settings



Press the **Advanced Settings** key to access the Vector Diagrams feature. Screen 1 will appear.



Before you press the Advanced Settings key, make sure that the product has been previously set up as this will establish the correct frequency setting.

Screen 1

The screen that appears will depend on what operating mode has been configured on the metal detector. The two modes are: **Gated Mode** and **Continuous Mode**.

The Gated Mode operating display (Figure 78) will appear when a Pack Sensor is **in** use **AND** the speed setting is Fixed. Gated Mode has two subsidiary modes, **Clear** and **Persist**, and is primarily used for packaged product.

The Continuous Mode operating display (Figure 79) will appear when a Pack Sensor is **not** in use or when the speed setting is Variable. Continuous Mode is primarily used for non-discrete product.

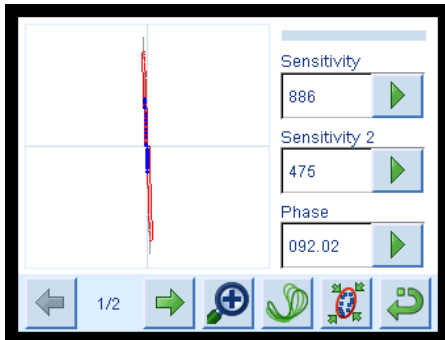


Figure 78: Gated Mode Display Options

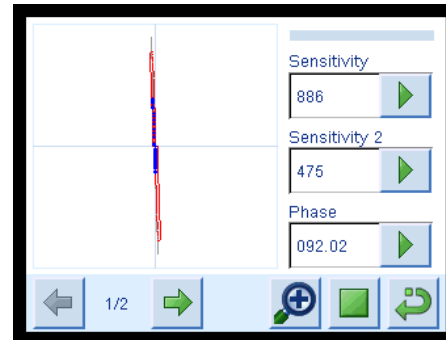


Figure 79: Continuous Mode Display Options

The principles of acquiring a product setting using either Gated Mode or Continuous Mode are very similar, however they utilise different keys in the Navigation Bar.



Refer to Section 8.4 "Vector Diagrams", page 177 for an explanation on how the keys function; to understand the difference between Gated and Continuous Modes, and to adjust the shape of the envelope.

The purpose of any readjustment is to shape the detection envelope by adjusting the Sensitivity, Sensitivity 2 and Phase settings until it approximately surrounds the product signal, as seen in Figure 80.

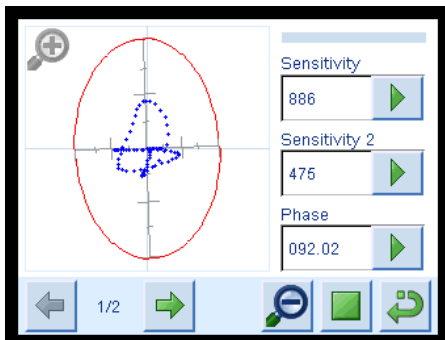


Figure 80:

Screen 2

If Optimised Setup was used to set up the product then Screen 2 (Figure 81) will allow the Phase Tolerance to be adjusted. Adjusting the Phase Tolerance can compensate for any pack-to-pack or temperature drift phase variations that might exist between products as they pass through the aperture.

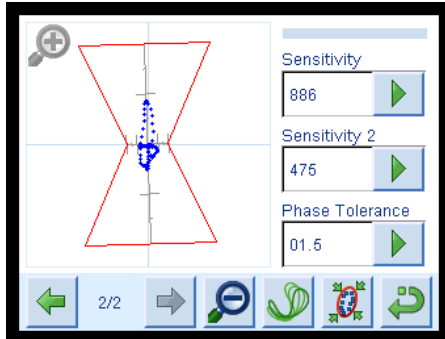


Figure 81:

The Phase Tolerance can be set between 0 and whatever the Phase Tolerance High Limit is set to. This is a value between 1 and 10 and is usually determined at the time of installation.



Refer to page 180 for more information on adjusting the Phase Tolerance.



Selecting the Auto Setup procedure to set up the product will always set the Phase Tolerance to 0.



If the Phase Tolerance High Limit needs to be changed, please contact your local SAFELINE service representative.

5.3.5 Reject Settings

Refer to Section 8.5 of this manual for important information about reject timer settings before adjusting the reject timer parameters.



Press the **Reject Settings** key on the User Level 3 menu to view or alter the reject settings for the current running product.

The screen displayed depends on the type of reject timer that is in use on your detector:

- Immediate or Delayed Reject operation
- Gated Reject operation

To learn how to set the type of Reject Timer, see the System Reject Settings section, on page 103.



The Delayed Reject and Gated Reject timer types will be distance based when a system Speed Sensor has been configured at the Install Level. Under this condition the units, where applicable, will be in pulses instead of time. The screens shown below are for timed operation.

Immediate Reject or Delayed Reject Operation

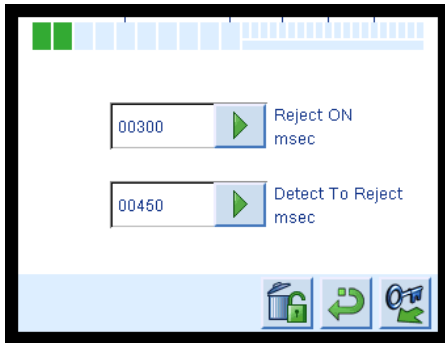


Figure 82:

Overview

You can manually adjust both the **Reject On time** and **Detect To Reject** time.

Procedure

1. Press either the **Reject On time** or the **Detect To Reject** parameter. The screen changes to show the adjustment keys.

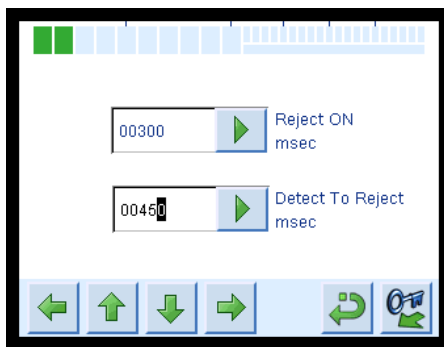


Figure 83:

2. Use the **Arrow** keys to change the timer values.
To avoid incorrect adjustment of the reject timer settings, ensure that the metal test sample (or metal test sample plus product) used is just triggering the detector. To do this, it may be necessary to adjust the detector's sensitivity so that the test sample gives a bargraph reading of approximately 2 to 3 red segments.



If enabled, press the **Unlock Bin** key to unlock the Reject Bin and remove rejected products or test samples.

For Immediate Reject Operation:

- 2.1. Set the **Detect To Reject** value to zero (00000).
- 2.2. Pass the product with the test sample and adjust the **Reject On** time to the required value.
- 2.3. Press the **Confirm** key to store the new settings. Alternatively, press the **Cancel** key to abandon the procedure.

For Delayed Reject Operation:

- 2.4. Pass the product with the test sample and adjust the **Detect To Reject** time to the required value.
- 2.5. Pass the product with the test sample and adjust the **Reject On** time so that the product and test sample is rejected consistently and accurately.



The method used for setting the reject timer parameters is dependent on the type of product being inspected and the reject mechanism used. For a step by step guide to setting up the system for Immediate or Delayed reject operation, refer to Section 8.5 of this manual.

3. Press the **Confirm** key to store the new settings. Alternatively, press the **Cancel** key to abandon the procedure.

Gated Reject Operation

For Gated Reject operation, pressing the **Reject Settings** key starts a semi-automatic routine.

Before starting the routine, you should have a sample of the product to be rejected and an appropriately sized metal test sample. The test sample size should be sufficient to comfortably trigger the detector. Follow the instructions shown on the display.



Figure 84:

Procedure

1. When requested, pass the product through the detector with the test sample at the rear. After several seconds, the Reject On time and Pack To Reject screen will appear, Figure 85.

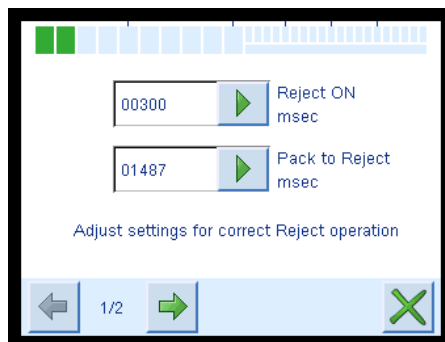


Figure 85:

2. Pass the product with or without a test sample and adjust the **Reject On** time and **Pack To Reject** time by pressing the appropriate parameter.



The initial values of Reject On and Pack To Reject are determined from information entered at the Install Access Level, Section 6.2.



During adjustment of either setting, the red horizontal detect bar will light and the detection buzzer will sound continually.

3. Press the **Right** Arrow Key on the navigation bar, when the settings have been adjusted for correct reject operation, to move to the next screen, Figure 86.



Figure 86:

4. Ensure correct reject operation with the test sample positioned at the front and rear of the product then pass it.
5. Press the **Confirm** key to store the settings. Alternatively, press **Cancel** to abandon the settings and return to the User Level 3 menu.

5.3.6 Product Management



Press the **Product Management** key to display a further menu of product management options.

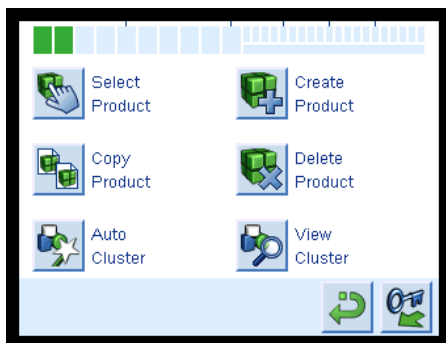


Figure 87:

The **Auto Cluster** option is disabled if only a single product is available. The **View Cluster** option is shown only if a cluster is available to view.

The **Select Product** option operates as described on page 116.

Create Product



Press the **Create Product** key from the **Product Management** menu.

To create a new product

Procedure

1. Press the **Create Product** key.
- On the first screen, the detector offers a default product name using the next available sequential number.

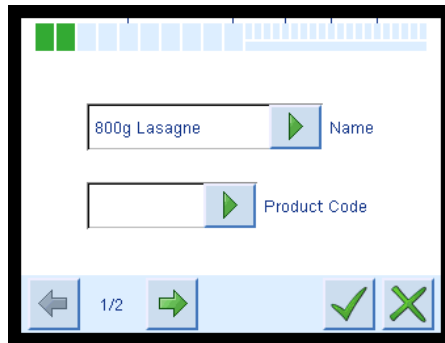


Figure 88:

2. Press the **Name** parameter to edit the default product name.
The alphabetic keypad is displayed for you to edit the product name — the operation, of which, is described in Section 4.9.
3. Enter the name of the product then press **Confirm** to accept it. The previous screen is displayed showing the new name.
4. Press the **Right Arrow** in the navigation bar to move to the next screen, which allows you to set values for the Product Settings and Reject Settings.
The **Auto Setup** option operates as described in Section 5.2.
The **Product Settings** and **Reject Settings** options operate as described earlier in this section. As a starting point, the detector uses the same operating frequency and reject settings as the current running product. This avoids the need for you to adjust frequency if the products have similar product effect characteristics, or the reject settings if the products are of similar size and weight. Note that the frequency will be selected automatically if you run Auto Setup and it has been configured from the Install level for auto frequency selection.

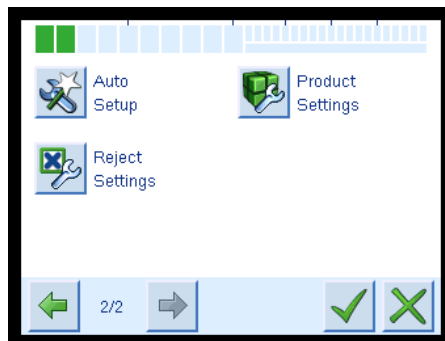


Figure 89:

5. Press **Confirm** to accept the new product when you have entered values for the settings.
When you press **Confirm** to accept the new product, the detector requests that you confirm the action.



Figure 90:

6. Press **Confirm** to store the new product and return to the Product Management menu. Alternatively, press **Cancel** to go back to the relevant screen to make further changes.

Copy Product



Press the **Copy Product** key from the **Product Management** menu.

The Copy Product facility allows you to copy an existing product setting. The facility makes an exact copy of an existing product setting and allows you to enter a new product name. The facility can be useful for manufacturers who produce the same products in different wrapping for different customers and want to specifically identify the products for QA/Performance Validation purposes.

To copy a product

Procedure

1. Press the **Copy Product** key.
- On the first screen, the detector offers a list of the existing products that you can copy. The default (highlighted in the green box) is the current running product, but you can select any other product from the list.
2. Use the **Up** and **Down** Arrow keys to select a product from the list.
3. Press the **Confirm** key to accept the copy and return to the Product Management menu.



Figure 91:



If you wish to rename the product, press the Right Arrow key before pressing the Confirm key to move to the next screen and rename the product. If you don't visit screen 2 to amend the name, the detector automatically assigns the name of the copied product, with a '1' in brackets.

4. Press the **Right** Arrow in the navigation bar to move to the next screen.

When you move to the next screen, the automatically assigned default name is shown in the **Name** field.

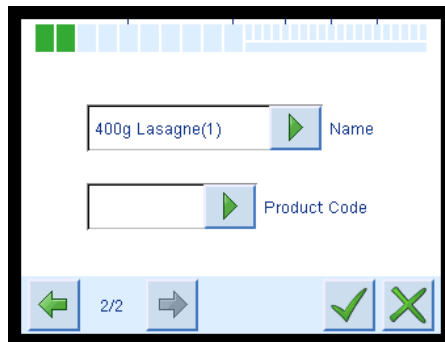


Figure 92:

5. Press the **Name** parameter to alter the default name.
6. Amend the product name when the alphabetic keypad is displayed — the operation, of which, is described in Section 4.9.
7. When you have amended the product name, press **Confirm** to accept the copied product. When you press **Confirm**, the detector requests that you confirm the action as shown in Figure 91.
8. Press **Confirm** to store the product copy. Alternatively, press **Cancel** to go back to the relevant screen to make further changes. If you choose to store the product copy, the detector returns you to the Product Management menu.

Delete Product



Press the **Delete Product** key from the Product Management menu.

The detector offers a list of the existing products that you can delete.

Procedure

To delete a product:

1. Press the **Delete Product** key
2. Use the **Up** and **Down** Arrow keys to select a product from the list. When you press **Confirm** to delete the product, the detector requests that you confirm the action.



Figure 93:

3. Press **Confirm** to delete the product. Alternatively, press **Cancel** to go back to the list and make a different selection. If you choose to remove the product, the detector returns you to the Product Management menu.

Auto Cluster



Press the **Auto Cluster** key from the **Product Management** menu.



The Clustering feature is enabled by default. To enable or disable Clustering, see page 116.



The Auto Cluster option is disabled if only a single product is available.

Clustering allows the inspection of multiple product types without the need to manually switch over product settings. The feature offers ease-of-use functionality for multi-product applications, by providing you with a "change-free" mode of operation.

The auto-clustering process attempts to cluster all previously setup products into the fewest number of clusters. Up to 20 products can be operated in a single cluster. Products operating at different frequencies, with different reject timer types, or below a certain sensitivity setting cannot be clustered together.

To automatically cluster all available products:

Procedure

1. Press the **Auto Cluster** key.
2. If product clusters already exist, the detector displays the message below.



Figure 94:

3. Press **Confirm** to overwrite the existing clusters. Alternatively, press **Cancel** to abandon the Auto Cluster operation and return to the Product Management menu.
4. If there are no existing clusters, or you press **Confirm** to overwrite them, the detector attempts to cluster all products and displays a list showing which product is in which cluster. If a product cannot be clustered, it shows NO in the **Cluster** column.

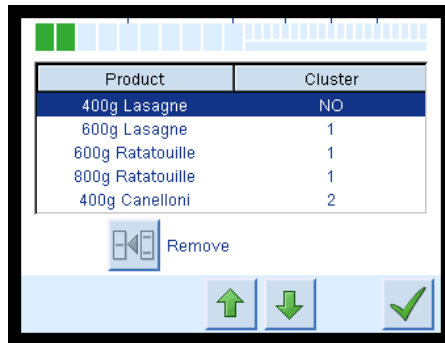


Figure 95:

As a starting point, the detector uses "Cluster n" as the product name description for the cluster, where "n" is the allocated cluster number.

When you create a cluster using the **Auto Cluster** function, the detector automatically makes the newly created cluster the running product. If Auto Cluster creates more than one cluster, the detector makes the first cluster (Cluster No. 1) the running product.

When a cluster is the current running product, the Product Settings key changes to Cluster Settings. This option allows the cluster name to be viewed at User Level 2, and edited at User Level 3.

Any required adjustments to any one of the product's settings within the cluster must be carried out on the individual product settings. You would therefore need to make an individual product the current running product, in order to be able to access the Product Settings option to amend the product details.

View Cluster



Press the **View Cluster** key from the **Product Management** menu.

Note that the View Cluster option is shown only if a cluster is available to view.

The screen displays a list showing all available discrete products, and indicating which cluster they operate in. If a product does not operate in a cluster, it shows NO in the **Cluster** column.

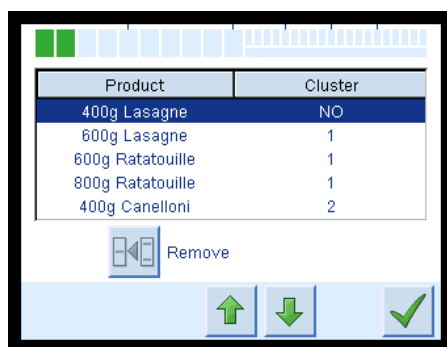


Figure 96:

The Remove Key



The **Remove** key allows you to remove from the cluster any selected product in the list box.

Removing products from a cluster may be a requirement for performance or operational reasons. For example, a product may need to be removed if its signal is proving dominant and affecting performance. When removed, NO is shown in the **Cluster** column for the excluded product.

5.3.7 Cluster Settings



If the current running product is a cluster (rather than a discrete product), the Product Settings menu option on the User Level 3 menu is replaced with the **Cluster Settings** option. Press the Cluster Settings key to view or alter the settings for the current running cluster of products. The Cluster Settings option is only available when the current running product is a cluster.



The Clustering feature is enabled by default. To enable or disable Clustering, see page 116.

Changing the Cluster Name

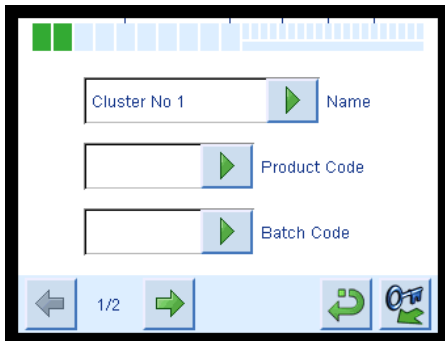


Figure 97:

1. Press the **Name** parameter to edit the cluster name. The alphabetic keypad is displayed for you to edit the product name — the operation, of which, is described in Section 4.9.
2. Enter the name of the cluster then press **Confirm**. The previous screen is displayed showing the new name.



Additional information, such as a Product Code and Batch Code, can be entered to help differentiate between similar products and to make them be traced more easily if there is a need to evaluate previously inspected product.

Cluster Product Code and Batch Code

A Product Code can be a variant of the main product, a barcode or a similarly unique product number and is unique to the current running product.

The Batch Code can be used to name the current batch of products running, and may help isolate when the consignment was originally inspected.

These codes, if entered, will appear with the product name in the Running Mode Display.

To set the Cluster's Product Code or Batch Code:

1. Press the **Product Code** and Batch Code parameters to enter a code.
2. When you have entered the appropriate product name and codes, press the **Right Arrow** key to move onto the next screen, Figure 98.

Reject Inhibit

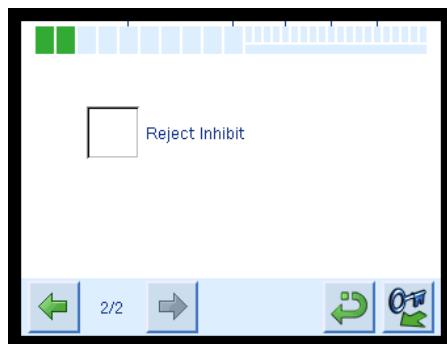


Figure 98:

Enabling Reject Inhibit disables the operation of the reject device. The top five red segments on the right side of the bargraph flash to highlight this activation.

To enable/disable Reject Inhibit:

1. Tick the **Reject Inhibit** box to enable the feature, or untick the box to clear the tick and disable the feature.
2. Press the **Return** key to return to the User Level 3 menu.

5.3.8 QA



Press the **QA** key to access the QA test mode.

From here, User Level 3 operators can run Performance Tests, as described in Section 5.2, and print QA reports.

See Chapter 7 for further details on setting up and running performance tests.

5.3.9 Unlock Bin



Refer to the Unlock Bin description on page 80.

6 Install Level Operating Instructions

This chapter explains how you set up the operational parameters that control the way your metal detector will be used. You do this using the options available from Install Settings and the Advanced Settings menu.

SECTION	TITLE	PAGE
6.1	Install Level	100
6.2	Install Settings	100
6.3	Advanced Settings	110
6.4	Options Installed	142

6.1 Install Level



The Install Level default access code is 999999. For additional information on entering pass codes, see page 69.

When you enter a pass code that gives access to the Install Level functions, the screen displays the Install Level menu.

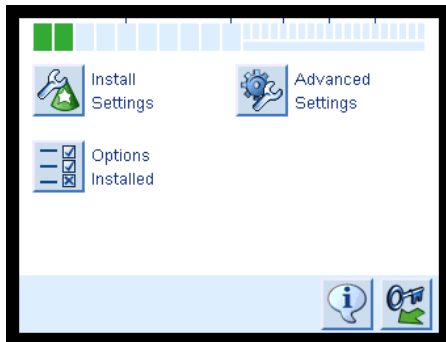


Figure 99:

Press the **Install Settings** key to access a series of screens covering the main operational parameters for the detector. Use this wizard when installing the metal detector for the first time.

Press the **Advanced Settings** key to access a further menu of advanced settings and administrative functions. These are described in Section 6.3.

Press the **Options Installed** key to access the section that allows software options to be configured. These are described in Section 6.4.



We strongly recommend that you select the Save Installer Settings option (from the Advanced Settings menu, see Section 6.3) as soon as you have installed your detector. This allows the metal detector to be restored to a known state in the event of any future problems.

6.2 Install Settings

When you press the **Install Settings** key on the Install Level menu, the screen displays the first of seven installation screens.

Figure 100 gives an overview about the structure of the Install Settings menu. To navigate from one page to the next, press the **Left** and **Right** Arrows. Alternatively, press **Return** to return to the Install Level menu.

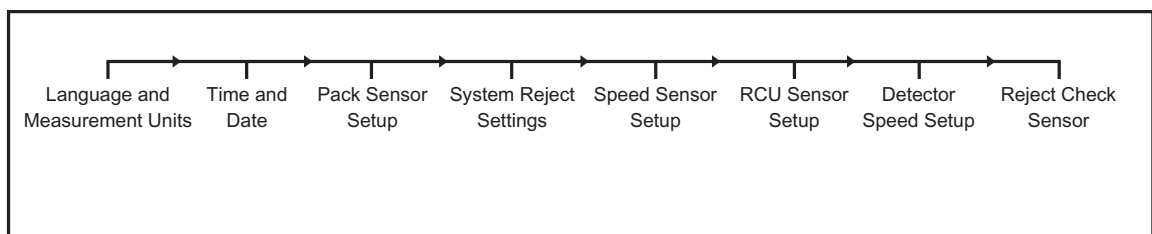


Figure 100:

NOTICE!

The Reject Check Sensor screen only appears if the Pack Sensor feature is enabled in this section.

6.2.1 Language and Measurement Units



When you press the **Install Settings** key on the Install Level menu, the screen displays the below screen.

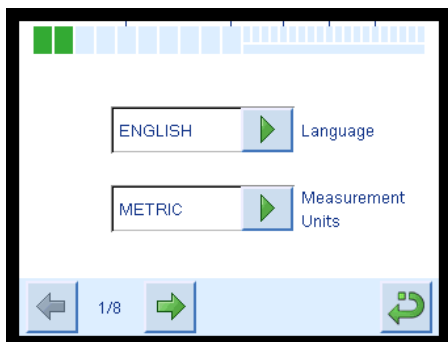


Figure 101:

1. Press the **Language** parameter to select the default language for the screens and messages.
The languages available are: English, German, Dutch, French, Spanish, Italian, Polish, Danish, Swedish, Norwegian, Czech, Portuguese (BR), Finnish, Turkish, Russian, Simplified Chinese, Traditional Chinese, Thai, Korean, Serbian, Japanese, Vietnamese, Croatian, Indonesian and Hungarian.
Note: Additional languages are constantly being supported.
If required, the language can be personalised for each user whilst they are logged in. See "Access Account Management", page 130, for more information.
2. Press the **Measurement Units** parameter to select Metric or Imperial units for the User Interface measurement units.

6.2.2 Time and Date

When you press the **Right Arrow** key on the Language and Measurements screen, Figure 102 is displayed.

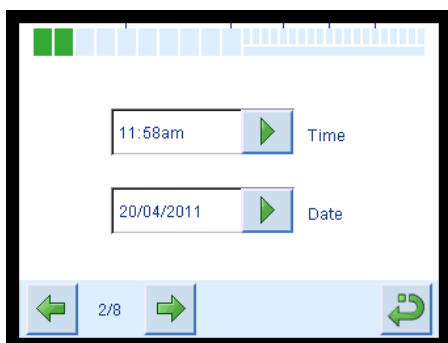


Figure 102:

1. Press the **Time** parameter to set the current time.
2. Press the **Date** parameter to set the current date.

Note: You can also set the time and date using the Date and Time option on the Advanced Settings menu, which also allows you to choose the date format, and to select 24 hour clock times. See page 136 for more information.

6.2.3 Pack Sensor Setup

When you press the **Right Arrow** key on the Time and Date screen, the Pack Sensor Setup screen is displayed so that you can specify and set up a pack sensor.

When fitted, the detector can use the pack sensor for gated reject timers, counting packs and signal processing synchronisation. The pack sensor must always be fitted on the conveyor belt on the in-feed side of the detector, for example the side through which the product enters the aperture.

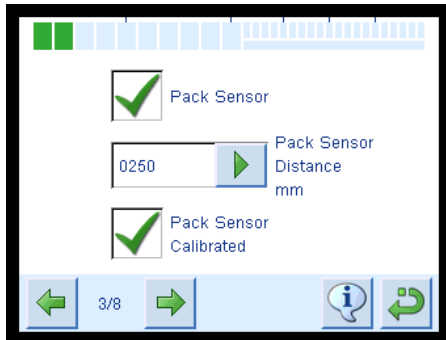


Figure 103:

Procedure

To set up the Pack Sensor:

1. Tick the **Pack Sensor** box to specify that a pack sensor is present on your metal detector system. For correct Pack Sensor operation, you must select the **Pack Sensor Calibrated** box to force the detector to run an automatic calibration routine, as described below.

If the timer settings have already been set up on your detector and you subsequently uncheck the Pack Sensor box, the screen displays a warning to tell you that the timer settings will be lost.



If the Pack Sensor box is not ticked the additional settings are not shown.

2. Press **Confirm** to proceed, or press **Cancel** to return to the previous screen and leave the settings intact.
3. Press the **Pack Sensor Distance** parameter to set the distance between the centre of the pack sensor and the in-feed side of the detector. This distance is used for initial reject settings and signal processing.

Press the **Information** key to display a diagram showing details of measuring the Pack Sensor distance. See Figure 104.

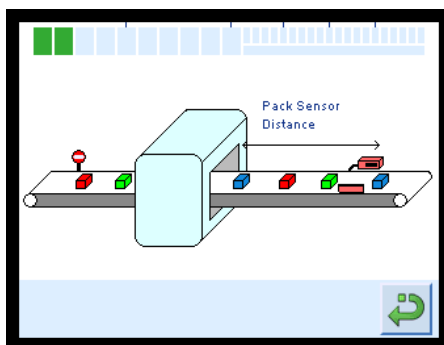


Figure 104:

4. Tick the **Pack Sensor Calibrated** box to start an automatic calibration routine. Follow the onscreen instructions to calibrate the pack sensor.



Figure 105:

When the calibration routine has been completed, the screen message informs you that the calibration was successful and the display reverts to the Pack Sensor Setup screen.

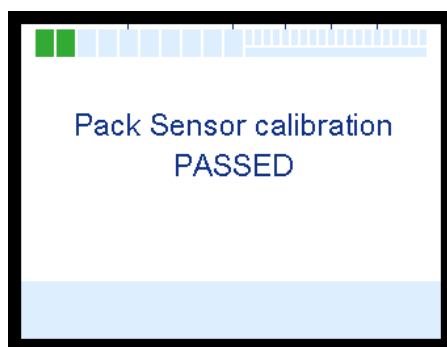


Figure 106:



If the detector does not see a change in the sensor state or if the signal is unstable, the message **Pack Sensor Calibration FAILED** will be displayed and the tick box will not be selected on return to the Pack Sensor Setup screen.

6.2.4 System Reject Settings

Refer to Section 8.5 of this manual for important information about reject timer settings before adjusting the reject timer parameters.



This section also influences the actions in the Reject Settings section, page 87.

When you press the **Right Arrow** key on the Pack Sensor Setup screen, the System Reject Settings screen is displayed.

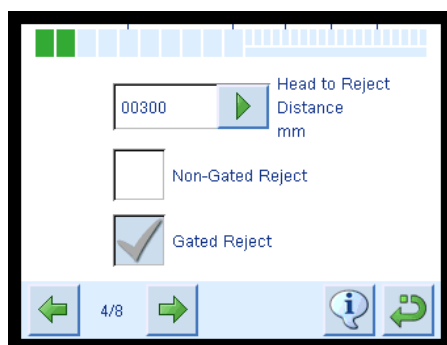


Figure 107:

Procedure

To set up the System Reject Settings:

1. Press the **Head to Reject Distance** parameter to set the distance between the reject device and the out-feed face of the detector. This distance is used for initial reject settings.

Press the **Information** key to display a diagram that shows details of measuring the Head to Reject distance. See Figure 108.

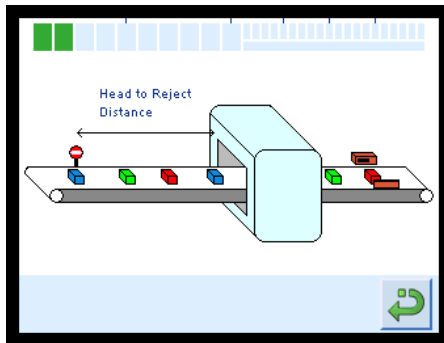


Figure 108:

2. Tick either or both of the **Non-Gated Reject** or **Gated Reject** boxes. The detector allows for the presence of both gated and non-gated reject systems.

The **Non-Gated Reject** box will specify that a non-gated reject system is to be used on your detector.

The **Gated Reject** box will specify that a gated reject system is to be used on your detector. This option is available only if a Pack Sensor is present.



If the timer settings have already been set up on the detector and either of the gated or non-gated reject tick boxes are unticked, the screen displays a warning to tell you that the timer settings will be lost.

3. Press **Confirm** to proceed, or press **Cancel** to return to the previous screen and leave the settings intact.

6.2.5 Speed Sensor Setup

When you press the **Right Arrow** key on the System Reject Settings screen, the Speed Sensor Setup screen is displayed so that you can specify and set up a speed sensor. For details on setting up a speed sensor, see Section 13.2.

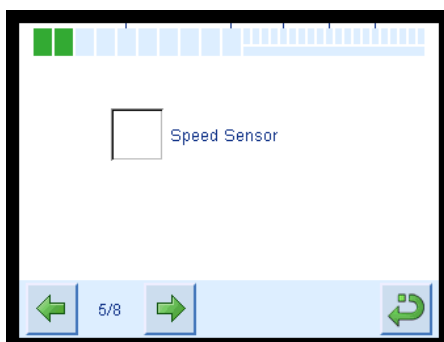


Figure 109:

Procedure

To set up the Speed Sensor:

1. Tick the **Speed Sensor** box to specify that the product transport system uses a rotary encoder, to provide the detector with digital clock pulses relating to its speed and distance travelled.

If timer settings have already been set up on your detector and you subsequently untick the Speed Sensor box, the screen displays a caution to tell you that the timer mode will change and any previous settings will be lost.

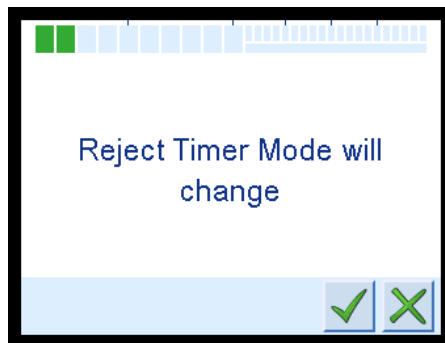


Figure 110:

2. Press **Confirm** to proceed with deselecting the option and losing the timer settings. Alternatively, press **Cancel** to go back to the previous screen and leave the Speed Sensor tick box in its selected state.

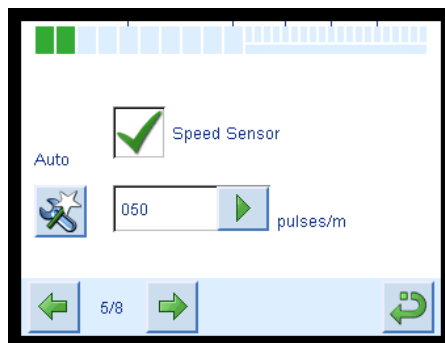


Figure 111:

3. Press the **pulses/m** parameter to set the number of pulses per unit distance or the Auto key to start an automatic speed measurement routine.

6.2.6 RCU Sensor Setup



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

When you press the **Right** Arrow key on the Speed Sensor Setup screen, Figure 112 is displayed so that you can specify and set up the Reject Confirmation Unit sensor.

Refer to Section 8.6 for important information about the RCU settings before adjusting RCU sensor parameters.

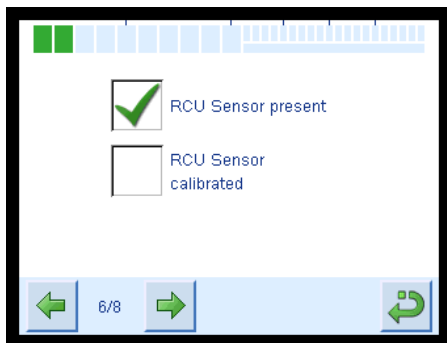


Figure 112:

To setup the RCU Sensor:

Procedure

1. Tick the **RCU Sensor Present** box to specify that a Reject Confirmation Unit sensor is present on your detector.
2. Tick the **RCU Sensor Calibrated** box to run the RCU Sensor Calibration routine.

The screen messages inform you of the calibration process. During the calibration process, the detector inhibits the reject device to ensure that the reject confirmation sensor is in its normal running (non-rejecting) state.



Figure 113:

- When the calibration routine has been completed, the screen message informs you if the calibration was successful. The display then reverts to the previous screen and the **RCU Extension Time** is revealed. This time period determines how long the detector must wait from releasing the reject device to receiving a signal from the RCU sensor that confirms the reject mechanism has correctly operated or that product has been successfully rejected. If no signal is received within this time period, the RCU will alarm.

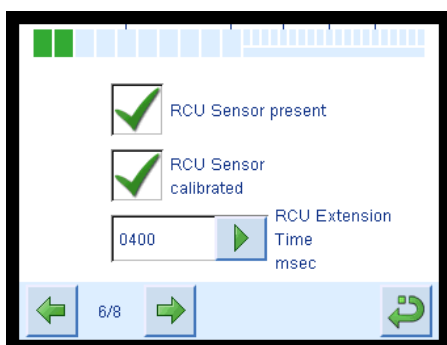


Figure 114:

6.2.7 Detector Speed Setup

When you press the **Right Arrow** key on the RCU Setup screen, Figure 115 is displayed so that you can specify the detector speed range.

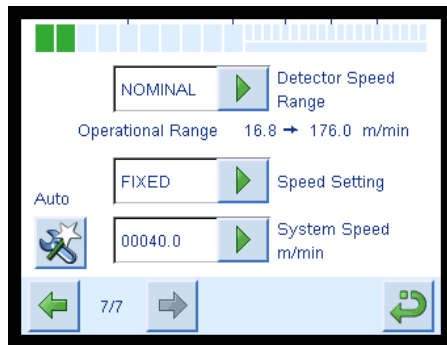


Figure 115:

To configure the Detector Speed:

1. Set the **Detector Speed Range** parameter. The options include:
 - LOW
 - NOMINAL
 - HIGH
2. Set the **Speed Setting** parameter. The options include:
 - FIXED
 - VARIABLE
3. Set the **Speed** parameter. The parameter that appears will depend upon what was set for the Speed Setting.
4. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Install Settings menu.

Detector Speed Range

The Detector Speed Range is the potential through-put speed of the product as it passes through the detector. The NOMINAL setting should usually be suitable for most purposes. The Operational Speed for each range is shown below the parameter box.

Procedure

To set the Detector Speed Range:

1. Press the **Detector Speed Range** parameter and use the arrows to set the speed range to **LOW**, **NOMINAL** or **HIGH**.
2. Press the **Confirm Selection** to continue.

Speed Setting

The Speed Setting is the actual through-put speed of the product, and can be determined below.

Fixed

The FIXED option is used to determine the System Speed, and should be used for applications where the speed is required to be constant.

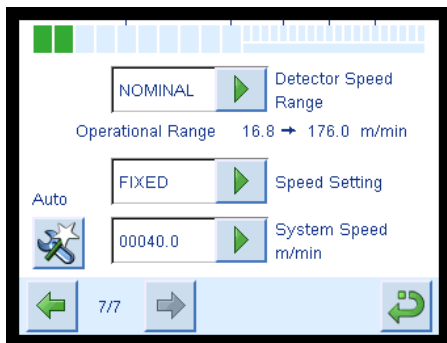


Figure 116:

Procedure**To set the Speed Setting:**

1. Press the **Speed Setting** parameter and use the arrows to set the speed to **FIXED**.
2. Press the **Confirm Selection** to continue.

Procedure**To set the System Speed:**

1. Press either the **System Speed** parameter to set the actual speed or the  key to start an automatic speed measurement routine.

Before starting the routine, you should have a metal test sample ready to pass through the detector. The test sample size should be sufficient to be comfortably detected.

When you run the automatic speed measurement routine, Figure 117 will appear; after which, you will be prompted to perform a series of actions to measure the system speed.



Figure 117:

When the measurement is complete, the screen displays a message to inform you before returning to the Detector Speed Range screen.

Variable

The VARIABLE option is used to determine the Typical Speed, and should be used for applications where the speed is unknown or the variation exceeds 50% of nominal speed.

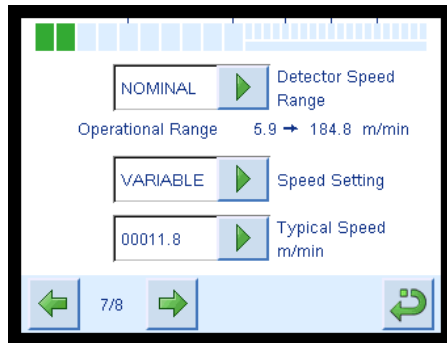


Figure 118:

Procedure**To set the Speed Setting:**

1. Press the **Speed Setting** parameter and use the arrows to set the speed to **VARIABLE**.
2. Press the **Confirm Selection** to continue.

Procedure**To set the Typical Speed:**

1. Press either the **Typical Speed** parameter to set the Typical Speed.
2. Press the **Confirm Selection** to continue.

6.2.8 Reject Check Sensor



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

When you press the **Right** Arrow key on the Detector Speed Setup screen, the Reject Check Sensor screen is displayed.

The Reject Check Sensor provides early notification that a contaminated pack has not been successfully rejected and prevents it from continuing down the line. If a contaminated pack is detected by the metal detector and correctly rejected, the Reject Check Sensor will not generate an alert. However, if the contaminated pack is not properly rejected then an alert will be produced as it passes the Reject Check Sensor.

Furthermore, as the Reject Check Sensor is synchronised with the Pack Sensor, the Reject Check Sensor will generate an alarm if the Pack Sensor stops working and fails to detect any packs passing through its aperture.

For the Reject Check Sensor to work, the pack needs to pass the Pack Sensor before it passes through the metal detector. The Reject Check Sensor screen establishes the relationship between the Pack Sensor and the Reject Check Sensor, and only appears if the Pack Sensor feature was enabled and calibrated on Screen 3.

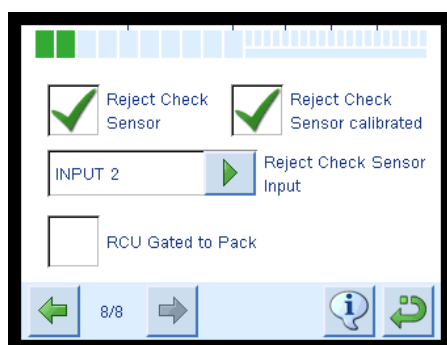


Figure 119:



If a speed sensor is used, the distance between the Pack Sensor and the Reject Check Sensor will be measured in pulses. Alternatively, if no speed sensor is used, the distance between the two sensors will be timed.



If you press the **Information** key, a diagram of the Pack Sensor and the Reject Check Sensor fitted on the conveyor belt is shown for several seconds.

To set up the Reject Check Sensor:

Procedure

1. Ensure that a Pack Sensor is installed and calibrated.
2. Make sure that the Gated Reject setting is enabled on the System Reject Settings screen, page 103.
3. Ensure that the Reject Check Sensor is installed and positioned on the conveyor belt, just beyond the Reject Confirmation Sensor.
4. Tick the **Reject Check Sensor** box, as shown in Figure 119. The Reject Check Sensor Input parameter and the Reject Check Sensor Calibrated tick box will appear.
5. Press the **Reject Check Sensor Input** parameter then select the input to which the sensor is wired.
6. Tick the **Reject Check Sensor Calibrated** box then follow the on-screen instructions to calibrate the sensor.

The Reject Check Sensor Calibrated tick box is greyed out until the Reject Check Sensor Input has been allocated. If no input is available, the calibration option shall be inactive. Once allocated, the input should not be changed. If it is changed, the calibration tick box should be unchecked and calibration should be performed again.

RCU Gated to Pack

This feature is only applicable to gated systems where a Reject Check Sensor and a Speed Sensor are installed.

The Reject Confirmation Unit can be set up to react only when the detection event is confirmed to be associated to a contaminated pack. If there is no activity at the Pack Sensor and a detection event occurs, the RCU can be inhibited to nullify the false detection.

By enabling this feature, the failsafe nature of the system becomes reliant on the correct functioning of the Pack Sensor. If the Pack Sensor fails or has been setup incorrectly, the detector will not be able to track any product passing through its aperture and the RCU will either be deactivated or unsynchronised with the pack — potentially allowing contaminated products to flow down the line. Subsequently, if this feature is required, it is mandatory that a Reject Check Sensor is fitted in order to facilitate ongoing testing of the Pack Sensor by the Reject Check Sensor and vice versa.



SAFELINE recommends that for the maximum failsafe coverage, the RCU Gated to Pack box should be unticked. However, if this feature is enabled, please ensure that an appropriate risk assessment has been conducted prior to commencement.

Tick the **RCU Gated to Pack** box to enable this feature.

6.3 Advanced Settings



When you press the **Advanced Settings** key on the Install Level menu, you gain access to the Advanced Settings menu.

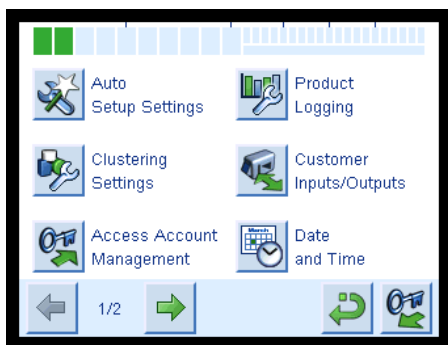


Figure 120:

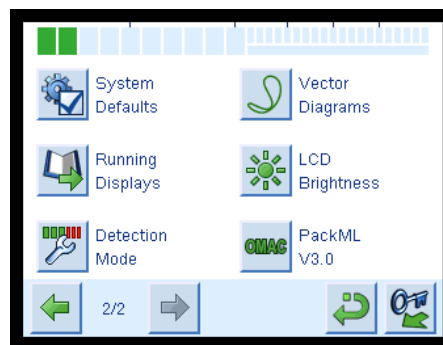


Figure 121:

The Advanced Settings menu has two screens to navigate. Note that some of the options contain sub-sections. Figure 122 gives an overview about the structure of the Advanced Settings menu and its sub-sections.

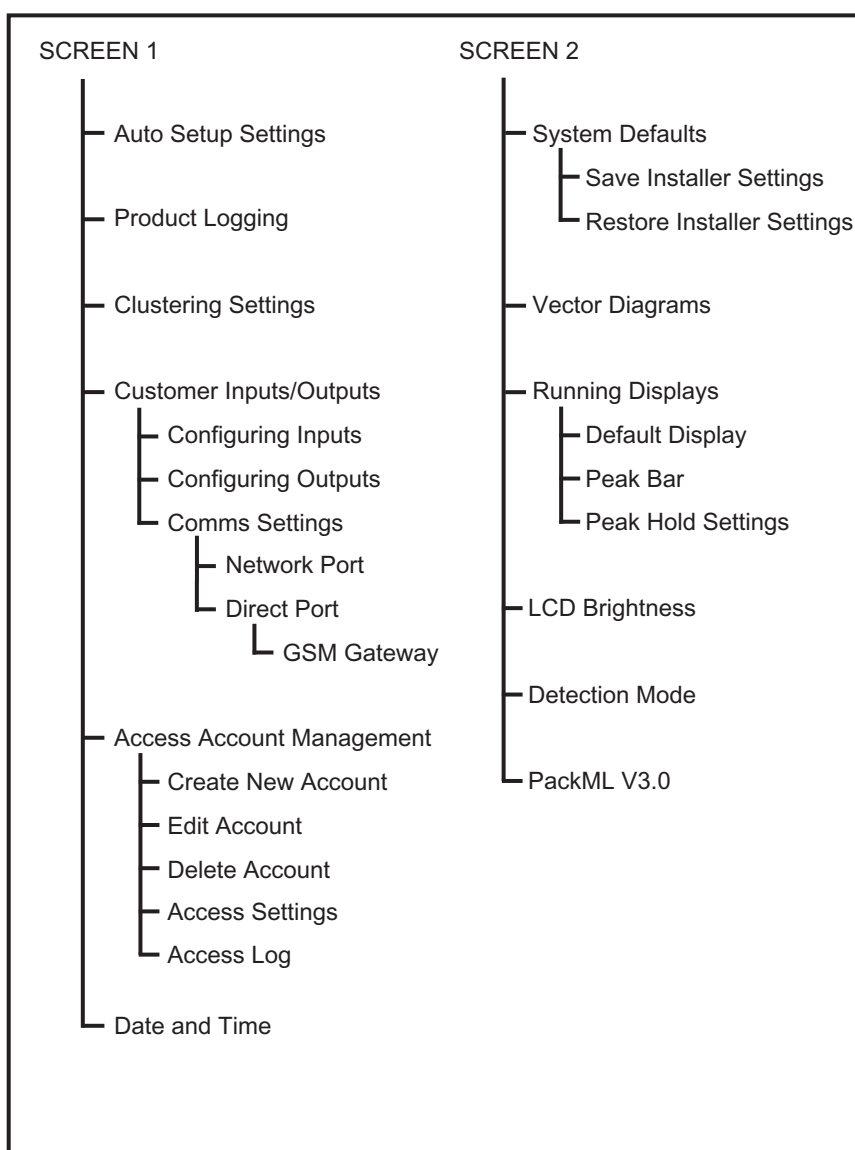


Figure 122: Advanced Settings Overview

6.3.1 Auto Setup Settings



Press the **Auto Setup Settings** key to view or alter the settings for the automatic product setup routine. Screen 1 will appear, Figure 123.

Screen 1



Figure 123:

Auto Setup Level

Press the **Auto Setup Level** parameter to alter the target signal level (in number of bargraph segments) which the Auto Setup and Optimised Setup will endeavour to setup to.

Auto Freq Selection

Tick the **Auto Freq Selection** box to enable the detector to automatically select the optimum frequency during Auto Setup. If unselected, the Auto Setup will endeavour to setup at the currently selected frequency.



The **Auto Freq Selection** feature does not apply when an Optimised Setup is performed since it is assumed that the product being optimised already exists on the metal detector.

Reject Inhibit (Setup)

The **Reject Inhibit (Setup)** feature is enabled by default which means that, during either an Auto Setup or an Optimised Setup, the reject mechanism will be temporarily inhibited and will not operate. This ensures that no products are unnecessarily rejected during the setup.

However, if an Optimised Setup is performed on a 'live' production line it is advisable to disable the **Reject Inhibit (Setup)** feature so that any contaminated products can be rejected. It is assumed that the product being optimised already exists on the metal detector.



As a general rule, **Reject Inhibit (Setup)** should be utilised in the following way:

- Auto Setup when the product line is not live: **Enabled**
- Optimised Setup when the product line is not live: **Enabled**
- Optimised Setup when the product line is live: **Disabled**



When an Optimised Setup is performed, the new product will pass through the aperture while the metal detector is still configured with the existing settings. The new settings will then take precedence once they have been established by the Optimised Setup. If the **Reject Inhibit (Setup)** feature is enabled, it is advisable to re-test any product that may have passed through the metal detector against the new settings.

With **Reject Inhibit (Setup)** enabled, the top five red segments on the right side of the bargraph will flash during the Setup to highlight this activation.

Reject Inhibit (Setup) should not be confused with the **Reject Inhibit** feature found on page 84 which disables the reject device for as long as the feature is enabled.

If required, untick the **Reject Inhibit (Setup)** box to clear and disable the feature.

Screen 2

Figure 124 is displayed and allows you to optimise the Auto Setup for Stainless Steel. Note that this screen only appears if **Auto Freq Selection** is selected on the previous screen. If Auto Freq Selection is not selected, screen 3/3 is shown as screen 2/2. The settings on this screen help the Auto Setup routine choose the best operating frequency for the type of product being inspected.

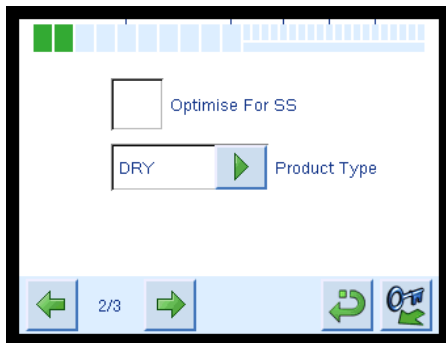


Figure 124:

Tick the **Optimise For SS** box to allow the detector to choose an operating frequency to optimise Stainless Steel performance. Leave the box unticked to allow the detector to choose an operating frequency to optimise overall performance for Non-Ferrous and Ferrous materials.

Press the **Product Type** parameter to select the more appropriate product effect description to suit the types of products being inspected. The options are **DRY** and **WET**.



The DRY Product Type can be used successfully for many WET product applications where the product composition is homogeneous in nature such as sauces, cheese, and some (see below) metallised film wrapped products. The WET option is designed to achieve a setup that will give moderate to good performance while allowing some tolerance for product signal variability. This is intended for products whose composition is more varied such as meats, ready meals and some (see below) metallised film wrapped products.



WET products are conductive and when passed through the detector can generate a signal in the same way as a metal particle. WET products may be conductive due to their composition of moisture, salt, natural acids or conductive additives. Typical wet products are meats, soups, sauces, etc.

DRY products are non-conductive and therefore when passed through the detector generate little or no signal. DRY products generally contain no moisture or conductive additives such as iron. Typical dry products are rice, pasta, powdered soups, cereals, etc.

Product packaging, such as metallised film, is conductive and generally falls under the WET product category. However the DRY product category can be used for some metallised film wrap applications with one or more of following attributes; where the product passing through the detector aperture is small relative to the aperture size, or the metallised film is thin, or the package seams are slight and/or consistent.

Screen 3

Figure 125 is displayed and allows you to adjust the detector's Sensitivity Limit (Sens Limit) for each operating frequency. The screen shown is for a three frequency (3f) unit.



The values are used by Auto Setup to help distinguish between vibration and genuine product signals and to help ensure that finalised product settings give optimum sensitivity performance that is not unduly affected by system vibration.

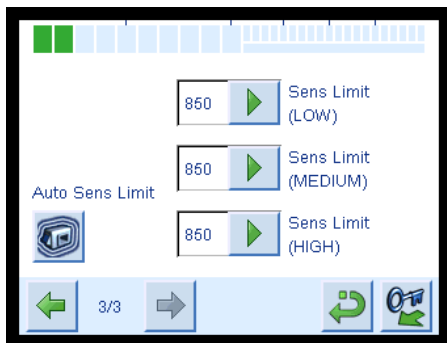


Figure 125:

Set the Sens Limit. There are two ways to do this: **Manually** or **Automatically** (preferred method).



The Detector Speed Range, page 107, must be set prior to manual or automatic setting of the Sensitivity Limits.



When adjusting the Sensitivity Limits manually or automatically, ensure that all mechanical and electrical equipment that may be a source of vibration is operating, including the product transport system and, where possible, the reject device.



When setting the Sens Limit values manually, the values may need reducing in situations where the detector is subject to high vibration.

Procedure

Set the Sens Limit manually:

1. Press the **LOW**, **MEDIUM** and **HIGH Sens Limit** parameters and use the Arrows to adjust the sensitivity limit established by the Auto Setup routine.
2. Press **Confirm Selection** to continue.

Procedure

Set the Sens Limit automatically (preferred method):

1. Press the **Auto Sens Limit** key to run the automatic routine to measure system vibration and set an appropriate Sens Limit for each frequency.
2. Press the **Return** key to return to the Advanced Settings menu.

6.3.2 Product Logging



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Press the **Product Logging** key to view or alter the settings for the product logging histograms. The histograms are a useful tool for monitoring any long and short time movement in the running products phase and amplitude. The histograms can be viewed in the Running Mode Displays, after the user has logged out.



Figure 126:

Procedure

1. Tick the **Product Logging** box to enable Product Logging histograms to be displayed in the Running Mode displays. The controls on this screen set the rate at which product amplitude and phase samples are collected. The samples may be time-based or pack-based.
For pack-based sampling, a Pack Sensor must be fitted and the Detector Speed must be **FIXED**. Refer to page 102 and page 107 respectively. If this is not the case, the Sample Rate field is disabled and time-based sampling must be used.
2. Press the **Sample Time** or **Sample Rate** parameter to alter the setting, then press the **Confirm** key.
3. Press the **Right** Arrow to go to the next screen.

Figure 127 is displayed and allows you to enable the Phase histogram and view it in the Running Mode displays. The phase histogram is useful for product effect applications. The controls on this screen set the data bin size for the phase. The smaller the bin sizes the higher the histogram resolution.

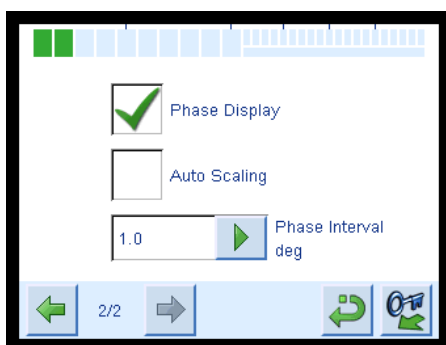


Figure 127:

4. Tick the **Phase Display** box to enable this histogram.
Tick the **Auto Scaling** box to enable automatic scaling of the histogram (in which case, the Phase Interval parameter is disabled). Alternatively, you can leave the **Auto Scaling** box unticked and specify the Phase Interval degrees manually.
5. Press the **Return** key to return to the Advanced Settings menu.

6.3.3 Clustering Settings



Press the **Clustering Settings** key to enable or disable the product clustering facility. This setting determines whether the cluster options will be displayed on the User Level menus.

Clustering can be useful if you want to inspect a number of different products that have similar product effect characteristics. All the similar products can be grouped in a cluster, thus removing the need to change the selected product when switching between products that are in the same cluster.

If your products are significantly different, or if you rarely need to change the running product during operation you can disable clustering. This removes all the clustering options from the menu displays.

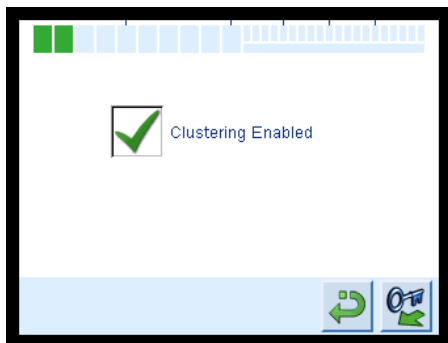


Figure 128:

1. Tick the **Clustering Enabled** box to enable the product clustering facility.
2. Press the **Return** key to return to the Advanced Settings menu.

6.3.4 Customer Inputs/Outputs



Press the **Customer Inputs/Outputs** key to view or alter the detector's Inputs, Outputs and Comms Settings.

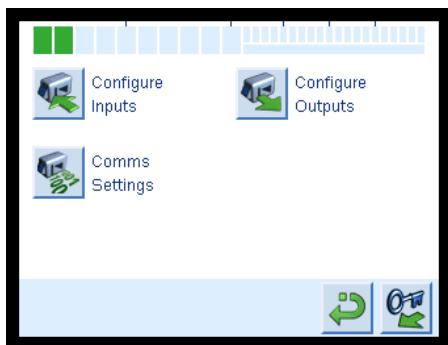


Figure 129:

Configuring Inputs



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Press the **Configure Inputs** key to display the Input Configuration selection screen. Note that the **Inputs** are unallocated by default.

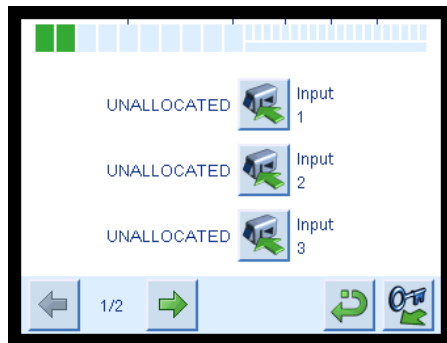


Figure 130:

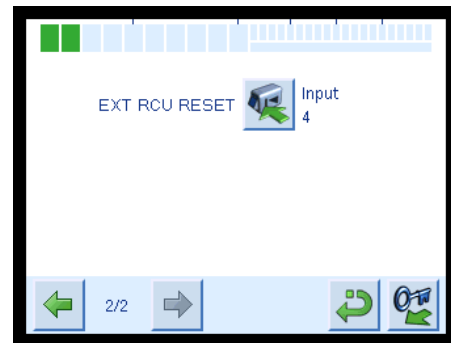


Figure 131:

Procedure

1. Select the **Input** parameter to be configured. Selecting any of the four inputs displays the following screen.

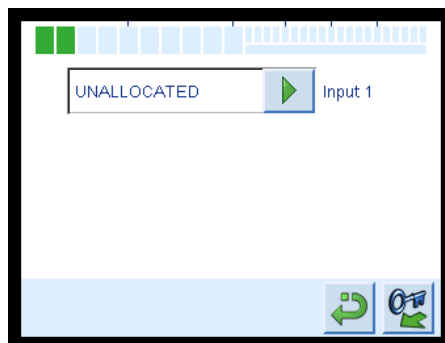


Figure 132:

2. Press the **Input** parameter key to select the input function.
3. Use the **Up** and **Down** Arrow keys to highlight the input function.
4. Press **Confirm Selection** to accept the selection.
5. Press **Return** to return to the **Configure Inputs** screen.

Note: For more information on the input functions available, refer to Table 43 and Table 44. Please note that some functions have additional screens that require configuring.

The following Input Functions can be selected:

INPUT FUNCTION DEFINITIONS	EXPLANATION
Unallocated	Not currently used.
Air Fail	This input signal is used to detect when the Air Line supplying the reject mechanism has failed. Additional configurable information: Activate Fault Relay. For more details, see Table 44.
Bin Unlocked	This input signal is used to detect if the Reject Bin is unlocked or open for longer than it should be. It ensures that rejected products cannot be removed from the reject bin by unauthorised employees or fed back into production. Additional configurable information: Bin Open Time and Activate Fault Relay. For more details, see Table 44.
Conveyor Running	This input signal is used when an external conveyor reports a running/stopped status to the metal detector. Upon receipt of this, any mechanism, such as the reject timer, is halted and then restarted when the conveyor signals that it is running again. All products between the metal detector's in-feed pack sensor and the reject mechanism should be removed by the customer.
Custom	This option enables the input to be fully customised for a device, including any text displayed on the screen. Additional configurable information: Custom Text and Activate Fault Relay. For more details, see Table 44.
Detector Disable	This input signal may be used when metallised products are known to be passing through the metal detector. The metal detector shall not reject any product whilst this signal is active.
Ext RCU Reset	The External RCU Reset Input (defaulted to Input 4) is used to connect a reset device to the detector, to clear an alert.
RCU Ext Clock	Whilst this option cannot be selected, if a RCU is enabled, Input 1 will be automatically be set to show RCU Ext Clock.
Key Lock Switch	This input can be used to Lock or Unlock access to the User Interface. If the Key Switch has been enabled whilst the user is logged into a secure access menu, the user shall be automatically logged out.
Prod/Cluster Change	This input signal is used when the end user wants to change the Product/Cluster remotely, perhaps by using a switch. For this function there is the option to configure two inputs, allowing the user to set up and switch between four Products/Clusters. The Product/Cluster change has to take place soon after the signal has changed. Dead time is configurable to allow signal stabilisation on both inputs. Additional configurable information: Dead Time. For more details, see Table 44.

INPUT FUNCTION DEFINITIONS	EXPLANATION
Reject Bin Full	This input signal is used to detect when the Reject Bin becomes full. The duration for the signal to Latch (Dead Time) is configurable, with the default set to 10 seconds. This allows products, which are long or do not transfer easily from the conveyor, enough time to pass the Bin Full sensor before entering the Reject Bin. Additional configurable information: Activate Fault Relay and Dead Time. For more details, see Table 44.
Remote Reject Inhibit	This input signal invokes the same action as selecting Reject Inhibit from the User Interface.
Sensor Warning	This input signal may be used if any of the light sensors installed on the conveyor system have a built-in, contamination-signalling alarm output. This type of sensor has an early warning feature to indicate that the optimum light reception is no longer guaranteed. Multiple sensor alarm outputs may be, depending on the sensor's design, connected in parallel to this input. Additional configurable information: Activate Fault Relay. For more details, see Table 44

Table 43:

INPUT FUNCTION-SPECIFIC DEFINITIONS	EXPLANATION
Bin Open Time	This is the period of time that the Reject Bin may be open or unlocked before a warning is displayed.
Activate Fault Relay	This feature should be enabled if a mechanism needs to be activated or deactivated upon the input being triggered. For example, the Fault Relay can be wired into the conveyor mechanism so that, when the Air Fail alert is triggered, the belt will halt.
Dead Time	This is the period of time when activity on the input is ignored. This allows time for signals to stabilise, as in Product/Cluster change and Reject Bin Full functions.

Table 44:

Configuring Outputs



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Press the **Configure Outputs** key to display the Output Function selection screen. Note that the **Outputs** are usually unallocated by default.

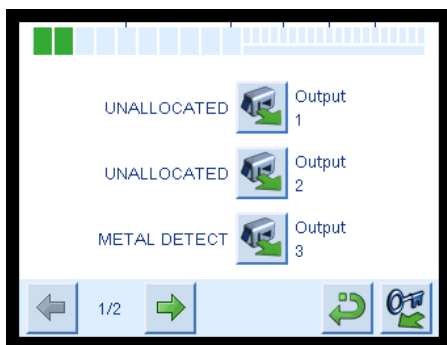


Figure 133:

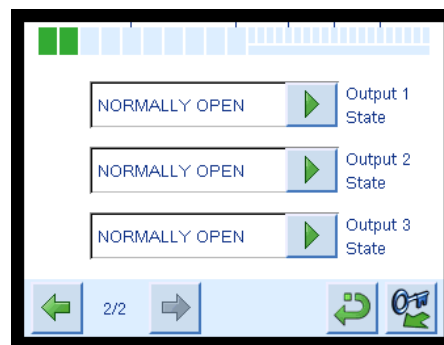


Figure 134:

The first screen allows a programmable output to be assigned a particular function. The **Output State** keys on the next screen sets the voltage-free contact state to Normally Open or Normally Closed and applies to **Output 1**, **Output 2** and **Output 3**.

NOTICE!

If fail safe operation is a requirement under a power failure/removal condition, set the Output State to Normally Closed operation.

To set the Output:

Procedure

1. Select the Output parameter to be configured. Selecting any of the three outputs will display the following screen.

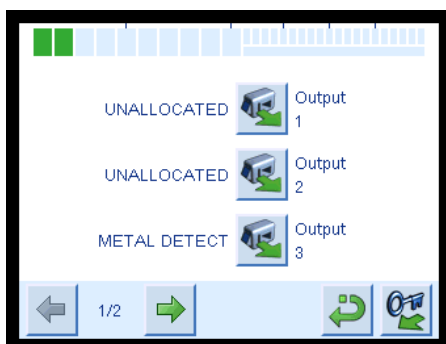


Figure 135:

2. Press the **Output** parameter key to select the output function.
3. Use the **Up** and **Down** Arrow keys to highlight the output function.
4. Press **Confirm Selection** to accept the selection.
5. Press the **Right** Arrow to go to the next screen if you need to change the Output State.
6. Press **Return** to return to the **Configure Outputs** screen.

Note: For more information on the output functions available, refer to Table 46 and Table 48. Note that some functions have additional screens that require configuring.

The following Output Functions can be selected:

OUTPUT FUNCTION DEFINITIONS	EXPLANATION
Unallocated	Not currently used.
Air Fail	This output is made available if the Air Fail feature is configured as an input. It is used to activate a device, such as a light, indicating that the Air Line supplying the reject mechanism has failed. Additional configurable information: Pulsed and On-Time. For more details, see Table 48.
Bin Unlocked	This output can be customised only if the Bin Unlocked input has been configured, and will activate a device if the Reject Bin remains open for longer than what is specified. Additional configurable information: Pulsed and On-Time. For more details, see Table 48.
Custom	This output can be customised for a device. Additional configurable information: Pulsed, On Time and Delay Time. For more details, see Table 48.
Detector Active	This output is used to activate a device, such as a light, indicating that the metal detector is active or inactive. Additional configurable information: Pulsed. For more details, see Table 48.
Early Warning	The output replicates the early warning conditions described in Section 5.3 of the Operating Guide, subsection Condition Monitoring. Additional configurable information: Activate Fault Relay. For more details, Table 48.
Metal Detect	This output may be configured to keep a detection event highlighted in the detection bar on the metal detector, in red, following a detection. Additional configurable information: Activate Fault Relay. For more details, see Table 48.
Multiple Rejects	This output may be configured to activate following an accumulated number of reject operations. To reset the Count, press the Reset Reject Count key located under the Counters option in the User Level 2 and 3 menus. Additional configurable information: Count Window, Total Rejects, Activate Fault Relay and Pulsed. For more details, see Table 48.
Pack Count	This output may be configured to activate a relay once the predetermined number, set here on this screen, has been reached, to trigger a piece of equipment such as a warning light or a diverter.
PV Alarm	This output may be configured to warn that a Performance Verification is due or overdue. To use this output, a Performance Verification Alert must have been initialised on the detector — usually determined at the time of manufacture. Additional configurable information: Activate Fault Relay and Pulsed. For more details, see Table 48.

OUTPUT FUNCTION DEFINITIONS	EXPLANATION
QA Test Due	This output may be configured to warn that a QA Test is due. Additional configurable information: Activate Fault Relay and Pulsed. For more details, see Table 48.
QA Test Overdue	This output may be configured to warn that a QA Test is overdue. Additional configurable information: Activate Fault Relay and Pulsed. For more details, see Table 48.
QA Test Due and Overdue	This output may be configured to warn that a QA Test is due and overdue. Additional configurable information: Activate Fault Relay and Pulsed. For more details, see Table 48.
QA Test Fail	Prior to F4.3.0, when a QA Test was conducted, the QA operator could maintain the production even though the test had failed. This new feature assigns an output signal to activate whenever a QA test has failed. This output can be used to trigger a controlled set of events upon receipt of this signal (e.g. stop the line). Additional configurable information: Activate Fault Relay and Pulsed. For more details, see Table 48.
Reject Bin Full	This output can be configured to activate when the Reject Bin becomes full. Additional configurable information: Pulsed and On-Time. For more details, see Table 48.
Status Check	This output can be configured to generate an alert when an error occurs. Additional configurable information: Pulsed and On-Time. For more details, see Table 47.
Unlock Bin	This output can be configured to unlock the Reject Bin for a predetermined length of time when the Unlock Bin key is pressed on the User Interface. Additional configurable information: On-Time. For more details, see Table 48.
Warning	This feature may be used to monitor the status of the detector and provide several alerts that might occur when products are running. For more details, see Table 48.
Warning Threshold	This output activates when a pre-programmed signal threshold has been breached. The Warning Threshold can be set between 3 and 99 (bars), where 11 bars are required to generate detection. If the Warning Threshold is set below the detect level it may be used as an additional early warning mechanism to avoid false rejections on products where the sensitivity fluctuates during the day. Note that the Warning Threshold output will not activate if it is set lower than the detect level and contaminated product is detected by the metal detector. The Warning Threshold can also be set above the detection level in order to monitor the size of detection. Additional configurable information: Warning Threshold Bars, Pulsed and On Time. For more details, see Table 48.

Table 46:

STATUS CHECK			
Text Displayed	Status Indicator	Error Condition	Clear Method
Pack Sensor Blocked	Slow Flashing	The Pack Sensor is blocked.	Clear the blockage.
Reject Bin Full	Slow Flashing	The Reject Bin is full.	Empty the Reject Bin.
Reject Check Sensor Blocked	Slow Flashing	The Reject Check Sensor is blocked.	Clear the blockage.
Reject Confirmation Sensor Blocked Pack Sensor Fault	Slow Flashing	The RCU Sensor is blocked.	Clear the blockage.
Reject Check Sensor Fault	Continuous	If either the Pack Sensor or the Reject Check Function fails to detect three consecutive packs, registered by the metal detector, an alert will occur.	Either access the QA menu then press the RCU/Fault Reset, or activate the external Reset device.
Belt Speed Out Of Range	Continuous	Speed pulses have fallen outside a pre-defined value, affecting the speed of the belt. The warning screen is only displayed when the Conveyor Running feature has been assigned to one of the inputs.	Either access the QA menu then press the RCU/Fault Reset, or activate the external Reset device.
Unexpected Reject Confirmation	Continuous	The RCU has changed state even though the reject mechanism did not active.	Either access the QA menu then press the RCU/Fault Reset, or activate the external Reset device.
Reject NOT Confirmed	Fast Flashing	The Reject Check Sensor detected a pack despite the reject mechanism activating.	Either access the QA menu then press the RCU/Fault Reset, or activate the external Reset device.
Reject NOT Confirmed	Fast Flashing	The RCU did not detect a pack despite the reject mechanism activating.	Either access the QA menu then press the RCU/Fault Reset, or activate the external Reset device.

Table 47:

OUTPUT FUNCTION-SPECIFIC DEFINITIONS	EXPLANATION
Activate Fault Relay	This feature should be enabled if a mechanism needs to be activated or deactivated upon the output being triggered.
Delay Time	Once the input signal has been detected, the output signal can be delayed for a predetermined time until the product reaches a designated point on the production line, at which point it will trigger the relay and activate a mechanism. This delay feature is useful if the output is connected to, for example, a diverting system.
On-Time	This setting determines the length of time that the Output Relay remains active, and starts when the Delay Time cycle finishes. If the On-Time is set to 0ms, the signal shall deactivate when the software has confirmed that any relevant input signal has become inactive.
Pulsed	This function, if selected, shall output a pulsed signal to the designated Solid State Relay. This enables a beacon connected to the output to flash.
Count Window	This sets the duration of time, in a shifting 1, 15, 30, 45 or 60 minute window, for the Total Reject number to operate in.
Total Rejects	This determines the limit of rejects allowed in the time set in the Count Window. If the accumulated number of rejects exceeds the predetermined number, an alarm will be triggered.
Reject Count	If the number of rejects exceeds the predetermined number (set here) an alarm will be triggered. This is only available when the Reject Type is set to Consecutive. To use this feature, a pack sensor must be fitted.
Reject Type	If a Pack Sensor is fitted, press the Reject Type key and set to either Consecutive or Accumulative. Selecting Accumulative enables the Count Window setting whilst selecting Consecutive enables the Reject Count option. If no Pack Sensor is fitted, only Accumulative will be made available. See above for more details.

Table 48:

Comms Settings



Press the **Comms Settings** key to display the Serial Comms selection screen. This feature allows control and configuration data to be accessed through the **Network** and **Direct** communication ports.

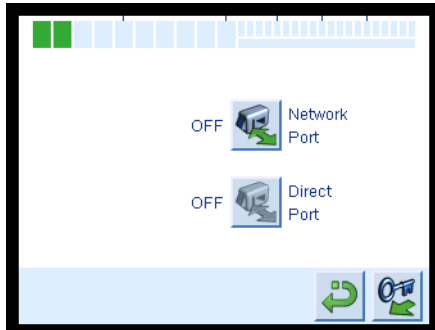


Figure 136:

Whilst the configuration screens are similar for both of these options, there are some subtle changes.

Selecting **Network Port** will provide the following options:

- OFF
- RS232/RS422
- ETHERNET
- FIELDBUS

Selecting **Direct Port** will provide the following options:

- OFF
- RS232/RS422
- Quad Band GSM Gateway (TC65 GATEWAY)
- FIELDBUS

Configuring for Ethernet and RS232/RS422

As stated previously, various communication protocols can be assigned to the Network or Direct ports. Ethernet and RS232/RS422 can be configured on Network or Direct Ports but, for this example, Ethernet will be assigned to the Network Port.

To configure the communications port for Ethernet use:

1. From the Serial Comms selection screen, select **Network Port**. The Comms Mode screen is displayed.

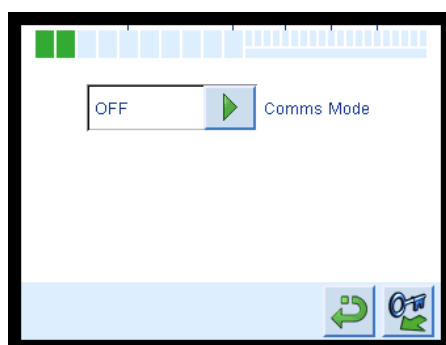


Figure 137:

2. Press the **Comms Mode** parameter and select **Ethernet**.

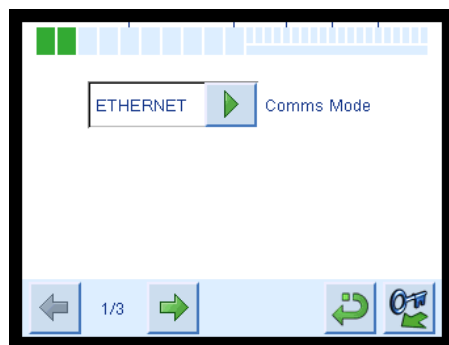


Figure 138:

Note: If the **RS232/RS422** option is selected, the Baud Rate and the Address parameters are enabled and can be edited.

3. Press the **Right Arrow** key to move to the next screen.

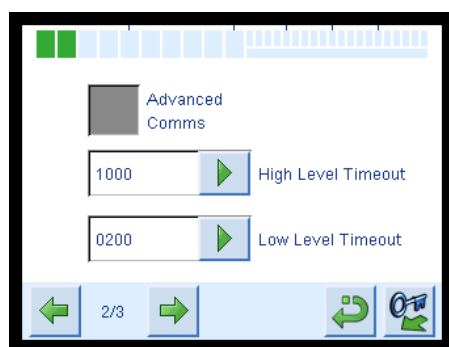


Figure 139:

4. Press the **High Level Timeout** parameter to specify the time that the detector waits for a response from the client before resending a signal.
 5. Press the **Low Level Timeout** parameter to specify the time before the metal detector will repeat an event message, if an acknowledgment has not been received.
- Note: The **Advanced Comms** option is not currently supported.
6. Press the **Right Arrow** key to move to the next screen.



Figure 140:

7. Press the **Event Filter Level** parameter to specify the level to which unsolicited metal detector events are filtered. The filter levels are NONE (default), LOW, MEDIUM, HIGH and ALL. NONE means no messages are filtered, everything is sent, whilst ALL means that all messages are filtered out.
8. Press **Return** to return to the Comms Settings screen.

Configuring for Fieldbus



The Fieldbus Interface Module may be supplied with the metal detector or bought as a separate item.

The Fieldbus Interface Module can be configured on Network or Direct Ports but, for this example, it will be assigned to the Network Port.

To configure the communications port for Fieldbus use:

1. From the Serial Comms selection screen, select **Network Port**. The Comms Mode screen is displayed.

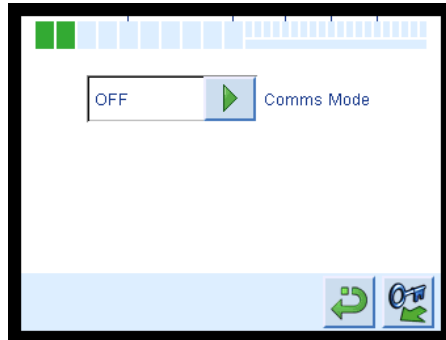


Figure 141:

2. Press the **Comms Mode** parameter and select **FIELDBUS** from the list.

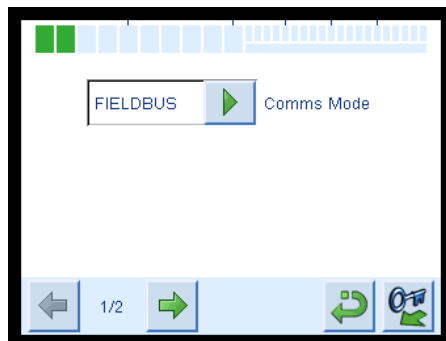


Figure 142:

As soon as the mode is changed to FIELDBUS, the metal detector will immediately attempt to communicate with the Fieldbus Interface Module.

If, for any reason, the metal detector cannot communicate with the Fieldbus Interface Module, a periodic 'Fieldbus Communication Fault' message will display on the metal detector's user interface.

3. Press the **Right Arrow** key to move to the next screen.

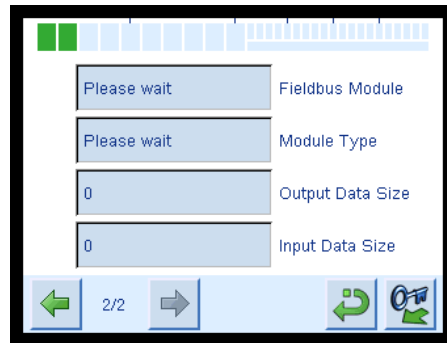


Figure 143:

This page provides information relating to the fitted hardware and the size of the data model supported by this data model version. Input data size refers to the size (in bytes) of the data that is provided as input to the PLC (i.e. the metal detector outputs). Output data size refers to the size (in bytes) of the data that the PLC provides as outputs (i.e. the metal detector inputs).

It may take several seconds before all information is available on this screen (Figure 144). This is due to the information being retrieved from the Fieldbus Interface Module. Also note that the **Module Type** field will be populated with whatever Fieldbus protocol is being used. If the data is not yet available, the field will display a 'Please wait' message, as in Figure 143.

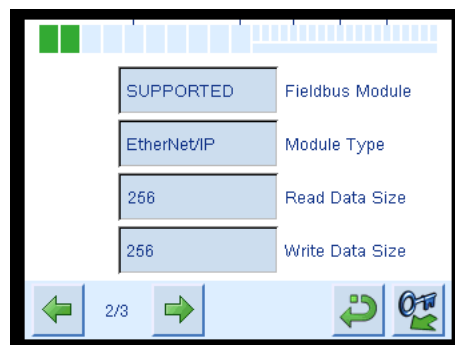


Figure 144:

Once the metal detector has determined that the hardware is connected and supported, a third screen will become available to allow the Fieldbus Interface Module to be configured.

4. Press the **Right Arrow** key to move to the next screen.

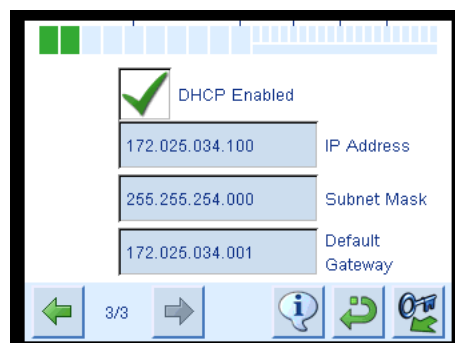


Figure 145:

The configuration page enables the key Fieldbus Interface Module network parameters to be configured. Each Fieldbus Interface Module requires a unique IP address to be assigned to allow it to be accessed by third-party equipment such as a PLC.

By default, DHCP (Dynamic Host Configuration Protocol) is enabled, allowing the IP Address of the Fieldbus Interface Module to be set automatically by an available DHCP server on the network.

DHCP servers work by providing IP addresses to equipment on a lease basis. In certain circumstances, it is possible for the IP address lease to expire, causing the DHCP server to assign a new (different) IP address to the Fieldbus Interface Module. To ensure that the IP address of the Fieldbus Interface Module remains constant, it is recommended that the Fieldbus Interface Module is manually assigned a static IP address.

To enter a static IP address, disable the DHCP Enabled option and enter values for the IP Address, Subnet Mask and Default Gateway, as shown in Figure 146.

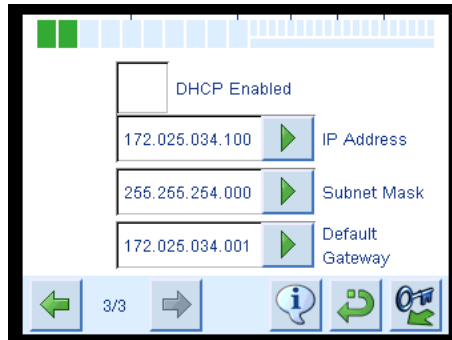


Figure 146:

Any changes on this page will be applied as a whole. When the user attempts to navigate away from the page (logging out, moving up or moving backwards), Figure 147 will appear requesting confirmation to change the network settings.

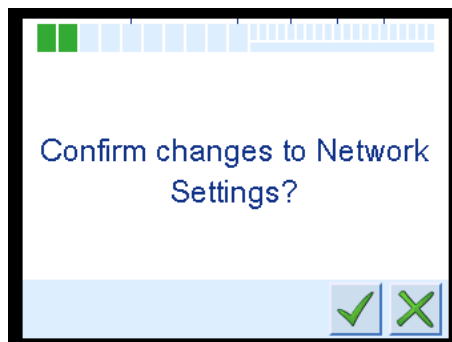


Figure 147:

5. Press the **Confirm** key to confirm the network settings. Figure 148 will appear.

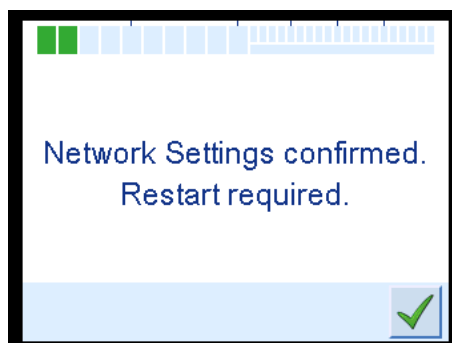


Figure 148:

6. Press the **Confirm** key.
7. Restart the metal detector.



The metal detector must be manually restarted to activate the settings. The metal detector will then be configured for Fieldbus Interface Module communications.



Product should not be passing through the metal detector during a restart. Restarting the metal detector may stop the conveyor belt, increasing the possibility that any contaminants may not be detected.

Configuring for Quad Band GSM Gateway



The Gateway may be supplied with the metal detector or bought as a separate item.

Please note the following:

- If the Gateway needs fitting, refer to Section 12.1 for installation details.
- If the Gateway is already fitted, refer to Section 12.3 for configuration details.
- For more information on buying the Fieldbus Interface Module or the Gateway, contact your SAFE-LINE Service Organisation.

6.3.5 Access Account Management



Press the **Access Account Management** key to create, edit or delete user accounts for access to the detector, or to view the user access log. Upto 32 unique user accounts can be created and managed.

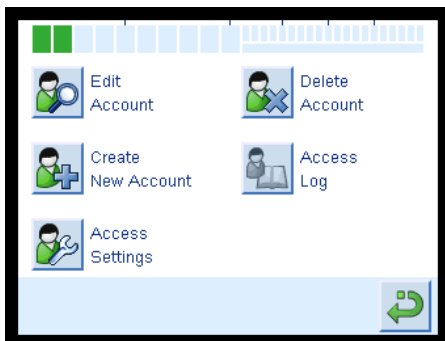


Figure 149:



Although the default language for the metal detector is determined at the Install Level menu (see page 101) specific languages can be attributed to the users, allowing them to operate the metal detector in their native language. This can be configured in the section below.

Create New Account



Press the **Create New Account** key to set up a new user account. When you select the Create New Account option, the first configuration screen is displayed.

Figure 150:

To create a new account:

Procedure

1. Press the **Account Username** parameter to enter a name for the account.
The display shows the alphabetic keypad for you to enter the name — the operation, of which, is described in Section 4.9.
2. Press the **Account Access Level** parameter to choose an access level for this account (USER 1, 2 or 3).
3. Tick the **Enable Account** box to activate the new account.
4. Press the **Right Arrow** key to move to the next screen.

The screen that appears next, either Figure 151 or Figure 152, will depend on what is configured in the Access Settings section, page 135. By default, Figure 151 will appear.

Figure 151:

Figure 152:

Figure 151 appears when the Access Settings have been set to **STANDARD** and requires a user to log into the metal detector, via the standard interface, by entering a Passcode.

Figure 152 will appear if the Access Settings are set to **21CFR** and requires a user to log in, via the advanced authentication screen, by entering a Username and a Password.

For more information about configuring the Access Settings, see page 135.

Standard Authentication

1. If Figure 151 has been set, press the **Language** parameter to select the language from the list.
2. Press the **Account Passcode** parameter and use the Arrow keys to enter a Passcode for the new account.
3. Press the **Confirm** key to accept the new account. The screen will ask you to confirm that you want to store it.
4. Press the **Confirm** key to save the new account details and return to the Access Account Management menu.

Advanced Authentication



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

The Advanced Authentication screen requires the user to log in with a Username and a Password, and can be used as part of a 21CFR Part 11 compliant system.

1. If Figure 152 has been set, press the **Language** parameter to select the language from the list.
2. Press the **Account Password** parameter to enter a Password for the new account. The display shows the alphabetic keypad — the operation, of which, is described in Section 4.9.

Note: The Password is encrypted, therefore a series of asterix will appear instead of any numerical or alphanumeric characters when the Password is entered into the keypad. Also, any password created will be case sensitive. Remember to always make a record of any passwords.

3. Press the **Confirm** key to accept the new account. The screen will ask you to confirm that you want to store it.
4. Press the **Confirm** key to save the new account details and return to the Access Account Management menu.

Edit Account



Press the **Edit Account** key to view and alter the existing account details. The detector offers a list of existing user accounts to edit.

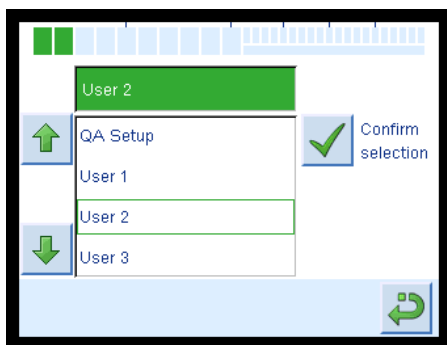


Figure 153:

To edit an account:

1. Use the **Up** and **Down** Arrow keys to select the user account you want to edit.
2. Press the **Confirm Selection** key. Figure 154 will appear.

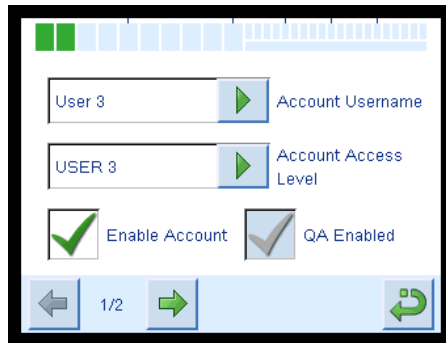


Figure 154:

3. Press the **Account Username** parameter to edit the name of the account.
4. Press the **Account Access Level** parameter to change the access level for this account.
5. Untick the **Enable Account** box to clear the tick and disable the account. Similarly, tick the box to enable the account again. Note that the **QA Enabled** feature can only be changed at the QA level (888888).
6. Press the **Right Arrow** key to move to the next screen. Figure 155 will appear.

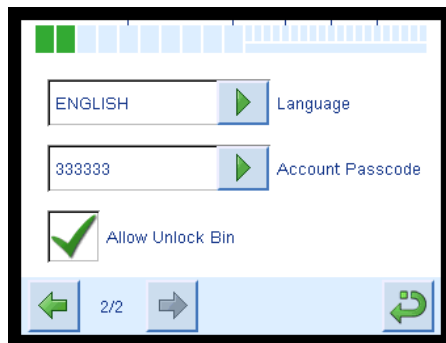


Figure 155:

7. Press the **Language** parameter to select the preferred language of the user.
8. Press the **Account Passcode** parameter to edit the passcode.
9. Tick the **Allow Unlock Bin** box to enable this feature for the user. Similarly, untick the box to clear the tick and disable the feature.
10. If no other changes are required, press **Return** to save the changes and return to the Access Account Management menu.

Delete Account



Press the **Delete Account** key to delete an existing user account. The detector offers a list of existing user accounts to delete.

To delete an account:

Procedure

1. Use the **Up** and **Down** Arrow keys to select the user account you want to delete.
2. Press the **Confirm Selection** key when you have selected a user account, where you will be asked to confirm the action.

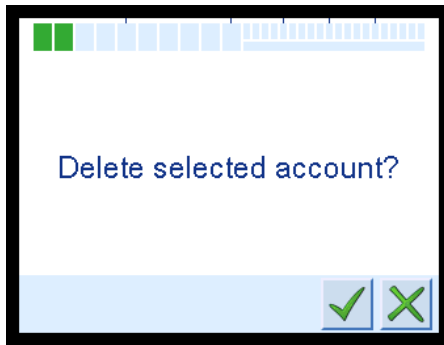


Figure 156:

3. Press **Confirm** to delete the account and return to the Access Account Management menu.

Access Log



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Press the **Access Log** key on the Account Management menu to view the log of user access information.

The Access Log provides a record of all user access events, showing the time, the event and the username and holds the latest 100 events. Access Log events where a PVR test was performed are displayed in GREEN. All other Access log events are displayed in RED.

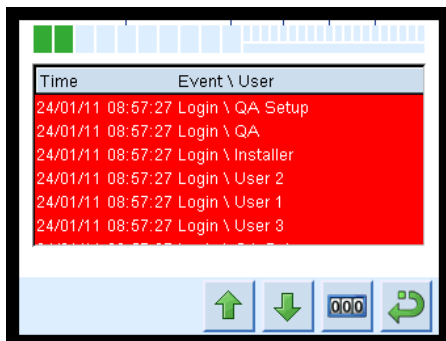


Figure 157:

1. Use the **Up** and **Down** Arrow keys to view the entries in the log.
2. Press the **Reset** key (with the three zeroes) to clear the entries in the log.
3. Press the **Return** key to return to the Access Account Management menu.



This screen can also be enabled to be displayed in the Running Mode Displays.

Access Settings



Press the **Access Settings** key to determine how the user logs into the metal detector. When you select the Access Settings option, one of two screens are displayed.

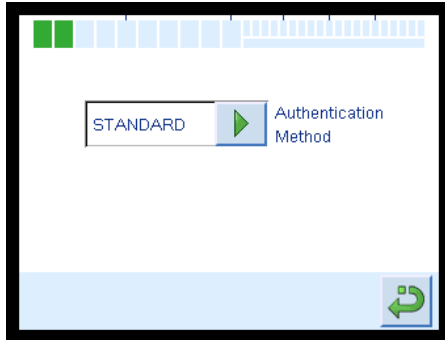


Figure 158:

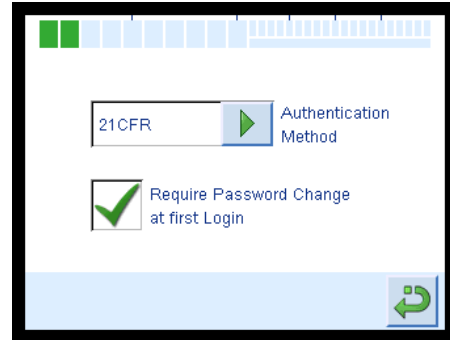


Figure 159:

The screen that appears will depend on how the metal detector has been configured.

To change the Authentication Method:

Procedure

1. Press the **Authentication Method** parameter. You can select the following options - STANDARD or 21CFR
2. Use the **Up** and **Down** Arrow keys to highlight the Authentication Method.
When **STANDARD** is selected, the standard authentication screen is enabled (Figure 160) that requires the user to log into the metal detector by entering a Passcode.
If **21CFR** is chosen, the advanced authentication screen is enabled (Figure 161) that requires the user to log in with a Username and a Password.
The **21CFR** method has an option to enable or disable a feature that forces a user to change their password after they have logged on for the first time, or after a password has been reset by the Installer. If this feature is enabled, achieved by ticking the **Require Password Change At First Login** box, the user will not be prompted to change it again.
3. Press **Confirm Selection** to accept the selection.
4. Press **Return** to go back to the Access Account Management menu.

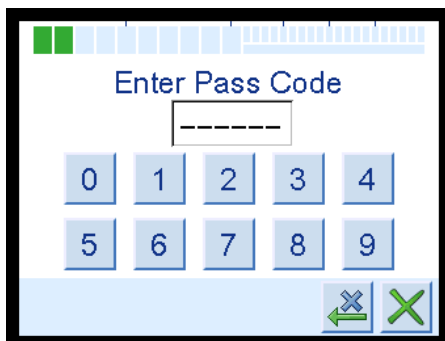


Figure 160:

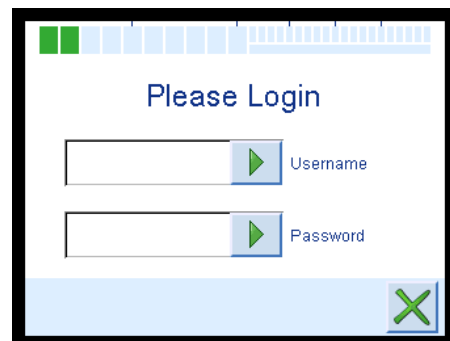


Figure 161:

6.3.6 Date and Time



Press the **Date and Time** key to adjust the actual date and time, or to alter the display format of the date and time.

The screen displays the date and time screen.

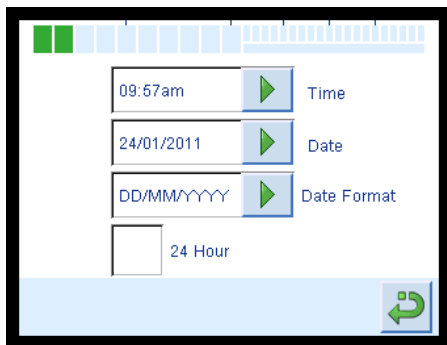


Figure 162:

1. Press the **Time** parameter to set the current time.
2. Press the **Date** parameter to set the current date.
3. Press the **Date Format** parameter to set the date format to:
 - DD/MM/YYYY
 - MM/DD/YYYY
 - YYYY/MM/DD
4. Tick the **24 Hour** box to use the 24 hour clock. Leave the box blank to use 12 hour AM and PM times.
5. Press the **Return** key to return to the Advanced Settings menu.

6.3.7 System Defaults



Press the **System Defaults** key on screen 2 of the Advanced Settings menu to save or restore the detector settings. The screen displays the system defaults screen.

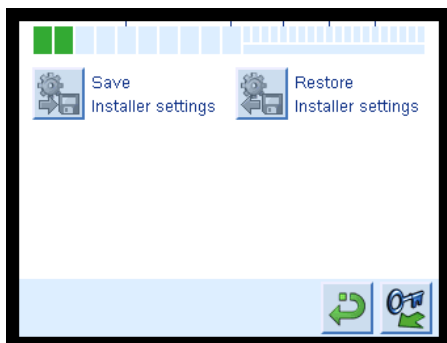


Figure 163:

The **Save Installer Settings** option stores the current values of the parameters for future use, if required. The **Restore Installer Settings** option can be used to return to the saved values.



We strongly recommend that you select the Save Installer Settings option (from the Advanced Settings menu, see Section 6.3) as soon as you have installed your detector. This allows the metal detector to be restored to a known state in the event of any future problems.

1. Press the **Save** or **Restore** key. In both circumstances, the screen displays a message asking you to confirm the action.

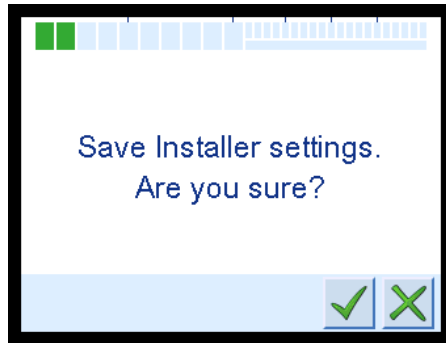


Figure 164:

2. Press the **Confirm** key to proceed with the action, or **Cancel** to abandon it.

6.3.8 Vector Diagrams



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Press the **Vector Diagrams** key on screen 2 of the Advanced Settings menu to enable or disable Vector Diagrams. The setting determines whether the Vector Diagrams display will be available to User Level 3 operators when adjusting the Product Settings option.

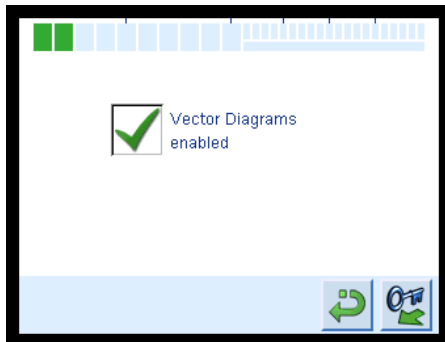


Figure 165:

1. Tick the **Vector Diagrams Enabled** box to enable Vector Diagrams.
2. Press the **Return** key to return to the Advanced Settings menu.

6.3.9 Running Displays



Press the **Running Displays** key on screen 2 of the Advanced Settings menu to enable or disable the Running Display screens. Whichever feature is ticked will be displayed in the Running Mode Displays.

Screen 1

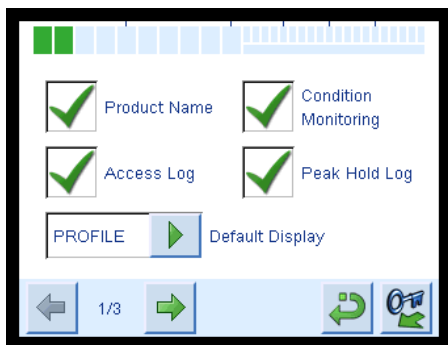


Figure 166:

Product Name

Enabling the **Product Name** feature will display the name of the current running product in the Running Mode Displays.

Access Log



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

The Access Log provides a record of all user access events. Enabling the **Access Log** feature will display this record in the Running Mode Displays.

Condition Monitoring

Condition Monitoring constantly monitors the key elements of the detector's functionality and gives an Early Warning if any of the monitored parameters exceed predefined limits. Enabling the **Condition Monitoring** feature will display a highly visible representation of the status of the metal detector in Running Mode Displays.

Default Display

The Default Display allows the default Running Mode display to be selected — that the metal detector reverts to when the user logs out or when the machine powers up. Press the **Default Display** parameter then select the display from the list.

Note that if you happen to log out of the metal detector and the Running Mode reverts to the **Performance Test Status** Running Mode display instead of the intended screen, it means that a Performance Validation Routine (PVR) is overdue. The PVR needs to be performed before the detector will revert to the desired screen.

Screen 2



Figure 167:

Peak Bar

Enabling the Peak Bar display will leave a temporary marker in the bargraph, during a detection, at the peak detection point before gradually decreasing back to zero, making the bargraph easier to read.

Peak Hold Settings



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

This feature allows the Peak Hold value to be represented on the Peak Hold Log in Bars, to either 1 or 0 decimal points (DP), or as a percentage of the trigger level. For example, if 5 Bars register, the equivalent trigger level percentage can be calculated as:

$$\frac{5}{11} \times 100 = 45.5\%$$

Press the Peak Hold parameter then select the measurement from the list.

Screen 3



Figure 168:

PackML V3.0

Enabling the PackML V3.0 feature will display the PackML State Machine running menu. From here, the current mode and state of the metal detector can be established.

For more information on PackML and configuring the settings, see Chapter 11.

OEE

Enabling the OEE (Overall Equipment Effectiveness) feature will display the OEE running menu. This display presents information about how efficiently the metal detector is performing on the production line.

For more information on the OEE, see Section 11.4.

6.3.10 LCD Brightness



Press the **LCD Brightness** key on screen 2 of the Advanced Settings menu to change the brightness of the display.



Figure 169:

1. Press the **Decrease Brightness** or **Increase Brightness** key to change the brightness of the display.
2. When the desired brightness has been set, press the **Return** key to return to the Advanced Settings menu.

6.3.11 Detection Mode



Press the **Detection Mode** key on screen 2 of the Advanced Settings menu to determine the Detection Mode.

The default Detection Mode is set to **NORMAL**. This mode delivers the standard high level of sensitivity however, for applications that require even higher levels of performance, **BOOST1** or **BOOST2** can be selected. Boost detection modes apply an intelligent software algorithm that selectively identifies and 'boosts' signals from potential contaminants. BOOST2 gives a higher level of sensitivity than BOOST1.

Boost is intended for applications operating with little to no product effect and should be selected only when extremely high levels of sensitivity are required and operating conditions permit.



In electrically noisy environments or in applications where there is a product effect, it may not be possible to operate at the highest sensitivity levels. Please contact your local SAFELINE representative as it may be possible to identify and suppress any sources of interference and/or reduce product effect.

To change the Detection Mode:

1. Press the **Detection Mode** parameter.
2. Use the **Up** and **Down** Arrow keys to select BOOST1 or BOOST2.
3. Press the **Confirm Selection** key, where upon a message will appear requesting you to refer to this operating manual, then press **Confirm** again.
4. Press the **Boost Threshold** parameter and set the threshold level.

Normally this parameter need not be adjusted. Adjusting the Boost Threshold refines the point at which the algorithm identifies potential contaminants. Reducing this parameter has the potential to increase sensitivity to contaminants, whilst increasing this parameter reduces the effect of the Boost algorithm.

5. Press the **Boost Window Time** parameter and set the window time.

Normally this parameter need not be adjusted. The Boost Window Time can be modified to filter ambient background noise from that of genuine product contamination.

6. When the Boost settings have been set, press the **Return** key to return to the Advanced Settings menu.



Enabling BOOST1 or BOOST2 will change the appearance of the bargraph slightly to show that the metal detector is operating in Boost Mode. See Figure 170 for an example. Another way to determine which Detection Mode is enabled is to check page 2 of the Information Screens. If BOOST1 or BOOST2 is enabled, **B1** or **B2** will be displayed next to the Sensitivity settings. If neither of these are visible, then NORMAL Mode is in operation. See Section 4.5 for more information about the Information Screens.

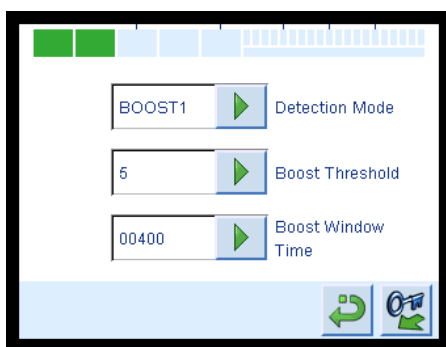


Figure 170:



If Vector Diagrams have been enabled and Boost is then initiated, Vector Diagrams will be disabled for as long as Boost mode is enabled. Conversely, if Clustering is enabled, Boost mode will be rendered inactive whilst the cluster is running. Similarly, if Boost mode is enabled and an Auto Setup is performed, Boost mode will be temporarily inhibited.

6.3.12 PackML V3.0



Press the **OMAC/PackML** key on screen 2 of the Advanced Settings menu to determine the PackML settings.

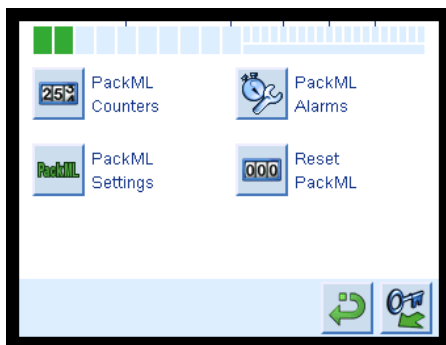


Figure 171:

PackML Counters, PackML Alarms, PackML Settings and Reset PackML functions are described in Chapter 11 "PackML V3.0", page 217.

6.4 Options Installed



When you press the **Options Installed** key on the Install Level menu, you gain access to the Options Installed section.

If this Metal Detector is the LS version, certain software features (or options) may or may not have been installed as standard at the time of order. By accessing this section you can see which options are installed, install further options or initiate a 60-minute trial to test the option.

Figure 172 and Figure 173 below show the screens installed in this section. To navigate from one page to the next, press the **Left** and **Right** Arrows. Alternatively, press **Return** to return to the Install Level menu.

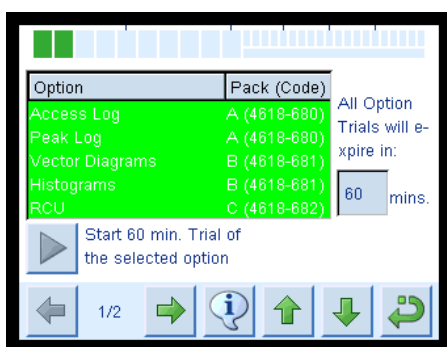


Figure 172: Option Code Status screen



Figure 173: Option Enabling Code screen

6.4.1 Option Code Status

When you press the **Options Installed** key on the Install Level menu, the screen displays the **Option Code Status** screen, Figure 172.

This screen is used to determine which software options are currently installed on the metal detector. Use the **Up** and **Down** Arrow keys to highlight the option. Table 53 explains the status of each colour.

COLOUR	CONDITION
Red	Option not installed
Green	Option installed
Amber	Option currently being trialed

Table 53:

Trialling the Option

If an option is not installed on the Metal Detector, you can trial it for 60 minutes as if it was permanently installed. Once the time has expired, or if you stop the trial, the option will revert to its pre-trial state.

Starting a Trial



Select an option from the list and press **Start**.

Stopping a Trial



Select the active option from the list and press **Stop**.

Installing an Option

If a software option is not installed on the Metal Detector, it must be bought as a separate item. In most cases, an option will be bundled together with other options as part of a Software Pack which, once ordered, can then be installed on the Metal Detector. Table 54 shows the options/Software Packs available.

SOFTWARE PACKS	OPTIONS	SOFTWARE PACK STOCK CODE
Onscreen HACCP Reporting	Access Log Peak Log	4618-680
Product Data and Enviromental Displays	Vector Diagrams Histograms	4618-681
Due Diligence Enhancement	RCU RCS 21CFR Mode	4618-682
Enhanced System Supervision	Extended PVR GSM Gateway	4618-683
Extended Programmable I/O	Extra I/O	4618-684

Table 54:

To order a Software Pack, contact your Safeline Service representative together with the following information:

- Software Pack Stock Code
- Host ID

The Host ID is unique and can be identified by a 16-digit identification number. This number is required at the time of order so that any new options can be installed on the Metal Detector. To acquire the Host ID, press the **Right** Arrow key and go to screen 2, Figure 174

Once the order has been completed, an **Option Enabling Code** will be issued that must be entered on the next screen, Figure 174.

6.4.2 Option Enabling Code

When you press the **Right Arrow** key on the **Option Code Status** screen, the **Option Enabling Code** screen is displayed, Figure 174. On this screen, you will be able to acquire the Host ID and enter the new **Option Enabling Code** once you have received it.



Figure 174:

Procedure

To enter the new code:

1. Select the **Option Enabling Code** parameter. The display shows the alphabetic keypad, Figure 175.

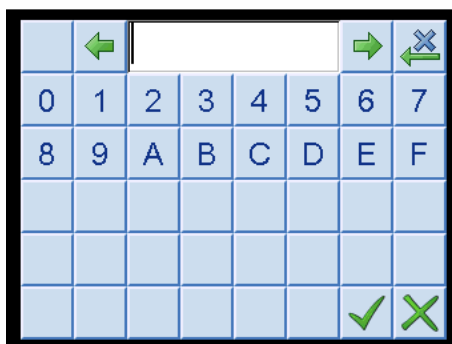


Figure 175:

2. Enter the new code and press **Confirm**.



If the Enabling Code is entered incorrectly, a warning will appear informing you of this. A successful entry will see the Option Code updated on the **Option Enabling Code** screen, and the options highlighted green on the **Option Code Status** screen, Figure 172.

3. Press the **Return** key to return to the Advanced Settings menu.

7 Quality Assurance

This chapter explains how you set up the operational parameters that control the way that Quality Assurance (QA) procedures will be run on your metal detector, and how you use the QA menu options to run Performance Testing procedures to validate the ongoing operation of your system.

SECTION	TITLE	PAGE
7.1	Introduction to QA	146
7.2	QA Setup Functions	146
7.3	QA Operator Mode and Test Procedures	158
7.4	Performance Testing	160

7.1 Introduction to QA

The performance test procedures help you to comply with Quality Assurance standards (such as ISO 9001) by ensuring that the detector system is tested and operating to your company's specified quality assurance standards of performance.

The quality standards of many user companies require the detector and its reject system to be manually tested at specified intervals by authorised QA personnel to validate compliance.

QA personnel can programme the detector to indicate when testing is required and to give an alarm if testing is not carried out at the appropriate time. Individual QA personnel can be allocated a personal security code, which can be used to ensure that the individual responsible for testing does so at the specified time.



Remember to record all settings on the Settings Sheets in Chapter 14 at the rear of the manual.

7.1.1 Performance Test Reports

Although effective as a feature in its own right, Performance Testing is most effective when a performance report is generated and then either printed directly onto paper or transferred electronically to a USB Memory Stick.

These reports, whether printed or stored electronically, are dated and time-stamped to show when the detector was tested and by whom. This demonstrates the authorised personnel's compliance with company standards and hence your company's compliance with the agreed quality standard. This may prove invaluable to companies wishing to demonstrate compliance with ISO 9001 and for users supplying the major retail organisations with strict detector standards.

The reports also record general information relating to the detector performance. They can date and time stamp events such as rejections, and changes made to the detector settings. These reports are a valuable tool for recording events that affect detector performance.

Instructions on how to print reports can be found on page 157, whilst information on installing and configuring a printer can be found in Chapter 9. Details on how to transfer reports to a USB Memory Stick can be found in Chapter 10.



Use of the printer is dependent upon whether a printer port has been fitted on the metal detector. Similarly, the Safeline USB Adapter must be installed before reports can be transferred to a USB Memory Stick.

7.2 QA Setup Functions



The QA Setup Level default access code is 888888. For additional information on entering pass codes, see Section 4.7.

When you enter the pass code that gives access to the QA Setup functions, the screen displays the QA Setup menu.

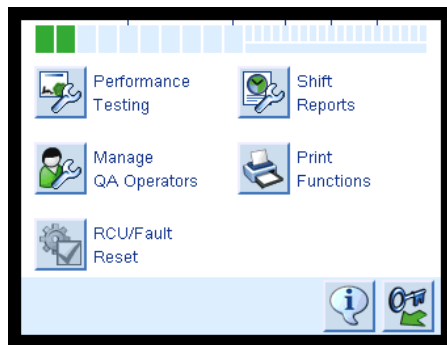


Figure 176:

Some of the options contain sub-sections. Figure 177 gives a general overview about the structure of the QA Setup menu and its sub-sections. For more information on running an actual **Performance Test** procedure, see page 135.

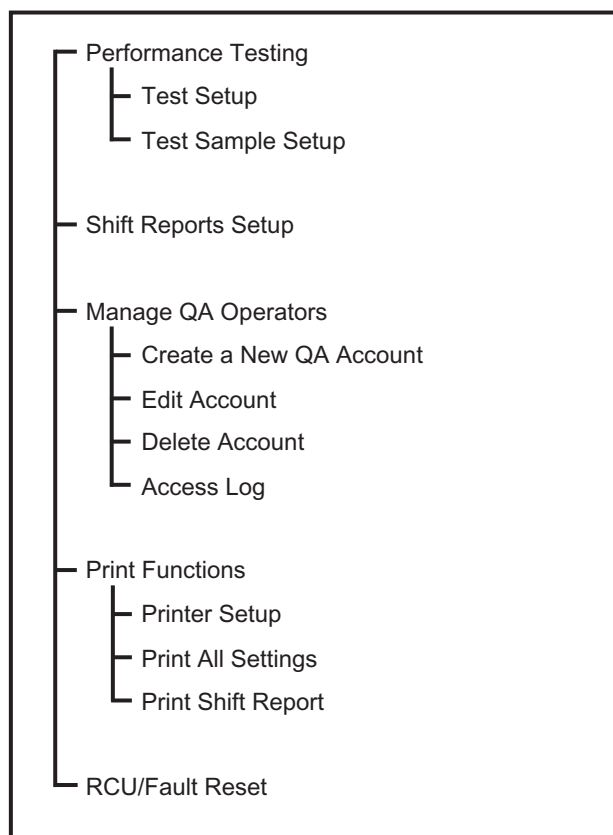


Figure 177:

7.2.1 Performance Testing



Press the **Performance Testing** key on the QA Setup menu to display the menu of product testing options.

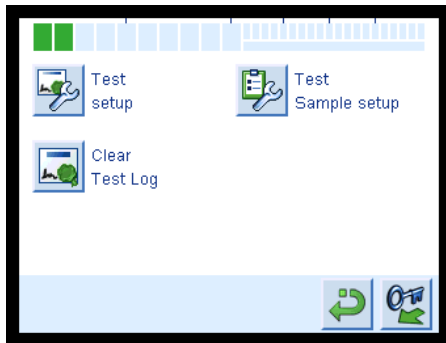


Figure 178:



If Multi-Pass testing is enabled, the Performance Testing menu changes to include an option to clear the Test Log, which is explained on page 167.

Test Setup



On the Performance Testing menu, press the **Test Setup** key to view or alter the generic settings for the product testing procedures.

Screen 1

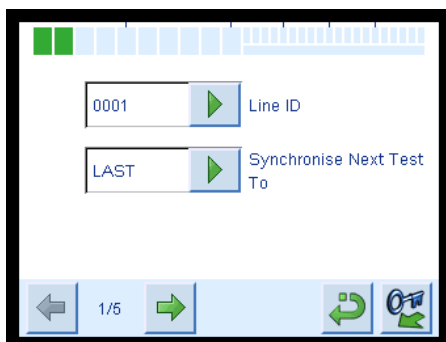


Figure 179:

You can use the Line ID to identify the production line where the detector system is located.

1. Press the **Line ID** parameter to enter a numerical or alphanumerical identification. The display shows the alphabetic keypad for you to enter the identification — the operation, of which, is described in Section 4.9.
2. Press the **Synchronise Next Test To** parameter to choose whether the next test should be synchronised with the **FIRST** test or the **LAST** test.

For example, if the first test is due at 07:00 and the interval is 1 hour, but the test is actually performed at 07:10:

- **Synchronise with Last** means the next test is due at 08:10.
- **Synchronise with First** means the next test is due at 08:00.

3. Press the **Right Arrow** key to move to the next screen.

Screen 2

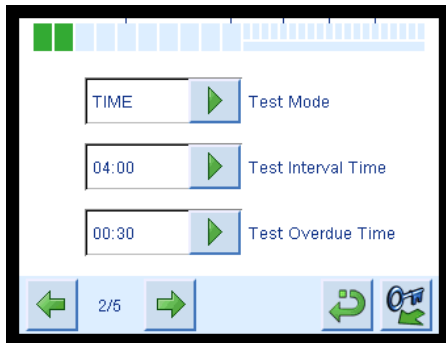


Figure 180:

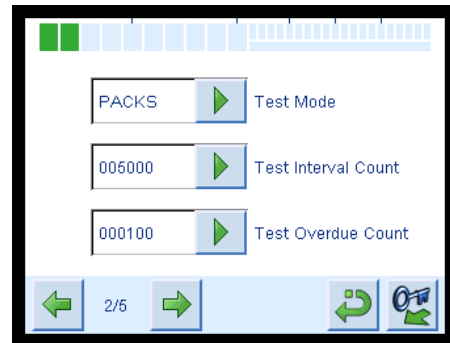


Figure 181:

1. Press the **Test Mode** parameter on screen 2 to choose between **OFF**, **TIME** and **PACKS** as the method of scheduling performance tests. Please note that the **PACKS** option is only available if a system pack sensor is fitted.
 - If you choose **OFF** as the test mode, no product testing will be scheduled or carried out. In this condition the **Test Interval Time** and **Test Overdue Time** parameters do not appear.
 - If you choose **TIME** as the test mode, you use the other two fields to set the **Test Interval Time** and the **Test Overdue Time**, in hours and minutes.
 - If you choose **PACKS** as the test mode, you use the other two fields to set the **Test Interval Count** and the **Test Overdue Count** in numbers of packs.
2. Press the appropriate parameter and adjust the settings.
3. Press the **Right Arrow** key to move to the next screen, which will only appear if **Test Mode** is configured.

Screen 3

This screen allows the detector to be configured to request a Performance Test following a change in procedure.



Figure 182:

1. Select the appropriate conditions that will trigger a Performance Test.
 - Tick the **Test Following Product Change** box to request a test following a change in the running product.
 - Tick the **Test Following Settings Change** box to request a test following a change in one or more of the critical settings. Generally, these settings are those that are captured on a Shift Report with the addition of Reference Phase.
 - Tick the **Test Following Initialisation** box to request a test following power up or after a test has been reconfigured.

When a Performance Test has been requested by one of the above conditions, the metal detector enters the **Due** state. The Running Mode's traffic light system display alternates between Due and Overdue to indicate that the metal detector has generated the condition.

2. Press the **Right** Arrow key to move to the next screen, which will only appear if Multi-Pass testing has been set up on the detector. If this feature is not present and is required, contact your SAFELINE Service Organisation.

Screen 4



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

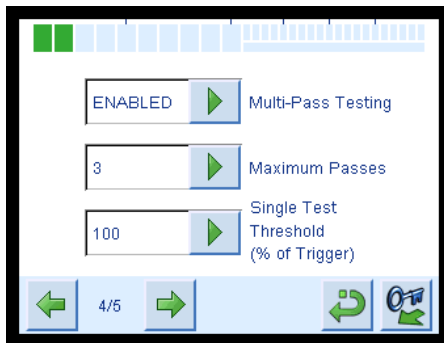


Figure 183:

1. Press the **Multi-Pass Testing** parameter to choose between **ENABLED** or **DISABLED**. The other two fields apply only if you enable this option.

If enabled, you can set the **Maximum Passes** at 1, 2 or 3. This is the number of test passes for each sample type (ferrous, non-ferrous, and stainless steel) that have been set up for the product.

You can also set a benchmark for comparison of successful tests. You do this by specifying the **Single Test Threshold** as a percentage of the Trigger signal. The benchmark must be higher than the trigger, so the percentage value must be 100% (when the bargraph reaches the 11th bar) or higher.

2. Press **Return** to return to the Performance Testing menu.

Screen 5

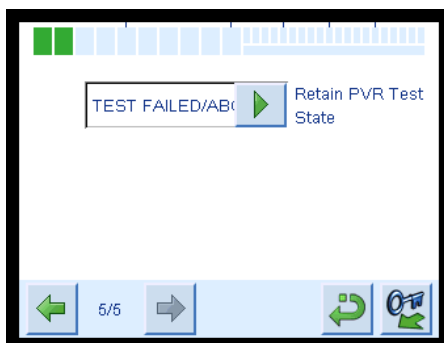


Figure 184:

1. Press the **Retain PVR Test State** parameter to select the conditions that will keep the PVR in either the DUE or OVERDUE state.
 - Set to **Test Failed/Aborted** to keep the PVR State at DUE or OVERDUE if the user fails any of the test samples or aborts the overall PVR test. The PVR State will only change to NOT DUE if all of the test samples are tested and do not fail. This is the default setting.

- Set to **Test Aborted Only** to keep the PVR State at DUE or OVERDUE if the user aborts the overall PVR test. The PVR State will only change to NOT DUE if all of the test samples are tested. The result of each test is irrelevant.
- Set to **Off** to disable the feature. The PVR State will change to NOT DUE if either all of the test samples are tested (the result of each test being irrelevant) or the user aborts the overall PVR test.

2. Press **Return** to return to the Performance Testing menu.

Test Sample Setup



On the Performance Testing menu, press the **Test Sample Setup** key to view or alter the test sample material type and size for individual products. Different sample sizes can be set for all three material types.

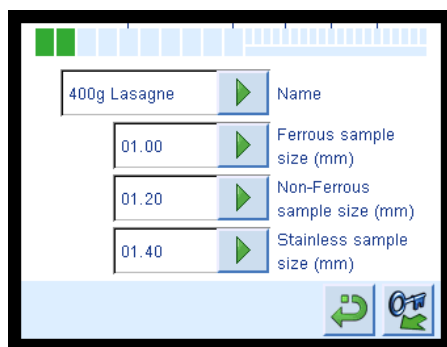


Figure 185:

The first field shows the product or cluster to which the tests relate. Initially, this shows the current running product or cluster, but you can select a different product or cluster from the list.

You use the other three fields to specify the size of sample for Ferrous, Non-Ferrous, and Stainless Steel samples that will be used to test this product.

1. Press the parameter key to set the sample sizes. If you leave a sample size as 00.00, that test will not be run for the product.
2. Press the **Return** key to return to the Performance Testing menu.

7.2.2 Shift Reports Setup



On the QA Setup menu, press the **Shift Reports** key to view or alter the shift times and intervals and the shift reporting settings.

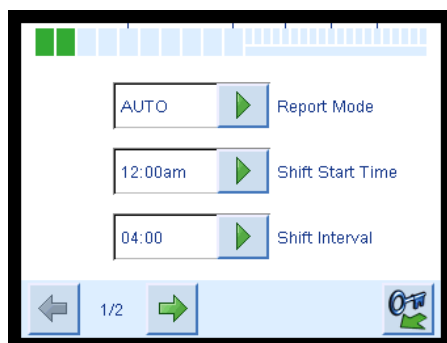


Figure 186:

1. Press the **Report Mode** parameter to choose between OFF, MANUAL and AUTO.
 - Set the Report Mode to **OFF** to disable the shift report facility. In this condition, all subsequent shift report settings do not appear.
 - Set the Report Mode to **MANUAL** to specify that Shift Reports will be printed only when requested. In this mode, the **Shift Start Time** and **Shift Interval** parameters do not appear.
 - Set the Report Mode to **AUTO** to enable shift reports to be automatically printed on a timed basis. In this mode, shift reports can also be activated manually.

For automatic operations use the **Shift Start Time** and **Shift Interval** parameters to specify the shift timings (in hours and minutes).

Shift reporting starts when the first shift starts, and is printed every shift interval.

You can set the Shift Interval to any value between 00:01 and 24:00.

2. Press the **Right Arrow** key to move to the next screen.

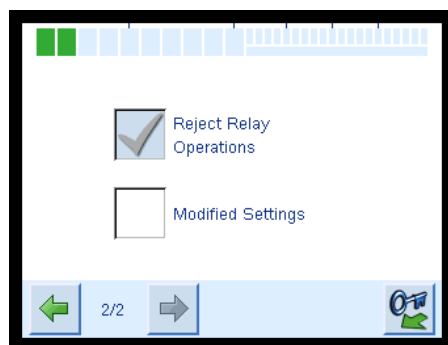


Figure 187:

3. Tick either the **Reject Relay Operations** or the **Modified Settings** boxes, or both, to define the content of the Shift Reports. Note that you cannot deselect both options, as the shift reports would have no content.

The following list shows the settings that are recorded if you choose the **Modified Settings** option for inclusion in Shift Reports:

- Product or Cluster change
 - Frequency
 - Sensitivity
 - Phase
 - Reject Timer Settings
 - Reject Inhibit
 - Reject Count Reset
 - System Speed
 - Pack Count Reset
4. Press the **Return** key to return to the QA Setup menu.

7.2.3 Manage QA Operators



Press the **Manage QA Operators** key to create, edit or delete QA Operator accounts for access to the detector, or to view the QA access log.

The screen displays the QA Accounts menu.

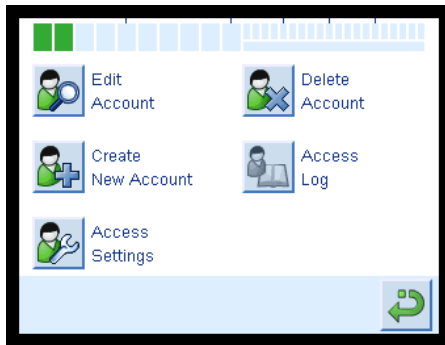


Figure 188:



Although the default language for the metal detector is determined at the Install Level menu (see page 101) specific languages can be attributed to the users, allowing them to operate the metal detector in their native language. This can be configured in the section below.

Create a New QA Account



When you press the **Create New Account** key, the display shows the first account creation screen.

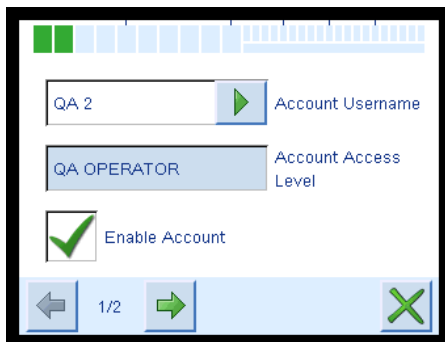


Figure 189:

To create a new QA account:

Procedure

1. Press the **Account Username** parameter to enter a name for the account.
The display shows the alphabetic keypad for you to enter the name — the operation, of which, is described in Section 4.9.
The Account Access Level automatically shows QA Operator. You can create only QA Operator accounts using this function. To create User Accounts, you must use the **Access Account Management** function described in Section 6.3.
2. Tick the **Enable Account** box to activate the new account.
3. Press the **Right Arrow** key to move on to the next screen.

The screen that appears next, either Figure 190 or Figure 191, will depend on what is configured in the Access Settings section, page 135. By default, Figure 190 will appear.

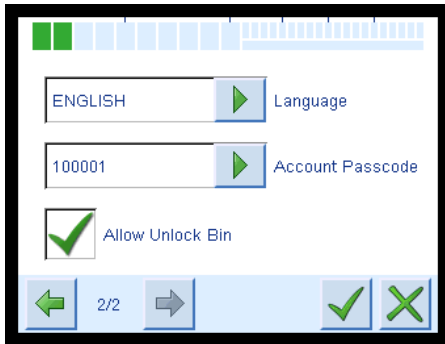


Figure 190:

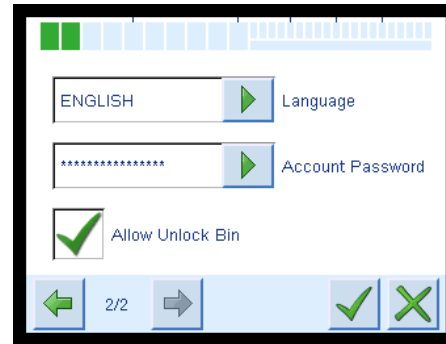


Figure 191:

Figure 190 appears when the Access Settings have been set to **STANDARD** and requires a user to log into the metal detector, via the standard interface, by entering a Passcode.

Figure 191 will appear if the Access Settings are set to **21CFR** and needs a user to log in, via the advanced authentication screen, by entering a Username and a Password.

For more information about configuring the Access Settings, see page 135.

Standard Authentication

1. If Figure 190 has been set, press the **Language** parameter to select the language from the list.
2. Press the **Account Passcode** parameter and use the Arrow keys to enter a Passcode for the new account.
3. Tick the **Allow Unlock Bin** box to enable this feature for the user. Similarly, untick the box to clear the tick and disable the feature.
4. Press the **Confirm** key to accept the new account. The screen will ask you to confirm that you want to store it.
5. Press the **Confirm** key to save the new account details and return to the Manage QA Operators menu.

Advanced Authentication



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

The Advanced Authentication screen requires the user to log in with a Username and a Password, and can be used as part of a 21CFR Part 11 compliant system.

1. If Figure 191 has been set, press the **Language** parameter to select the language from the list.
2. Press the **Account Password** parameter to enter a Password for the new account. The display shows the alphabetic keypad — the operation, of which, is described in Section 4.9.

Note: The Password is encrypted, therefore a series of asterix will appear instead of any numerical or alphanumeric characters when the Password is entered into the keypad. Also, any password created will be case sensitive. Remember to always make a record of any passwords.

3. Tick the **Allow Unlock Bin** box to enable this feature for the user. Similarly, untick the box to clear the tick and disable the feature.
4. Press the **Confirm** key to accept the new account. The screen will ask you to confirm that you want to store it.

5. Press the **Confirm** key to save the new account details and return to the Manage QA Operators menu.

Edit Account



Press the **Edit Account** key to view and alter the existing account details. The detector offers a list of existing QA accounts to edit.

To edit an account:

1. Use the **Up** and **Down** Arrow keys to select the QA Operator account you want to edit
2. Press the **Confirm Selection** key.

There are two categories of account that you can edit from the **Manage QA Operators** function:

- **QA Operators** are accounts that have been created using this function. They have access only to the Performance Test and reporting functions. The edit account screens are the same as screens 1 and 2 of the account creation screens, shown in Figure 189 and Figure 190, only now you are changing the existing settings.
- **User Accounts at Level 2 or 3** also appear on the account selection screen in the **Manage QA Operators** function. When you select one of these accounts, a single edit screen is displayed, as shown in Figure 192.

The screenshot shows a user interface for editing an account. At the top, there is a header bar with several colored squares. Below this, the 'Account Username' field contains 'User 3' and the 'Account Access Level' field contains 'USER 3'. There are two checkboxes: 'Enable Account' which is checked with a grey checkmark, and 'QA Enabled' which is checked with a green checkmark. At the bottom right, there is a green arrow icon pointing to the left.

Figure 192:

The only change to the typical User Account that you can make from the QA Setup function is to grant or remove access to the Performance Test functions.

The screen shows the Account Username and Access Level, but you can only change these through the **Access Account Management** function described in Section 6.3.

3. Tick the **QA Enabled** box to allow this user to run Performance Tests and (at User Levels 2 and 3) print QA reports.
4. Save the changes by pressing the **Return** key.

Delete Account



Press the **Delete Account** key to delete a QA Operator account. The detector offers a list of existing QA accounts to delete. You can only delete **QA Operator** accounts that were created using this function. Ordinary User Accounts are not shown in the selection list.

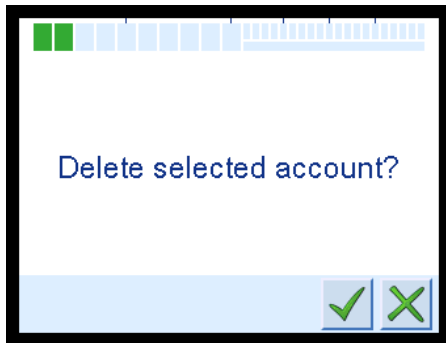


Figure 193:

To delete an account:

1. Use the **Up** and **Down** Arrow keys to select the user account you want to delete.
2. Press the **Confirm Selection** key, when you have selected a QA Operator account, where the detector will ask you to confirm the action.
3. Press the **Confirm** key to delete the account return to the QA Account menu.

Access Log



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Press the **Access Log** key on the QA Accounts menu to view the log of QA access information.

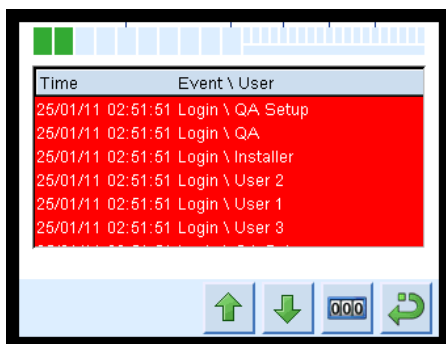


Figure 194:

The Access Log provides a record of all QA access events enabling historical access activity to be viewed. The log shows the time, event and account username and holds the latest 100 events.

1. Press the **Up** and **Down** Arrow keys to view the entries in the log.
2. Press the **Reset** key to clear the entries in the log.
3. Press the **Return** key to return to the QA Accounts menu.

7.2.4 Print Functions



Press the **Print Functions** key on the QA Setup menu to display the menu of printer-related options. Refer to Chapter 9 "Connecting a Printer", page 195 for details on installing and configuring a printer.

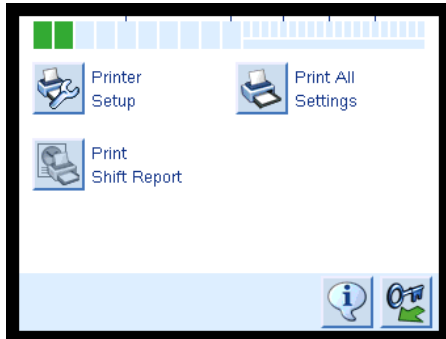


Figure 195:

Printer Setup



Press the **Printer Setup** key to display the screens used to set up the printer parameters.

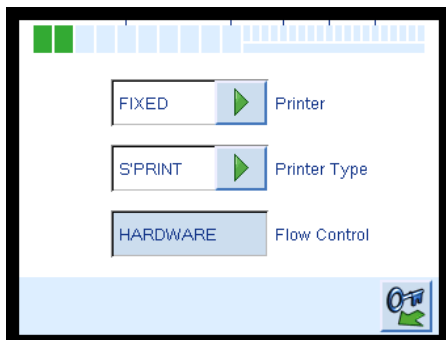


Figure 196:

1. Press the **Printer** parameter to specify whether the printer is Fixed, Portable or Absent.
 - **Fixed** means that the printer is permanently connected. If you try to run a print option and the detector finds no printer present, it displays a warning message. The **Print All Settings** and **Print Shift Report** options are always enabled.
 - **Portable** means that the printer may not always be connected, so "Printer not found" warnings are not displayed. The **Print All Settings** and **Print Shift Report** options are enabled when the printer is present.
 - **Absent** means that no printer is connected. The **Print All Settings** and **Print Shift Report** options are always disabled.
2. Press the **Printer Type** parameter to specify the type of printer. The options available include:
 - S'Print
 - Martel
 - Terminal
 - USB MSD

Note: Selecting Terminal provides the option to transfer report information straight to a PC, via a Hyperterminal connection, where it can be saved from a text editor such as Notepad.

Note: If the Safeline USB Adapter is fitted and the USB MSD option is selected, refer to Chapter 10 for further instructions.

3. Press the **Flow Control** parameter to specify the printer handshaking method. If the Flow Control key is disabled, no options are available and the Flow Control is Hardware. **Hardware** uses the RTS/CTS method to transmit data to the printing device.
4. Press the **Return** key to return to the Print Functions menu.

Print All Settings



Press the **Print All Settings** key on the Print Functions menu to produce a printout of all the current detector settings that have been made from the Install, QA Setup, and User Levels.

Print Shift Report



Press the **Print Shift Report** key on the Print Functions menu to produce a printout of all the recorded entries. The stored information available at the point of printing will depend on the Report Mode selected, as described on page 151 of this section.

For **MANUAL** Report Mode, the Shift Report contains all the data recorded since the last printout. The data recorded is then cleared to allow new data to be accumulated.

For **AUTO** Report Mode, if the Shift Report is printed before a shift has finished, the report contains all the data recorded so far in the shift. When the end of shift report is automatically printed, it will contain only the information recorded since the interim report was produced. The data recorded is then cleared to allow new data to be accumulated for the next shift interval.

The content of the Shift Report depends on the setting of the Shift Reports setup options described in page 151 of this section. The content can include details of reject operations and/or settings that have been modified during the shift.

7.2.5 Reject Confirmation Unit (RCU)/Fault Reset



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Press the **RCU/Fault Reset** key on the QA Setup menu to reset a RCU/Fault alert. This feature operates in the same way as the External RCU Reset and the CPU Fault Reset functions.

7.3 QA Operator Mode and Test Procedures

7.3.1 Introduction

QA Operator Mode is for carrying out a performance test of the detector, and thus provides immediate validation of the detector's performance integrity. The performance test procedures help you to comply with Quality Assurance standards (such as ISO 9001) by ensuring that the detector system is tested and operating to your company's specified quality assurance standards of performance.

The QA Setup account holder has the facility to configure performance checks to be requested at a preset time interval, as described on page 148.

The users who can carry out performance tests are described below. These users can carry out performance tests at any time; however, note that the test interval timer will be restarted as soon as the test is performed.

The time that the next test will be requested is displayed in the Running Mode as described below.

A printout is automatically printed immediately a performance test is carried out, providing the printer option has been selected in the QA Setup level described on page 157.

7.3.2 Accessing QA Operator Mode

The users who can access QA Operator Mode are in three categories.

QA Setup Account Holder

This is the only account that can access the QA Setup facilities. Note that whilst accounts can be configured and QA reports printed from the QA Setup Account, Performance Tests cannot be performed from here. See below for details on who can perform a test. The QA Setup Account default access code is 888888.

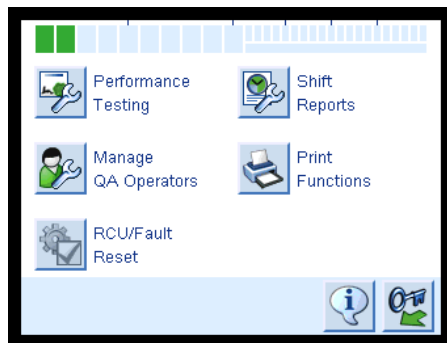


Figure 197:

QA Operators

These are users who have been set up by the QA Setup account holder using the **Manage QA Operators** function from the QA Setup menu. QA Operators can run Performance Tests and print QA reports, but they do not have access to the normal User Level functions for running the detector. Refer to page 69 for details of entering your security pass code to gain access to the secure menu system. The QA Operator default access code is 444444.

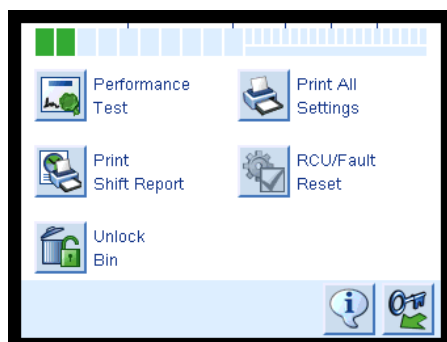


Figure 198:

The **Print All Settings**, the **Print Shift Report** and the **RCU/Fault Reset** options are described in page 157.



If Multi-Pass testing has been enabled and a QA operator logs in using the default access code (444444), a semi-automated test routine starts immediately, bypassing Figure 198. For more information about Multi-Pass testing, refer to page 161.

For more information about running a Performance Test, refer to Section 7.4.

User Accounts Enabled for QA

The QA Setup account holder can also grant QA access to ordinary User Level accounts at User Level 2 or 3. This can be useful in situations where QA activities and routine detector operations are carried out by the same personnel, rather than by dedicated QA operators.

User Level 2

User Level 2 accounts who are granted QA access can run Performance Tests. The Level 2 menu includes a Performance Test option.

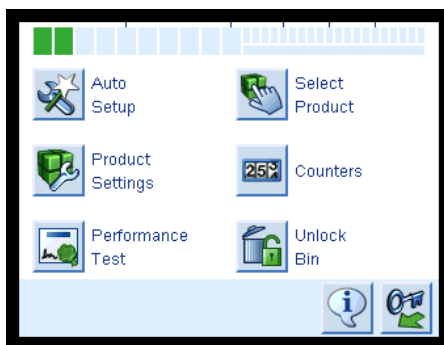


Figure 199:

User Level 3

User Level 3 accounts who are granted QA access can run Performance Tests and print QA reports. The Level 3 menu includes a QA option that gives access to the Performance Tests and the QA Reports menu.

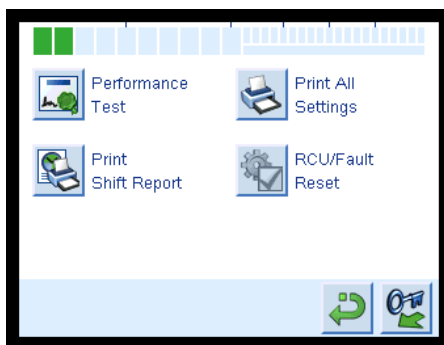


Figure 200:

7.4 Performance Testing

Performance tests can only be run for the current running product. It is also necessary for the Test Sample Setup option to have previously been set to specify the sample sizes to use for the performance tests for the product. If the Test Sample Setup option has not been set for the product, the Performance Test icon is disabled.



When the tests have been set up and you press the **Performance Test** key, the product test screen is displayed.

In Figure 201, all three tests — Ferrous, Non-Ferrous, and Stainless Steel — have been set up, so all three tests are available to be run. The fields show whether the tests have been run or not.



Figure 201:

In Figure 202, the Stainless Steel sample size was left as 0.00 in the Test Sample Setup option, so this test is not shown and cannot be run.

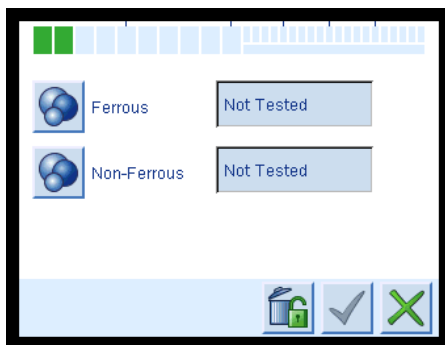


Figure 202:



If enabled, press the **Unlock Bin** key to unlock the Reject Bin and remove rejected products or test samples.

7.4.1 Running a Standard Performance Test



Press the relevant test key to run the test. The screen requests you to pass the product with the appropriate test sample.

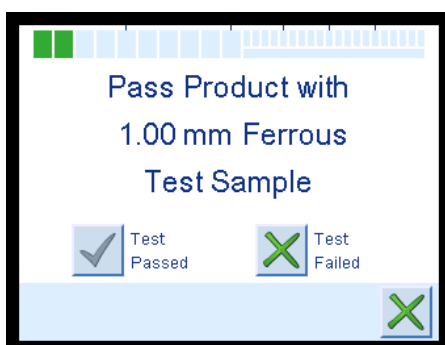


Figure 203:

The **Test Passed** key is only enabled once the following conditions are met:

- The sample is detected.

- The sample is rejected.
- The RCU (if fitted) confirms the sample is rejected.

Check that the metal detector detects the sample by monitoring the detect bar on the bargraph display and, where applicable, the product is successfully rejected.

1. Press **Test Passed** or **Test Failed** to indicate whether metal was successfully detected.
This returns you to the product test screen where further tests can be carried out if required. When the tests have been run for this product:
2. Press the **Return** key to return to the menu where you selected Performance Test.

Notes on Running a Performance Test

- Always pass the test sample through the detector aperture **with** the product.
- Check that the test sample has been detected by monitoring the bargraph at the top of the User Interface screen.
- Where applicable, check that the reject device operates to reject the test sample.
- Press the **Test Passed** or **Test Failed** key as appropriate to confirm the result.
- If there are more test samples to be checked, repeat these steps for each sample.

Worst Case Testing

Follow the guidelines below to ensure that the detector is tested to its worst case limits.

- Check that detection is satisfactory with the smallest test sample size.
- Check that detection is satisfactory with the largest test sample size.
- Check the operation using two test samples inserted separately one after the other.

7.4.2 Running Multi-Pass Performance Tests



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



Performance tests can only be run for the current running product. It is also necessary for the Test Sample Setup option to have previously been set to specify the sample sizes to use for the performance tests for the product. (Information about configuring the Test Sample Setup option can be found in the User Guide.) If the Test Sample Setup option has not been set for the product, the Performance Test icon is disabled.

When Multi-Pass testing has been enabled and a QA operator logs in using the default access code (444444), a semi-automated test routine starts immediately, bypassing the QA Reports and the Performance Test options. QA-enabled Level 2 and 3 operators, in contrast, need to press the Performance Test key to start the test.

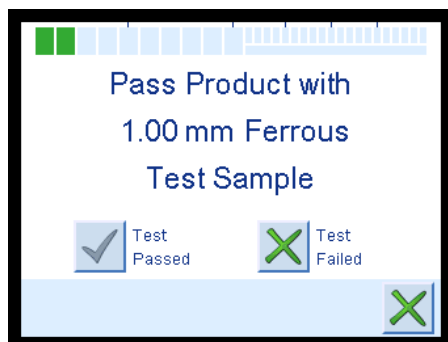


Figure 204:

The number of tests to be run in a Multi-Pass test will depend on the number of passes set up for each sample type, and the number of sample types set up for this product (ferrous, non-ferrous, and stainless steel).

Running the Test

1. Pass the product as instructed by the metal detector.
2. Press **Test Passed** or **Test Failed** to indicate whether metal was successfully detected.

If an RCU Sensor is fitted, the **Test Passed** key is enabled only if the RCU has signalled that the product was rejected, or that the reject mechanism operated. In addition, the signal strength detected during the test is recorded in the PVR Testing section of the QA Settings report.

If you press the **Cancel** key, the screen prompts you to confirm that you want to abort the test. If you confirm this, the test is logged as an aborted test.

In Figure 205, the **Test Passed** key was pressed and the **Results Screen** is displayed.

Results Screen

The screen shows the number of passes (of this sample type) remaining, whether metal was detected, the signal strength (as a percentage of the trigger level), whether the Reject Relay operated, and whether the Reject was confirmed. Note that the Reject Confirmed line will be omitted if a RCU sensor is not fitted.

In each case, press the **Confirm** key to confirm the test result. The screen then displays the next **Pass Product with Test Sample** screen until all the tests in the Multi-Pass run have been completed.

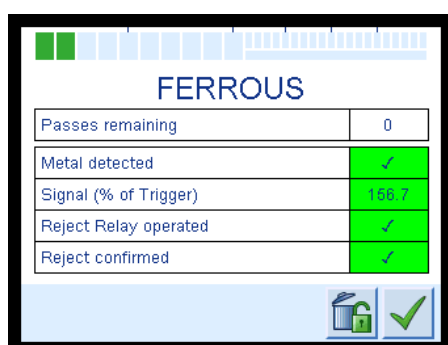


Figure 205:

If metal is detected, but the signal strength is below the benchmark value set up for multi-pass testing, the signal level is shown with an amber background, as in Figure 206.

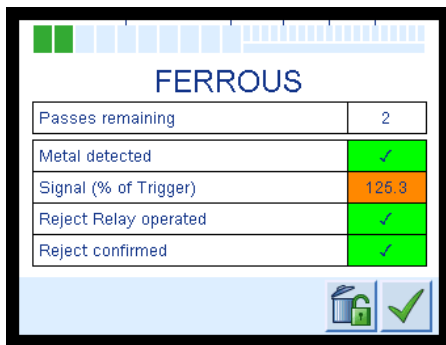


Figure 206:

If metal is detected, but the reject relay fails to operate, the screen shows the result as in Figure 207. This counts as a failed test because the reject mechanism did not operate satisfactorily.

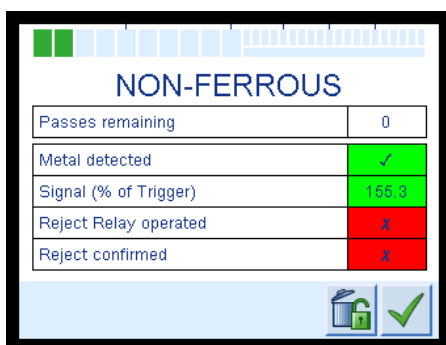


Figure 207:

If metal is not detected, the screen shows the failed test result as in Figure 208.

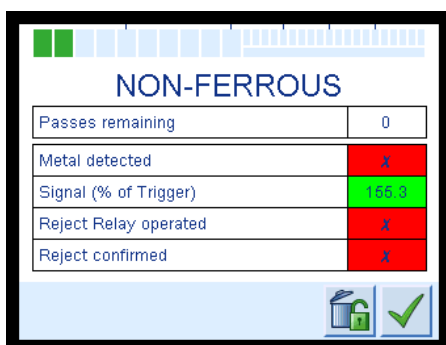


Figure 208:

Performance Testing Complete

When the last test has been performed, Figure 209 is displayed.



Figure 209:

Press the Confirm key to return to the Running Mode display (for dedicated QA operators) or to the menu (for QA enabled User Level 2 or 3 operators).

7.4.3 Running Mode Displays — QA screen

When Performance Testing is enabled, the Running Mode display includes a screen with QA information on it. The screen displayed depends on how Test Mode was configured, see page 149. Both screens show an indication of the Performance Test status:

- **Tested** (GREEN) when a test is not due to be performed.
- **Due** (AMBER) when a test is required.
- **Overdue** (RED) when a test is still required after a defined interval has elapsed.

Packs Mode

In **Packs Mode**, the Test Due field shows the number of packs before the test is required. This always shows the same value.

The **Current Count** field shows the number of packs that have passed since the last test and counts upwards until a test is performed.

When the test is performed, the **Current Count** resets to zero when synchronised to the last test, or to the number of packs passed since the test became Due when synchronised to the first test. The Test Due does not change.

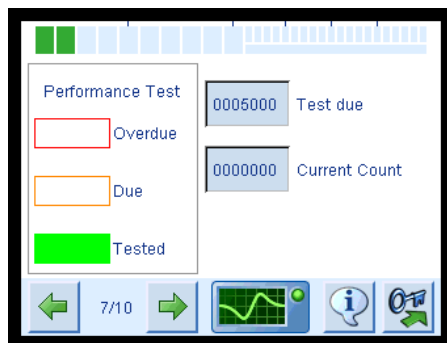


Figure 210:

Time Mode

In **Time mode**, the Test Due field shows the time when a test is required.

The **Current Time** field shows the current system time.

When a test is performed, the **Test Due** field is updated to a new time when the next test is due.

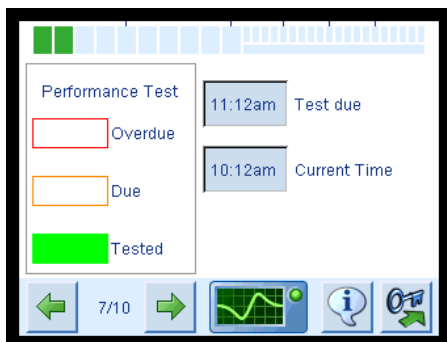


Figure 211:

The Test Log



When Multi-Pass testing is enabled, a log of the test results is made available on the Running Mode screen.

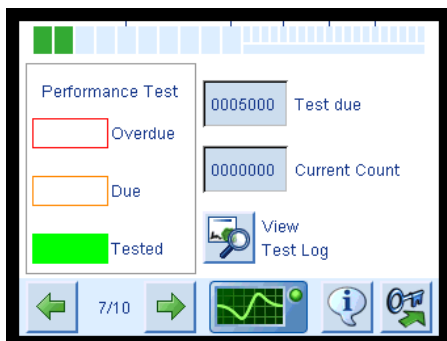


Figure 212:

1. Press the **View Test Log** key to display the log of the test results.

The log shows the date and time of each test, the result, and the Username of the operator who ran the test.

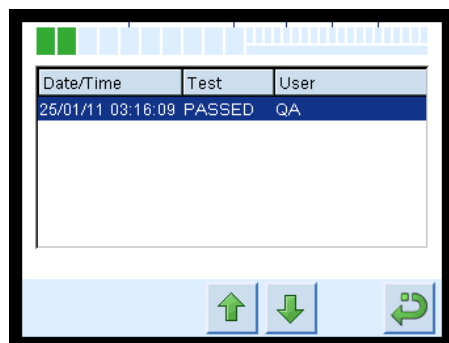


Figure 213:

2. Use the **Up** and **Down** Arrow keys to move through the log.

3. Press the **Return** key to return to the Running Mode screen.

7.4.4 Clear Test Log



If Multi-Pass testing is enabled, the QA Setup Performance Testing menu changes to include an option to clear the Test Log.

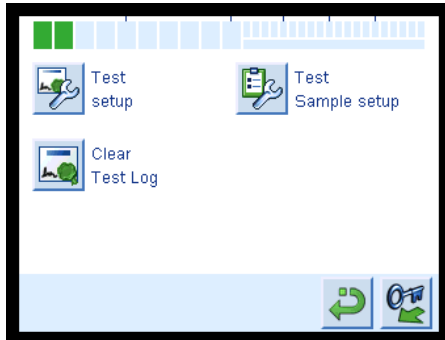


Figure 214:

1. Press the **Clear Test Log** key to clear the test results log. The key then becomes disabled until new entries have been added to the log.



Anyone viewing the log after it has been cleared will see a message informing them that the test log is empty.

8 How to... Guides

This chapter provides brief step-by-step guides and practical advice for the principal tasks involved in setting up and running your Metal Detector. For details on any of the steps involved, follow the references back to the explanations of using the relevant functions in the appropriate Operating Instructions (Chapter 5 to Chapter 7).

SECTION	TITLE	PAGE
8.1	Universal Settings	170
8.2	Automatic Product Setup	170
8.3	Manually Adjusting the Phase and/or Sensitivity	176
8.4	Vector Diagrams	177
8.5	Reject Timers	184
8.6	Set up the Reject Confirmation Unit (RCU)	190
8.7	Set up QA Performance Testing	192
8.8	Set up Product Performance Testing	193

8.1 Universal Settings

The following settings control the way the detector works, regardless of the product being run. Most of these settings can be set up at installation and will not need subsequent alteration.

STEP	REFERENCE
Set the Language for the displays and messages.	Install Level – Section 6.2.
Set the Measurement Units (metric or imperial).	Install Level – Section 6.2.
Set the Date and Time, and also the date format and use of 24 hour clock.	Install Level – Section 6.2 and Advanced Settings, Date and Time – Section 6.3.
Set up the RCU if being used.	Install Level – Section 6.2.
Set the Reject Inhibit if you want to prevent the reject device from operating while you set up the detector. Remember to reset Reject Inhibit OFF when you have finished setting up your detector.	Install Level – Section 6.2.
Set up the Pack Sensor, if present.	Install Level – Section 6.2.
Set up the Reject Settings.	Install Level – Section 6.2.
Set up the Speed Sensor, if present.	Install Level – Section 6.2.
Set the Detector Speed Range.	Install Level – Section 6.2.
Set the Auto Setup Settings to control the operation of the automatic product setup routine.	Advanced Settings, Auto Setup Settings – Section 6.3.
Set the Product Logging options to control the display of product logging histograms.	Advanced Settings, Product Logging – Section 6.3.
Choose whether to enable Product Clustering.	Advanced Settings, Clustering Settings – Section 6.3.
Allocate any customer-configurable inputs and outputs.	Advanced Settings, Customer Inputs/Outputs – Section 6.3.
Set up security code access for all staff who will operate the system.	Advanced Settings, Access Account Management – Section 6.3.

Table 57:



We strongly recommend that you select the Save Installer Settings option (from the Advanced Settings menu, see Section 6.3) as soon as you have installed your detector. This allows the metal detector to be restored to a known state in the event of any future problems.

8.2 Automatic Product Setup

8.2.1 Introduction

You can use the automatic setup feature to automatically set up the product on the metal detector. By passing product through the aperture, the metal detector will determine the:

- Sensitivity
- Phase
- Frequency

The Auto Setup feature is designed to make the setting up of your metal detector as easy as possible, therefore reducing the need to adjust any of the controls as the product passes through the aperture.

Auto Setup can be performed at either User Levels 2 or 3. Figure 215 shows the User Level 3 menu screen.

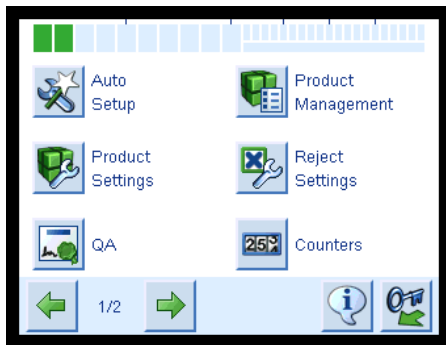


Figure 215:



Before using the automatic setup feature ensure that:

- If a pack sensor is fitted, the pack sensor has been set up correctly. The routine uses the pack sensor to identify that a product is being passed.
- The speed of the product has been set-up correctly.
- The sensitivity limit(s) have been set correctly.



Press the **Auto Setup** key to display the Setup options. Figure 216 appears.

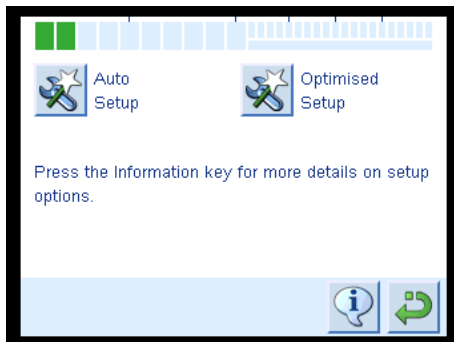


Figure 216:

There are two procedures available to help set up the product on the metal detector:

- Auto Setup
- Optimised Setup



Optimised Setup will not be available for selection if Inverse Detect is enabled.



The **Reject Inhibit (Setup)** feature is enabled by default which means that, during either an Auto Setup or an Optimised Setup, the reject mechanism will not operate. To enable or disable this feature see page 112.



As a general rule, **Reject Inhibit (Setup)** should be utilised in the following way:

- Auto Setup when the product line is not live: **Enabled**
- Optimised Setup when the product line is not live: **Enabled**
- Optimised Setup when the product line is live: **Disabled**



In a minority of cases following automatic setup, it may be necessary to manually trim the phase and/or sensitivity to optimise performance. Refer to page 176 for details on how to do this.



See "Auto Setup Settings", page 112 on how to view or alter the settings for the automatic product setup routine.



Remember to record all settings on the Settings Sheets in Chapter 14 at the rear of the manual.

Passing Products through the Detector

The product should be moving continuously through the aperture: the detector will not operate with a stationary product held in the aperture.

To ensure that the detector is set up correctly and will operate satisfactorily during normal production, we recommend that the product used for automatic set up is passed through the detector in the worst case position and orientation which could occur during normal production.

The worst case product effect condition is when the greatest disturbance of the coil system and the largest product signal is experienced. This occurs when the coil system condition changes from no product to maximum product.

With individual or boxed/cartoned products, the worst case product effect condition occurs as the product enters and leaves the detector. If the product is rectangular the product effect signal will generally be more severe if the product enters the detector aperture long-edge leading, as opposed to short-edge leading. The gaps between the products will create the worst case product effect condition. If successive products are touching, a reduced product signal will result.

For the majority of product types, the worst case condition occurs the closer the product is to the faces of the detector aperture.

The technique of setting up to the worst case product effect condition will ensure that no false product rejections occur during normal running conditions.

8.2.2 Performing an Auto Setup



If the **Auto Freq Selection** field is not selected the automatic setup will attempt to set up the detector at the currently selected Operating Frequency setting. Refer to page 112.

The Auto Setup procedure requires an operator to pass the product through the metal detector's aperture at specific intervals, either once or several times, whilst the product line is temporarily halted.

Auto Setup should be selected:

- If the Operating Frequency has not been determined.
- For single product setup.

- For dry products or for products with minimal moisture content variation.

In order to use the automatic setup, it will be necessary to control the flow of product through the detector to enable stopping and starting of the product flow when requested by the automatic setup routine. You cannot use the Auto Setup feature to set up products on a continuously running product line.

During the Auto Setup process, you will not be required to take any action for most of the displays other than to pass the product when instructed. Most of the displays are simply to inform you of what is happening and require no intervention. Where any intervention is required, the display will explain what needs to be done.

Auto Setup can be configured for fixed or automatic frequency selection, and its preset performance level can be controlled. This is achieved by using the **Auto Setup Settings** option described on page 112.

Before pressing the **Auto Setup** key:

- Ensure that the conveyor is running.
- Ensure that no product is passing through the detector.
- Select a sample product.

Procedure

To perform an Auto Setup:

1. Press the **Auto Setup** key as seen in Figure 216. Figure 217 appears.



Figure 217:

2. Pass the product through the detector when requested. A countdown timer indicates the time remaining to perform this action.
To terminate the Auto Setup procedure for this product, press the **Cancel** key. If the Auto Setup is terminated for any other reason than human intervention, a different message will display to inform you why the termination occurred.
3. When the automatic setup routine has been successfully completed, the screen displays a message to confirm this, then returns to the User Level menu.

8.2.3 Performing an Optimised Setup

Optimised Setup can analyse multiple samples over a prolonged period of time on a continuously running product line to reduce the downtime on a production line. Using Optimised Setup can also establish an improved level of sensitivity due mainly to the refined shape of the detection envelope.

Optimised Setup should be selected:

- When an existing Auto Setup needs optimising, where the Operating Frequency is known and the production line is active.
- When no Auto Setup has been performed but the product has been created, the Operating Frequency has been set and the production is active.
- For products with a high moisture content or a known moisture content variation.



When an Optimised Setup is performed, the new product will pass through the aperture while the metal detector is still configured with the existing settings. The new settings will then take precedence once they have been established by the Optimised Setup. If the **Reject Inhibit (Setup)** feature is enabled, it is advisable to re-test any product that may have passed through the metal detector against the new settings.



If an Optimised Setup is performed on a 'live' production line it is advisable to disable the **Reject Inhibit (Setup)** feature so that any contaminated products can be rejected. This assumes that the product being optimised already exists as a product on the metal detector.



If Boost has been manually enabled on a product and an Optimised Setup performed, Boost will be inhibited for that product and will have to be manually enabled again.

To enable or disable the reject mechanism during the setup, see the **Reject Inhibit (Setup)** feature on page 112.

Before pressing the **Optimised Setup** key, make sure the product line is moving.

Procedure

To perform an Optimised Setup:

1. Press the **Optimised Setup** key as seen in Figure 216. Figure 218 appears.



Figure 218:

2. When ready to proceed, press the **Run** key to start sampling. Once sampling begins, Figure 219 appears.



Figure 219:

3. A countdown timer indicates the sampling time remaining. Either wait for the timer to countdown to zero or press the **Stop** key to conclude sampling. Once sampling is complete, Figure 220 appears requesting you to verify the setup.



Figure 220:

4. Press the **Confirm** key to accept and store the new settings. Alternatively, press the **Cancel** key to abandon the procedure and revert to the previous settings. If neither key is pressed within 10 minutes, the Optimised Setup procedure will be cancelled and the previous settings reapplied.
- There is an option to compare the new settings against the previous settings by pressing the **View New Settings** key on Figure 220. Figure 221 will appear. Once viewed, press the **Return** key to return to the **Verify Setup** screen.

Parameters	Old	New
Sensitivity	886	905
Sensitivity 2	475	420
Phase	94.02	92.82
Phase Tolerance	0.0	0.6

Figure 221:

8.2.4 Testing the Sensitivity

Passing the product through the detector aperture should now give 'n' number of segments on the bargraph display, where 'n' is the Auto Setup Level set at the Install Level (refer to Section 6.3).

Test the sensitivity of the detector by passing metal samples through the aperture of the detector (preferably on or in the product). If required, manually adjust the Sensitivity (User Level 3 **Product Settings** option, page 82 to achieve the required performance standard.

Note that following automatic setup, the sensitivity may have been limited by the vibration characteristics of the system. If this is the case, ensure that manually increasing the sensitivity does not cause the detector to trigger from system vibration.

The screen may display a message telling you that the Auto Setup failed. This can occur for one of the following reasons:

1. The detector is sensing a signal when there is no product passing through the aperture. Repeat the automatic setup and ensure that no product is passing through the detector when instructed, and that no product or metal is close to the aperture and influencing the detector. Check that the Sensitivity Limit settings have not been set too high (refer to Section 6.3).
2. The automatic setup has requested you to 'Pass product through aperture' and no product has been sensed within the required period. Repeat the automatic setup and ensure that the product is passed through the aperture when requested.

3. The automatic setup has not been able to setup correctly due to the size of the product signal. If the Auto Freq Selection field is not selected (see page 170), use the User Level 3 **Product Settings** option (refer to page 82) to adjust the frequency to a lower setting if available.



In a minority of cases following automatic setup, it may be necessary to manually trim the phase and/or sensitivity to optimise performance. Refer to page 176 for details on how to do this.

8.3 Manually Adjusting the Phase and/or Sensitivity

The objective of the following procedure is to ensure that the setting of phase and sensitivity are optimised following automatic setup.

The correct setting of the phase will be one value which will give minimum signal from the product on the bargraph display, this is known as the **null point** setting. Changing the phase setting up or down in value from this setting will increase the amplitude of the signal.

The correct setting of the sensitivity will be a value which gives a peak signal from the product of 'n' segments on the bargraph display, where 'n' is the Auto Setup Level set at the Install Level (refer to Section 6.3 "Advanced Settings", page 110, subsection Auto Setup Settings).

1. Pass the product through the aperture in its normal manner to create a worst case product effect signal; for more details refer to **Passing Products through the Detector** in page 172.
2. For the purpose of this adjustment procedure only, adjust the sensitivity so that the peak signal from the product gives 10 segments on the bargraph display (User Level 3 **Product Settings** option, page 82).
3. To verify or optimise the null point set by the automatic setup, increase the phase setting in steps of 1° and at each step observe if the amplitude of product signal indicated on the bargraph display reduces. If an increase in product signal is observed, then decrease the phase setting in steps of 1° and at each step observe if the amplitude of product signal indicated on the bargraph display reduces.

For example if the automatic setup value is 90°, and as the phase setting is increased there is a clear reduction in signal as we change from 90° to 91°, and then from 91° to 92° the signal starts to increase again, this indicates that the null point is between 90° and 92°.

4. Now reduce the phase setting in steps of 0.2° i.e. 91.8°, 91.6°, 91.4°, 91.2°, etc. until the product effect signal is reduced to a minimum and then just starts to increase again.

For example, if as the setting is reduced there is clear reduction in signal from 90.8° to 90.6°, and then from 90.6° to 90.4° the signal starts to increase again, this indicates that the null point is between 90.8° and 90.4°. Using the 0.1° digit, adjust the phase setting up and down until minimum signal, i.e. the null point, is found.

5. Although not always necessary, you can determine a more precise null point by now using the 0.01° digit in a similar manner to the 0.1° digit as described in step 4.

The phase control circuit is now aligned to the product signal. Next adjust the sensitivity so that the product signal gives the required number of segments on the bargraph display; refer to the Note below.

6. Check the susceptibility of the detector to vibration, if unacceptable (i.e. system vibration is showing on the bargraph) reduce the sensitivity until acceptable.
7. Press the **Confirm** key to store the new settings in memory.



When using the phase control to minimise product signals, the detector may become more susceptible to vibration. The final setting of the sensitivity may be limited by vibration effects rather than product effect.

8.4 Vector Diagrams



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.



With Vector Diagrams enabled, User Level 3 operators will see the Advanced Settings key on the Product Settings screen. If Vector Diagrams has not been enabled, or if the software version is earlier than F4.2.0, the Advanced Settings key will not be displayed. To enable or disable Vector Diagrams, see page 137.

The User Level 3 Product Settings option provides facilities for manually adjusting the Phase and Sensitivity settings for the product to optimise performance. Before software version F4.2.0, the adjustment procedure simply involved altering the numerical values of the settings until the optimised response on the bargraph was observed.

Vector Diagrams allow experienced users to visualise product signals in conjunction with the product settings, and is particularly useful for fine-tuning wet-product detection settings and for compensating against inconsistency between products. The display presents a simple, visual representation of the settings so that the operator can better understand the consequences of the changes being made.

The Vector Diagrams display can be enabled or disabled from the Advanced Settings menu and are normally employed after the product has been set up for the metal detector, which establishes the correct product frequency setting.

When a product is passed through the metal detector (with Vector Diagrams enabled) a product signal is generated that can be displayed on screen. The product signal is represented on the display by a series of blue dots, whereas the detection envelope is represented by a red ellipse, as shown in Figure 222.

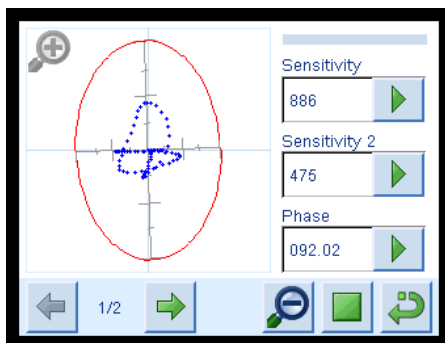


Figure 222:

Once the product signal is generated, the appropriate detection settings (the Sensitivity, Sensitivity 2, Phase and Phase Tolerance) are established and can be visualised on the display too. The combined effect of the detection settings creates a detection envelope, which can be adjusted to set the optimum detection settings.

One of two detection envelopes will appear, depending on how the product was originally set up. A product set up using the standard Auto Setup procedure will see the envelope resemble an ellipse as seen in Figure 223, whilst a product set up from an Optimised Setup will see its envelope interpreted differently, as seen in Figure 224.

If, however, the Phase Tolerance is set to 0, the envelope will resemble the standard elliptical detection envelope found in Figure 223.

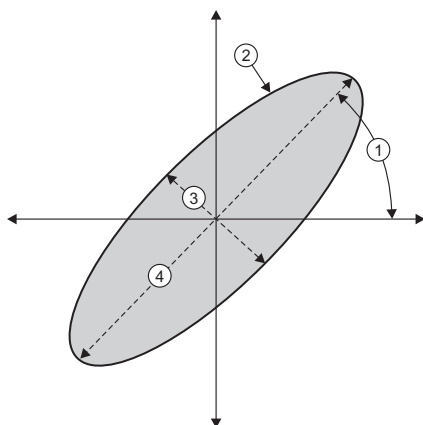


Figure 223: Auto Setup Detection Envelope

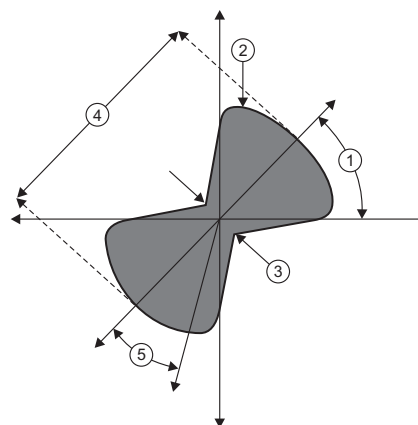


Figure 224: Optimised Setup Detection Envelope

KEY	DESCRIPTION
1	Phase (controls the angle of the envelope)
2	Trigger line
3	Sensitivity (controls the width of the envelope)
4	Sensitivity 2 (controls the length of the envelope)
5	Phase Tolerance (controls the shape of the envelope — Optimised Setup only)

The Sensitivity and Sensitivity 2 settings adjust the dimensions of the two axes of the detection envelope, whilst the Phase adjusts the angle of the main axis of the envelope. The Phase Tolerance is specific to an Optimised Setup and can be adjusted so that any pack-to-pack or temperature drift between products can be compensated for. Details on adjusting the Phase Tolerance can be found on page 180.

The Vector Diagram feature has two adjustment modes available to modify the detection envelope: **Coarse** and **Fine**.

8.4.1 Coarse Adjustment Mode

This is known as the Coarse Adjustment mode because the purpose is to shape the detection envelope until it approximately surrounds the product signal. In this mode, the X and Y axes are scaled 1 to 1, as shown in Figure 225.

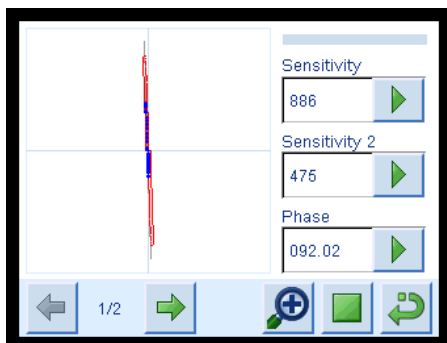


Figure 225:

Having set up the product beforehand and pressed the **Advanced Settings** key, pass the product through the metal detector again. The product signal and the current Sensitivity and Phase settings are displayed on screen.

Adjust the Sensitivity, Sensitivity 2 and Phase settings. You can either do this manually by selecting the appropriate parameter then use the Arrow keys to change the setting, or simply press the Autofit key (If operating in Gated Mode). For ease of use press the **Autofit** key. See page 183 for more details on the Autofit key.



Sensitivity, Sensitivity 2 and Phase can be conveniently adjusted together by selecting any of the settings, without the need to select the Confirm Key in between.

When the detection envelope is rotated (achieved by adjusting the Phase angle) to within a percentage of the measured product phase, the display automatically changes to give a magnified representation of the Vector Diagram, which is indicated by the Zoom icon in the top left corner. This initiates the Fine Adjustment Mode.



If it is proving difficult to shape the detection envelope so that it automatically zooms in, press the **Zoom In** key to manually zoom into and magnify the Vector Diagram.

Note that when using the Manual Zoom button the Auto Zoom mode will be overridden. Please also be aware that using the Manual Zoom when the phase alignment between the Product Signal and the Phase angle is too large, the display may produce an undesirable distorted view.



Press the **Zoom Out** key to manually zoom out from a Vector Diagram.

8.4.2 Fine Adjustment Mode

This is the fine-tuning part of the procedure, where the settings can be adjusted by selecting the appropriate parameter and using the Arrow keys to make the change. In this mode, the axes of the detection envelope are scaled so that the position of the product signal can be seen relative to the detection envelope.

The Zoom icon in the top left of the display indicates that the axis ratio of the detection envelope has been changed in order to show the data more clearly. See Figure 226.

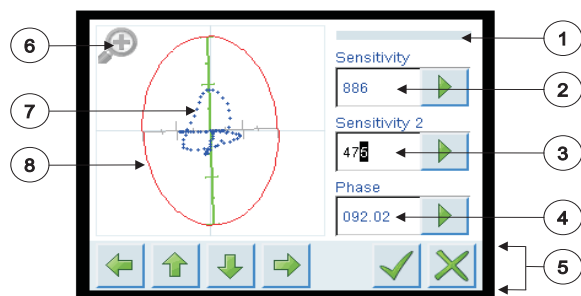


Figure 226:

KEY	DESCRIPTION
1	Detect Bar
2	Sensitivity
3	Sensitivity 2
4	Phase Angle
5	Navigation Bar
6	Zoom Mode

KEY	DESCRIPTION
7	Product Signal
8	Detection Envelope

When you adjust Sensitivity or Sensitivity 2, the vector diagram shows the relevant axis of the detection envelope in a contrasting bright green colour. The markers on the detection envelope axes indicate 25%, 50% and 75% of the detection threshold. If the detection threshold is exceeded, the Detect Bar will illuminate red.

When you have finished adjusting the settings, press the **Confirm** key to save the new settings. Alternatively, press the **Cancel** key to abandon the changes and leave the settings unaltered.

Press the **Return** key to return to the first Product Settings screen.

8.4.3 Phase Tolerance

If Optimised Setup was used to set up the product instead of Auto Setup, Screen 2 will allow the Phase Tolerance to be adjusted. Adjusting the Phase Tolerance changes the shape of the envelope to compensate for any pack-to-pack or temperature drift phase variations that might exist between products as they pass through the aperture.

Screen 1, Figure 227, remains the same and allows the Sensitivity, Sensitivity 2 and the Phase to control the size of the detection envelope Figure 228.

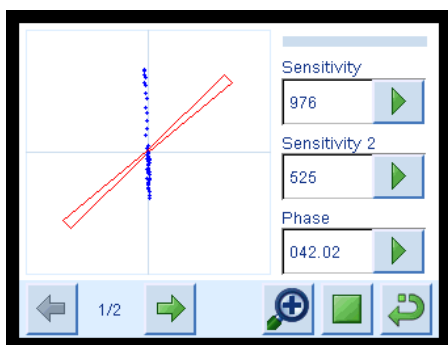


Figure 227:

The most obvious difference is the actual shape of the detection envelope. Figure 228 shows the detection envelope established through an Optimised Setup whilst Figure 229 shows the standard Auto Setup detection envelope.

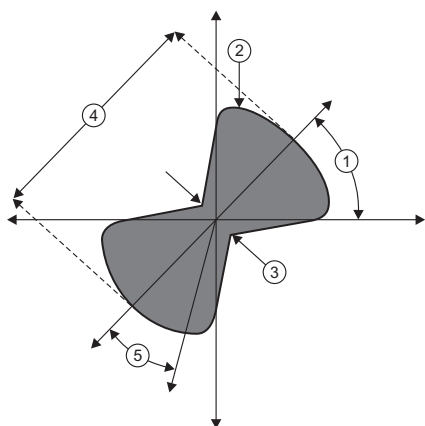


Figure 228: Optimised Setup Detection Envelope

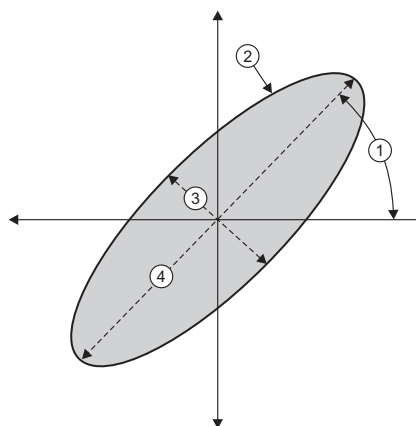


Figure 229: Standard Auto Setup Detection Envelope

KEY	DESCRIPTION
1	Phase (controls the angle of the envelope)
2	Trigger line
3	Sensitivity (controls the width of the envelope)
4	Sensitivity 2 (controls the length of the envelope)
5	Phase Tolerance

Screen 2, Figure 230, enables the Phase Tolerance parameter to be adjusted.

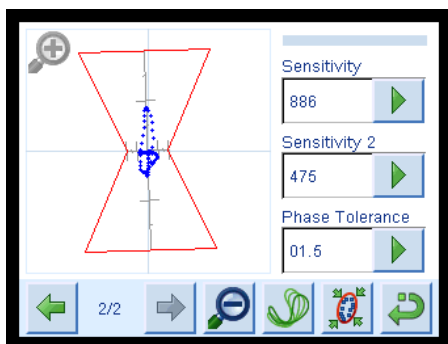


Figure 230:

The Phase Tolerance can be set between 0 and whatever the Phase Tolerance High Limit is set to. This is a value between 1 and 10 and is usually determined at the time of installation.



If the Phase Tolerance High Limit needs to be changed, please contact your local SAFELINE service representative.

Figure 231 shows the new-shaped detection envelope that was established through an Optimised Setup, superimposed (for the purpose of demonstration) over the standard detection envelope.

As the Phase Tolerance is adjusted, the shape of the detection envelope will change. Figure 231 shows the Phase Tolerance set to a high level, whilst Figure 232 demonstrates what the envelope will look like when it is set low. If the Phase Tolerance is set to 0, the envelope will resemble the standard elliptical detection envelope found in Figure 229.

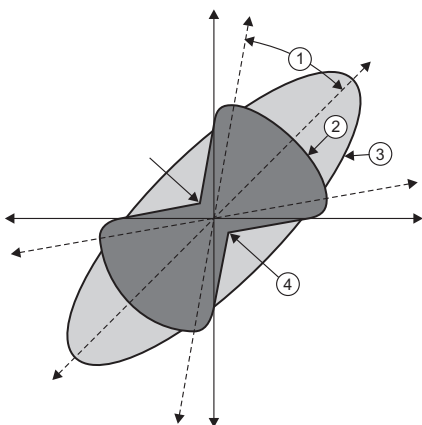


Figure 231:

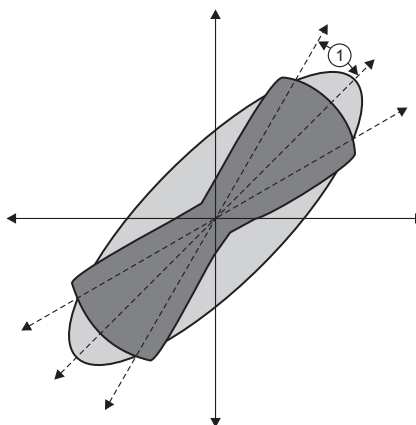


Figure 232:

KEY	DESCRIPTION
1	Phase Tolerance (adjustable tolerance for phase variations)
2	New trigger line
3	Previous trigger Line
4	Sensitivity (controls the width of the envelope at its narrowest point)



Selecting the Auto Setup procedure to set up the product will always set the Phase Tolerance to 0.



Optimised Setup will not be available for selection if Inverse Detect is enabled.

8.4.4 Operating Modes

The details of the Advanced Settings screen with the Vector Diagrams depend on the mode of operation: **Gated Mode** or **Continuous Mode**.

The **Gated Mode** operating display will appear when a Pack Sensor is **in** use **AND** the speed setting is Fixed. Gated mode is primarily used for packaged product or Continuous Mode Display Options has been setup.

The **Continuous Mode** operating display will appear when a Pack Sensor is **not** in use or when the speed setting is Variable. Continuous mode is primarily used for non-discrete product. Both modes of operation are described in the following section.

In Gated and Continuous modes, the advanced settings consists of four parameters that can be adjusted: **Sensitivity**, **Sensitivity 2**, **Phase** and **Phase Tolerance**. This is different to the non-advanced, standard adjustment mode where Level 3 operators can only adjust the **Sensitivity** and **Phase**, with the second sensitivity control (Sensitivity 2) being adjusted automatically in conjunction with the Sensitivity parameter. Similarly, a Level 2 operator can only adjust the Sensitivity.

Both modes of operation are described in the following section.

Refer to Section 6.2 "Install Settings", page 100 to configure the Pack Sensor and speed settings on the metal detector to determine the Operating Mode.

Gated Mode Display

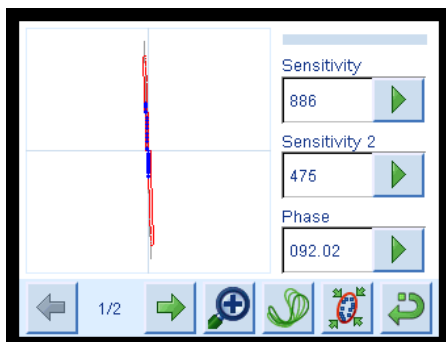


Figure 233:

There are two subsidiary modes within the Gated Mode Display Options: **Clear** mode and **Persist** mode. The default is Clear mode.

Clear Mode



Press the **Clear** key to enable Clear mode.

By pressing this, the display is cleared before each new product signal is drawn for each product that passes through the detector.

When you select this, the **Autofit** key is displayed.

Persist Mode



Press the **Persist** key to enable Persist mode.

By pressing this, the old product signal data is left on the display. This enables you to see how the signal data changes over time, so that you can see a graphical representation of the consistency or stability of the product.

The controls for the product settings operate in the same way for both modes, as described below.

When you select this, the **Autofit** key is removed from the display.

Autofit



Press the **Autofit** key to automatically determine the settings for Sensitivity and Phase based on the vector data that has been collected.

The Autofit function is intended as a quick way to adjust the settings so that they are reasonably close to the optimum values. It will set the target signal level on the bargraph to 5 bars. However, unlike Auto Setup, Autofit will not take into account the operating frequency or make allowances for any system vibration when determining the settings. Subsequently, Autofit is not intended as a replacement for Auto Setup.

If Autofit key does not appear on the display, check that you are operating in Clear mode by pressing the **Clear** key.

If, after running Autofit, you need to fine-tune the Sensitivity, Sensitivity 2 or the Phase, select the appropriate parameter then use the Arrow keys to change the setting.



If Optimised Setup has been used, pressing Autofit will set the Phase Tolerance value to zero. The Optimised Setup procedure must be run again to re-establish the Phase Tolerance value.

Continuous Mode Display Options

The principles of acquiring a product setting are very similar to those of Gated Mode, however Continuous Mode operates with **Run** and **Stop** keys.

In **Run** mode, the detector collects product signal data and displays it on screen, but will not adjust any of the settings. In **Stop** mode, you can manually adjust and optimise the Sensitivity, Sensitivity 2 and the Phase settings for the product, as shown in Figure 234.

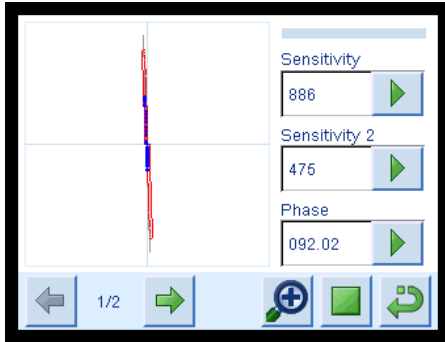


Figure 234:

The Run Key



Press the **Run** key to clear the display and enable the detector to start continuously collecting data and update the vector diagram as the product passes.

The Stop Key



Press the **Stop** key to stop collecting data and begin adjusting the settings. Note that any adjustments made to the settings must be performed manually.

When you have finished adjusting the settings, press the **Confirm** key to save the new settings. Alternatively, press the **Cancel** key to abandon the changes and leave the settings unaltered.

8.5 Reject Timers

8.5.1 About Reject Timers

A range of programmable reject timers is available to cover the variety of reject devices required for different applications. The reject timers are programmable for immediate reject, delayed reject, and gated (or synchronised) reject operation. The reject timers can be time-based for constant speed product lines, or distance-based for variable speed product lines and those that may be stopped or started by external equipment.

For gated reject operation, the system must have a Pack Sensor fitted. For distance-based operation, a Speed Sensor must be fitted.

Use the Install Level settings (Chapter 6) to specify if the reject timer is gated or non-gated and whether its operation is time-based or distance-based. In addition, you can enter reject mechanism and pack sensor (when fitted) distances to ensure that initial reject timer values will need minimal adjustment at User Level 3. For details, refer to Section 6.2, subsections **Pack Sensor Setup**, **Reject Settings** and **Speed Sensor Setup**. The Install Level settings must be configured before setting up reject timer values for your products.

Reject timer values can be adjusted at User Level 3, which is described in Section 5.3 under the subsection Reject Settings. A semi-automated timer setup routine is provided for gated reject timer operation; this simplifies the setting up of a relatively complicated reject timer and minimises the possibility of incorrect setup.

Recommended Applications

Table 8-2 below lists various types of reject mechanisms along with the recommended timer type for each mechanism.

RECOMMENDED APPLICATIONS			
Reject Mechanism	Timer Type		
	Immediate Reject	Delayed Reject	Gated Reject
Timed Audible Alarm	Ok	Ok	N/A
Conveyor Stop	Ok	Ok	N/A
Gravity Fall Systems	Preferred	Ok	N/A
Instant Reject with Timed Reject Period	Preferred	N/A	N/A
Retracting Band	N/A	Ok	N/A
Air Blast	N/A	Ok	Ok
Punch/Pusher	N/A	N/A	Ok
Drop/lift Flap	N/A	Ok	Ok
Plough action diverter	N/A	Ok	Ok
Flip action diverter	N/A	N/A	Ok

Table 64:

N/A = Not Applicable for this reject mechanism.

8.5.2 Reject Timer Types

This section details the available reject timer types and describes and illustrates their settings.

There are two types of reject timer: Non-Gated and Gated.

Non-Gated Reject Timers

There are two types of Non-Gated Reject Timer: Immediate and Delayed.

Immediate Reject Timer

The immediate reject timer is used in applications requiring instant rejection of contaminated products and can be used with either packaged or loose products.

For applicable reject mechanisms, refer to Table 64.

Delayed Reject Timer

The delayed reject timer is ideal for use with loose products where the reject device is situated some distance from the metal detector.

The delayed reject timer is also suitable for use with packaged products but is not as accurate as the gated reject timer.

The settings below can be adjusted at User Level 3, which is described in Section 5.3 under the subsection **Reject Settings**.

For applicable reject mechanisms, refer to Table 64.

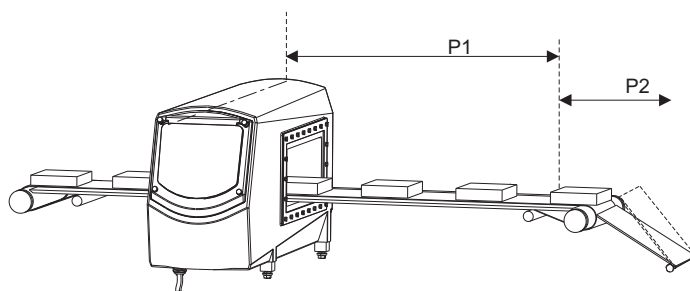


Figure 235:

KEY	DESCRIPTION
P1	Detect To Reject
P2	Reject On

The settings below can be adjusted at User Level 3, which is described in page 87.

Detect To Reject (P1)

This is the delay between metal being detected in the aperture and the reject device activating. Note that for Immediate Reject timer operation, this value is set to zero.

Reject On (P2)

This is the duration the reject device is activated for after the Detect To Reject delay has expired. The Reject On duration is automatically increased with larger contamination sizes to ensure that all of the contaminant is removed.

Gated Reject Timer

The gated timer is used to give precise rejection of packaged or individual products. The use of gating via a pack sensor ensures that the rejection is independent of the position or size of the metal contaminant within the product.

For applicable reject mechanisms, refer to Table 64.

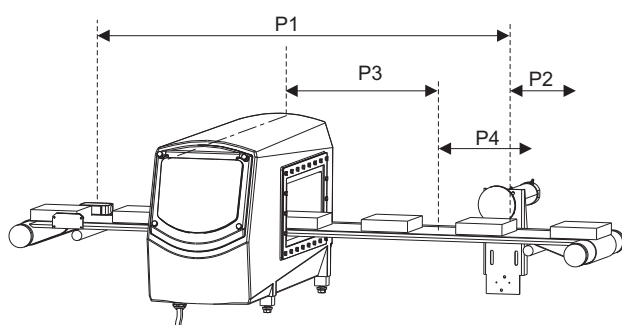


Figure 236:

KEY	DESCRIPTION
P1	Pack To Reject
P2	Reject On

KEY	DESCRIPTION
P3	Detect To Gate
P4	Gate Open

Pack To Reject (P1)

This is the delay between the leading edge of the pack being detected, by the pack sensor, and the reject device being activated, when the pack is in the optimum reject position.

Reject On (P2)

This is the duration the reject device is activated for after the Pack To Reject delay has expired.

Detect To Gate (P3)

This is the delay between metal being detected in the aperture and the start of the Gate Open. Note that this setting cannot be adjusted by the User.

Gate Open (P4)

This duration is initiated by the Detect To Gate and only during this period can a contaminated pack be rejected. This duration ensures that packs shall be rejected regardless of contamination position within the product. The Gate Open duration is automatically increased with larger contamination sizes. Note that this setting cannot be adjusted by the User.



When the system uses a Speed Sensor and the timer operation is distance-based (as opposed to time-based), the timer parameters are displayed on the screens as pulses. For example Detect To Reject Pulses (as opposed to Detect To Reject Time). The word pulse when used in this context refers to the distance the product will move between successive pulses from the Speed Sensor. Thus if the Speed Sensor has a setting of 100 pulses/m, a **Detect To Reject Pulses** setting of 75 is equivalent to a product moving a distance of $75 \times (1/100) = 75$ cm.

8.5.3 Important Information for Timer Setup

Sample Size Selection

For non-gated reject operation, use small size metal contaminants during the setting of the timers. The use of large contaminants will produce errors in the settings and affect the rejection process.

Use the smallest metal sample that can be detected; this should give approximately 2 to 3 red segments on the bargraph.

If this is not possible, use the smallest sample available and adjust the sensitivity setting so that the metal contaminant gives a bargraph indication of approximately 2 to 3 red segments.

For gated reject operation, where a semi-automatic routine simplifies the setup, use a metal sample size that will comfortably trigger the detector. This should give a minimum of approximately 15 red segments on the bargraph. The semi-automatic routine will indicate if the test sample is too large.

Sample Position on Product

For non-gated reject operation of packaged (as opposed to loose) products, the position of the contaminant sample on the product is important during the setting of the timers. Set the Reject On time with the sample positioned at the front/leading edge of the product.

For delayed reject operation, set the **Detect To Reject** time with the sample positioned at the rear/trailing edge of the product.

For gated timer operation, the semi-automatic routine directs you as to the required sample position.

Product Orientation

Sample products or product packs used to set up the timer should be passed through the detector aperture at their normal speed and without skewing or slipping.

Pack Length Limitation for Packaged Products

Where a variety of individual products with differing lengths are being monitored, ensure that for a particular timer setting the variation in pack length does not exceed $\pm 25\%$ of the pack length used to set the timer.

If the variation in pack length is greater than $\pm 25\%$ of the length used to set the timer, a different product setting should be used with another timer setting for those packs that fall outside the limit.

Positioning of Pack Sensor for Gated Timers

- Position the pack sensor such that the beam from the pack sensor is at 90° to the flow of the product along the conveyor.
- The pack sensor must be positioned on the product in-feed side of the detector.
- Ensure that the pack sensor (and reflector if fitted) are not affecting the metal detector by infringing upon the metal detector's Metal Free Zone.
- At conveyor speeds of 61 m/min (200 ft/min) or greater, the pack sensor must not be positioned less than 0.5 m (1.5 feet) from the reject device.
- The height and alignment of the pack sensor beam must be set so that all packs break the beam at the same leading edge position irrespective of the type or of the size of the pack.

8.5.4 Setting up and Verifying the Reject Operation

The correct operation of the reject device/mechanism is an important part of the system and this section details a step-by-step procedure for setting up the reject timer and verifying reject operation. Reject timer values are adjustable at User Level 3, which is described in Section 5.3 under the subsection **Reject Settings**.

Non-Gated Reject Timer

Immediate Reject Timer

Setup

1. Select the **Detect To Reject** parameter and set the value to zero.
2. Select the **Reject On** parameter.
 - For timed audible alarm and conveyor stop applications, set the **Reject On** value to the required time.
 - For a system fitted with a reject device and inspecting **packaged** or **separate products**, pass the product with the metal contaminant positioned at the rear/trailing edge through the detector aperture. Adjust the **Reject On** time so that the metal contaminated product is rejected consistently and accurately.
 - For a system fitted with a reject device and inspecting **loose products**, pass the product with the metal contaminant through the detector aperture. Adjust the **Reject On** time so that the metal contaminated product is rejected with the minimum of wasted product.

Procedure

Verification

1. For a system fitted with a reject device and inspecting **packaged** or **separate products**:

- 1.1. Check that the reject device operates correctly with the metal contaminant at the front/leading and rear/trailing edge on the pack.
 - 1.2. Check that the reject device operates correctly with different sizes of metal contaminant.
2. For a system fitted with a reject device and inspecting **loose products**:
 - 2.1. Check that the reject device operates correctly with different sizes of metal contaminant.
 - 2.2. Also check that the reject device operates correctly with two metal contaminants spaced at different distances apart on the conveyor belt.

If for any reason the timer setting is not correct, return to Section 5.3, subsection **Reject Settings** and repeat the above **Setup** steps as appropriate.

Delayed Reject Timer

Procedure

Setup

1. For **packaged** or **separate products**:
 - 1.1. Select the **Detect To Reject** parameter. Place the metal contaminant at the rear/trailing edge of the product. Pass the product with the metal contaminant through the detector aperture, ensuring that the product does not slip or skew. Adjust the **Detect To Reject** time so that the reject device operates just as the metal contaminant reaches it.
 - 1.2. Select the **Reject On** parameter. Place the metal contaminant at the rear/trailing edge of the product. Pass the product with the metal contaminant through the detector aperture, ensuring that the product does not slip or skew. Adjust the **Reject On** time so that the metal contaminant is rejected with the minimum of wasted product.
2. For **loose products**:
 - 2.1. Select the **Detect To Reject** parameter. Pass the product with the metal contaminant through the detector aperture. Adjust the **Detect To Reject** time so that the reject device operates just as the metal contaminant reaches it.
 - 2.2. Select the **Reject On** parameter. Pass the product with the metal contaminant through the detector aperture. Adjust the **Reject On** so that the metal contaminant is rejected with the minimum of wasted product.

Procedure

Verification

1. For **packaged** or **separate products**:
 - 1.1. Check the setting of the **Delayed Reject Timer** by passing the product and metal contaminant through the aperture of the detector.
 - 1.2. Check that the reject device operates correctly with the metal contaminant at both the front and rear of the pack.
 - 1.3. Check that the reject device operates correctly with different sizes of metal contaminant.
2. For **loose products**:
 - 2.1. Check the setting of the **Delayed Reject Timer** by passing the product and metal contaminant through the aperture of the detector.
 - 2.2. Check that the reject device operates correctly with different sizes of metal contaminant.
 - 2.3. Also check that the reject device operates correctly with two metal contaminants spaced at different distances apart on the conveyor belt.

If for any reason the setting of the **Delayed Reject Timer** is not correct, return to Section 5.3, subsection **Reject Settings** and repeat the above **Setup** steps as appropriate.

Gated Reject Timer

Setup and Verification

The setup of the Gated Reject Timer is controlled by a semi-automatic routine that directs you through the setup operation and verification.

8.6 Set up the Reject Confirmation Unit (RCU)

8.6.1 Introduction



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

The Reject Confirmation Unit (RCU) on loose-product applications confirms that the reject mechanism has responded at the correct time.

The RCU achieves this by providing a completely parallel reject timer path which allows it, once a contamination has been detected, to determine when the Reject Mechanism is to be activated and deactivated. Following reject deactivation, the RCU waits for a certain amount of time, known as the **Extension Time**, for a signal generated via the Reject Mechanism or the rejected product to confirm reject operation. This signal is produced by a suitably positioned sensor, called a Reject Confirmation (RC) Sensor. The RCU can also be used on variable speed applications provided that a speed sensor is fitted to the metal detector.

8.6.2 RC Sensor

The RC Sensor should be in one of two positions in order to monitor reject operation:

1. On loose product applications, the RC Sensor should confirm that the reject mechanism has reached its full reject position.
2. On packaged product applications, the RC Sensor should confirm that the product has entered the reject bin. This is an important requirement for a system using a gated reject timer as a RC Sensor signal is required for each reject event.

For delayed reject timer operation, the RC Sensor may be positioned as in 1.

The RC Sensor, under normal running conditions, should maintain its output in an inactive state and change to an active state when:

- on packaged product applications, a rejected pack obscures the sensor, or
- on loose product applications, the reject mechanism has reached its full reject position.

The RC Sensor active state will be automatically configured as HIGH or LOW by the RCU Sensor Calibration process. Refer to "RCU Sensor Setup", page 105.

For RC Sensor specifications, refer to Chapter 2 "Technical Specifications", page 19. For connection details, refer to Section 3.8.

8.6.3 RCU Extension Time

This setting is adjustable from the Install Level; refer to "RCU Sensor Setup", page 105, subsection **Reject Confirmation Unit Sensor Setup**. The Extension Time is the period the detector waits from the deactivation of the reject device to receiving a confirmation signal from the RC Sensor. Ensure that an adequate time period is allowed to prevent the generation of false RCU alarm conditions.

8.6.4 RCU Fault Reporting

The Detector will display a **Reject NOT Confirmed** condition, when a rejected pack or reject mechanism operation fails to activate the RC Sensor within the programmed Extension Time period. For gated timer applications, where the reject mechanism is synchronised to the pack sensor, the RCU will continue to monitor the correct rejection of product even under conditions where a number of consecutive packs trigger the metal detector.

The fault display will be shown intermittently, for two seconds in every eight seconds, from the running mode display only and will not prevent the Detector from operating. The RCU relay will also be activated.

Assuming the RC Extension time has been set correctly, the fault condition could be due to either or both of the following:

- The Reject Mechanism has failed to operate or failed to operate at the correct time.
- The RC Sensor has not signalled the RCU to confirm reject operation.

The Detector will clear the display and deactivate the RCU relay when the Reject Confirmation is reset.

For details of connections to the RCU relay contacts and Reject Confirmation Reset, refer to Figure 22, on page 42.

8.6.5 RCU Variable Speed Operation

The best practice approach for variable speed applications with Reject Confirmation (RC) is to use two independent Speed Sensors, as shown in Figure 237.

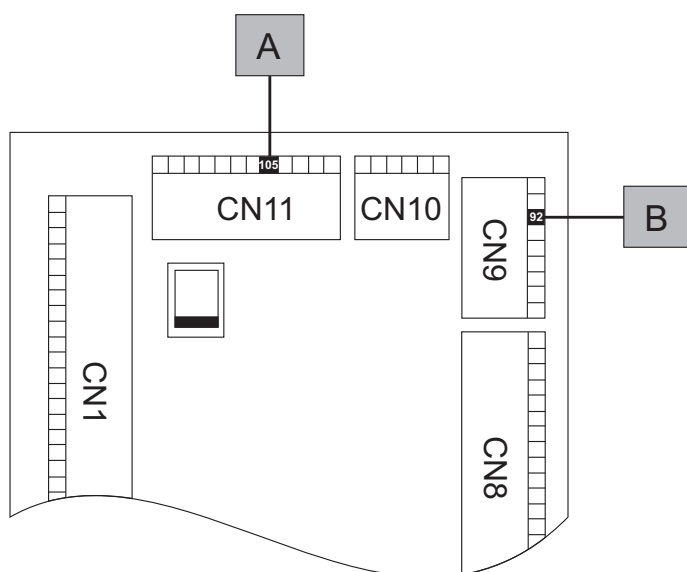


Figure 237: Using Two Speed Sensors

KEY	DESCRIPTION
A	Speed Sensor connected to the Speed Sensor Input (pin 105) to clock the Reject Timer
B	Speed Sensor connected to Programmable Input 1 (pin 92) to clock the RCU Timer

Speed Sensor **A** clocks the Reject Timer whilst Speed Sensor **B** clocks the RCU timer. This will ensure that Reject Confirmation continues to function if either Speed Sensor develops a fault. Note that the Speed Sensors must provide the same frequency of signal (in pulses per metre) for any valid belt speed.

SAFELINE recommends using the best practice approach.

The compromised approach (Figure 238) is to use one Speed Sensor (C) to feed both timer systems but this will result in the possibility of the Reject Timer and Reject Confirmation not functioning if the Speed Sensor develops a fault. Note that both inputs must be wired for the same sensor polarity.

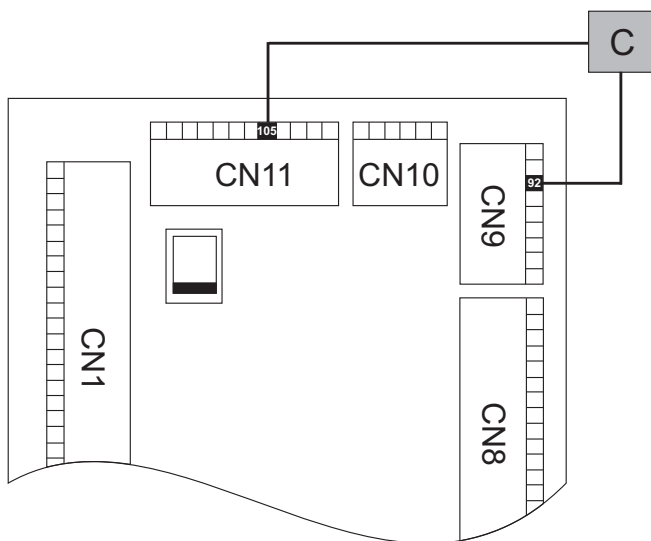


Figure 238: Using One Speed Sensor

KEY	DESCRIPTION
C	Speed Sensor connected to both the Speed Sensor Input (pin 105) and to Programmable Input 1 (pin 92)



Note that when the RCU is used in variable speed mode, Programmable Input 1 becomes unavailable for other functions.

For further details on the User Input/Output Board and its terminal connections, see Section 3.8.

For the Speed Sensor technical specifications, see "Speed Sensor Requirements", page 21.

8.7 Set up QA Performance Testing

The following settings control the way your QA procedures work, regardless of the product being run. Most of these settings can be set up at installation and will not need subsequent alteration.

When details of your products that will pass through the detector have been defined on the system, you will need to set up the Performance Test details for each product.

STEP	REFERENCE
Set the generic performance testing settings.	QA Setup, Test Setup option – Section 7.2
Set the shift times and intervals, and the shift reporting settings.	QA Setup, Shift Reports Setup option – Section 7.2
Set up security code access for all QA Operators who run performance tests or print QA reports.	QA Setup, Manage QA Operators option – Section 7.2
Set up the printer, if present.	QA Setup, Print Functions option – Section 7.2

Table 65:

8.8 Set up Product Performance Testing

8.8.1 Pre-requisites

First set up your detector's universal settings, then set the generic QA Performance Testing parameters. (Refer to Section 8.1 and Section 8.7.)

Then use the Auto Setup routine to set up your products (see Section 8.2). If necessary, manually adjust the sensitivity and phase for individual products. Refer to Section 8.3.

STEP	REFERENCE
Set the Ferrous, Non-Ferrous, and Stainless Steel sample sizes for each product.	QA Setup, Test Sample Setup – Section 7.2
Ensure that the QA Operators have the appropriate samples for running the performance tests.	
The detector will prompt the operator when each performance test is due to be run.	QA Setup, Manage QA Operators option – Section 7.2
Print shift reports.	QA Setup, Print Functions option – Section 7.2

Table 66:

9 Connecting a Printer

This chapter explains how to install and configure a printer to the Metal Detector.

SECTION	TITLE	PAGE
9.1	Printers	196
9.2	Installing the Internal Printer Cable	202
9.3	Printer Kits	206

9.1 Printers

Information transmitted by the metal detector can be transferred directly to paper by using either a Martel or S'print printer, or directly to a PC via the Terminal option. This section is provided for users who want to use the printer option.

If you choose the printer option, a printer kit can be acquired which contains the Custom S'print printer and all the necessary connection hardware and details.

Alternatively, the detector can be configured to drive a Martel dot matrix printer. This printer is often used with SAFELINE Signature products and enables customers with a mix of SAFELINE products to use a common printer. Note, however, that the Switch Group 1 settings, shown on page 199, are not the same for both product groups.

9.1.1 The S'Print-i Printer

The S'Print-i will only work with the R/RB/RZ-Series Profile detector. Figure 239 shows a typical setup for connecting an S'Print-i printer (not to scale).

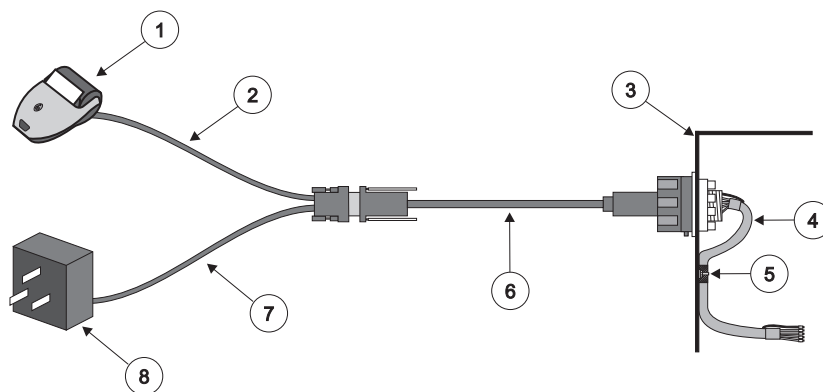


Figure 239:

KEY	DESCRIPTION	COMMENT
1	S'Print-i Printer	Stock Code: 2814-544
2	Cable with RJ11 and 9-way, D-Type Connectors	Stock Code: N/A. Supplied with Printer
3	Profile Power Supply Enclosure	Stock Code: N/A
4	R/RB/RZ-Series Profile Internal Printer Cable	Stock Code: 4610-717
5	P-Clip	Stock Code: 2808-595
6	Adapter Cable	Stock Code: 4610-718

KEY	DESCRIPTION	COMMENT
7	Power Supply Cable that plugs into the 9-way Connector	Stock Code: N/A
8	Power Supply Unit / Charger	Stock Code: 2814-551 (UK) 2814-552 (US) 2814-553 (Rest of Europe)

S'Print-i Settings

The S'Print-i, supplied by SAFELINE, should arrive pre-setup and ready to use.

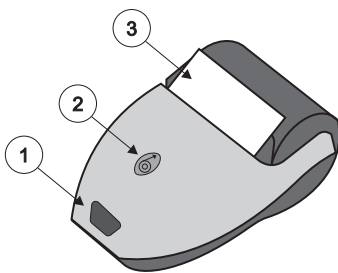


Figure 240:

KEY	DESCRIPTION
1	Paper
2	Button
3	LED Indicator

For details on installing the Internal Printer Cable, see Section 9.2. Once installed, the S'print printer must be configured to the detector's serial port with the following settings:

PARAMETER	S'PRINT
Interface	RS232
Baud Rate	38400 bps
Data Bits	8 bits/chr
Parity	None
Handshaking	RTS/CTS

Table 67:

S'Print-i Problem Solving

If problems occur, check the settings and adjust the printer as follows:

1. Disconnect the PSU/Charger.
2. Turn off the printer by quickly pressing the main button twice.
3. Press and hold the button for approximately 3 seconds until the unit starts to print out the current settings together and the Printer Health Check.

Note: To exit the Setup menu at this point, without making any changes to the settings, quickly press and release the button.

4. To view each parameter in turn, press and hold the button for approximately 2 seconds then release it.
5. To modify the settings in a parameter, quickly press and release the button.
6. To exit the Setup menu, progress to the last parameter (Print Dens), press and hold the button for approximately 2 seconds then release it. The settings will be then be stored and printed out.

Note that:

- The printer Setup menu must be exited before printing will start.
- When modifying a value, you need to pass through each stage of the Setup until you reach the end parameter (Print Dens) before the changes are updated.
- The printer should be charged before printing starts if the Head Voltage reading on the Printer Health Check is less than 6V.

LED Indicators

LED STATUS	DESCRIPTION
Always Off	The printer is Off
Always On	The printer is On The battery is charging
One Blink every 2 seconds	The printer is On No Fault – the battery is powered
One Blink per second	The paper has run out
Two Blinks per second	Resettable Error The printer may be overheating There is a battery voltage error Check settings for printer health check
Several Rapid Blinks	The Printer is powering down

Table 68:

9.1.2 The Martel Printer

The Martel Printer will work with PROFILE and Signature detectors. Figure 241 shows a typical setup for connecting a Martel printer to a PROFILE detector.

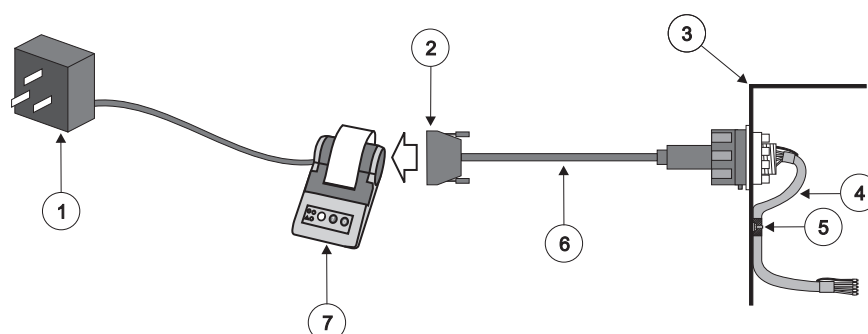


Figure 241:

KEY	DESCRIPTION	COMMENT
1	Power Supply Unit / Charger	Stock Code: N/A
2	25-way, D-Type Connector that plugs into the printer	Stock Code: N/A
3	Profile Power Supply Enclosure	Stock Code: N/A
4	Profile Internal Printer Cable	Stock Code: 4610-717
5	P-Clip	Stock Code: 2808-595
6	Adapter Cable	Stock Code: 4610-032
7	Martel Printer	Stock Code: N/A

Martel Settings

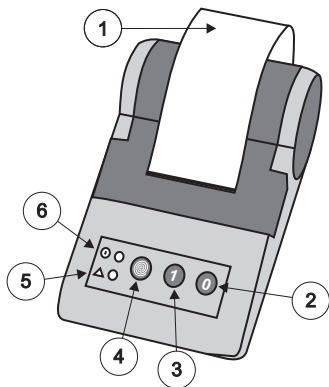


Figure 242:

KEY	DESCRIPTION
1	Paper
2	OFF Button
3	ON Button
4	Paper Feed Button
5	State Indicator
6	Power Indicator

For details on installing the Internal Printer Cable, see Section 9.2. Once installed, the Martel dot matrix printer must be configured to the detector's serial port with the following settings:

PARAMETER	MARTEL
Interface	RS232
Baud Rate	9600 bps
Data Bits	8 bits/chr
Parity	None
Handshaking	RTS/CTS

Table 69:

If selecting the Martel printer, the DIP switch setting on the back of printer will need changing when switching between Profile and Signature detectors. For the Profile detector, set the DIP switch settings using the values in Table 70. Make sure that the printer is turned off before altering the DIP Switch settings.

SETTING	SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7	SW1-8
Normal printing	OFF							
Hardware hand-shake		ON						
9600 Baud			ON	ON	OFF			
8 Data Bits						OFF		
No Parity							OFF	
Parity Type								OFF

Table 70:

For the Signature detector, set the DIP switch settings on the back of the printer as follows:

SETTING	SW1-1	SW1-2	SW1-3	SW1-4	SW1-5	SW1-6	SW1-7	SW1-8
Normal printing	OFF							
Hardware hand-shake		ON						
9600 Baud			ON	ON	OFF			
8 Data Bits						ON		
No Parity							ON	
Parity Type								ON

Table 71:

9.1.3 The Terminal Printer

If your PC is installed with a computer communications software, such as HyperTerminal or HyperACCESS, reports may be transferred directly from the metal detector to the PC. HyperTerminal can read the data from the serial port and display it on screen, after which it can be saved for future use as a txt file. The data stored in this file is Tab delimited and may be edited in an application such as Excel.

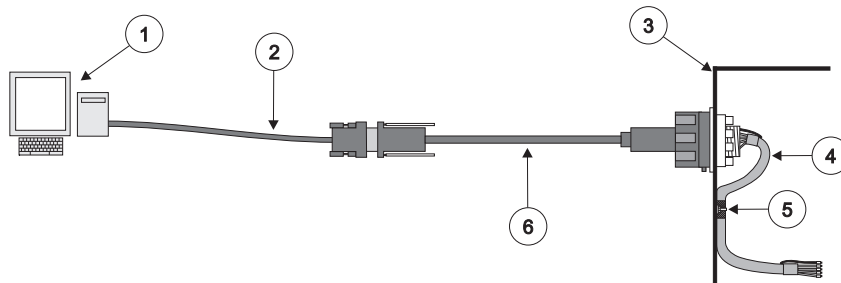


Figure 243:

KEY	DESCRIPTION	COMMENT
1	PC	Stock Code: N/A
2	Null Modem Cable (with female-to-female connectors)	Stock Code: N/A
3	Profile Power Supply Enclosure	Stock Code: N/A
4	Profile Internal Printer Cable	Stock Code: 4610-717
5	P-Clip	Stock Code: 2808-595
6	Adapter Cable	Stock Code: 4610-032

Connecting the Metal Detector to a PC

To connect the metal detector to the PC:

1. Install the Internal Printer Cable as shown in Figure 243. For detailed installation instructions, see Section 9.2.
2. Ensuring that the Null Modem cable is fitted with female-to-female connectors at both ends, connect one end to the Adapter Cable then connect the other end to a serial port on the PC.

Establishing a Link between the Metal Detector and the PC

From the Taskbar on the PC:

1. Select **Start All > Programs > Accessories > Communications > HyperTerminal**

The **Connection Description** box will appear, requesting that a name is entered for this connection. This name will be used to save the port configuration settings when HyperTerminal is closed.

2. Enter a name then press **OK**.

The **Connection To** box will appear, requesting that you select the serial port that the Null Modem Cable is connected to.

3. Select the serial port from the drop down list, for example **COM1**, then press **OK**.
The **COM1 Properties** box will appear and requires the Port Settings to be configured.
4. Set the **Port Settings** to the values stated in Table 72 then press **OK** to open the HyperTerminal window.

PARAMETER	TERMINAL
Bits per second	38400
Data Bits	8
Parity	None
Stop Bits	1
Flow control	Hardware

Table 72:

The link between the PC and HyperTerminal is now established, enabling reports transmitted from the metal detector to be received and saved.

Transmitting and Saving Reports

To transmit a report to the PC, press either the **Print Shift Report** or the **Print All Settings** key on the metal detector. For more information on performing this, see page 157. The report will appear on screen in the HyperTerminal window when the key is pressed.

To save a report, select **File > Save As** from the menu bar, assign a name and file type then press **Save**.



Upon closing HyperTerminal, you will be asked whether you want to save the connection name — entered earlier into the Connection Description box — for future use.

9.2 Installing the Internal Printer Cable

9.2.1 The Power Supply Enclosure

WARNING!

Ensure all power has been disconnected from the metal detector before work is attempted on any electrical component of the metal detector.

Any electrical work carried out on the metal detector must be performed by a qualified electrical engineer.

As part of the process of installing the Internal Printer Cable, there must be a hole in the metal detector's power supply enclosure. Recently-manufactured metal detectors currently ship with this hole already drilled, which is capped with a blanking plug and can be easily removed. However, in earlier detectors, this blanking plug will not exist, meaning that a hole will have to be drilled through the enclosure. The diagrams of the Double Enclosure (Figure 244) and the PSU Enclosure (Figure 245) show the location of the blanking plug or where the hole will need to be drilled.

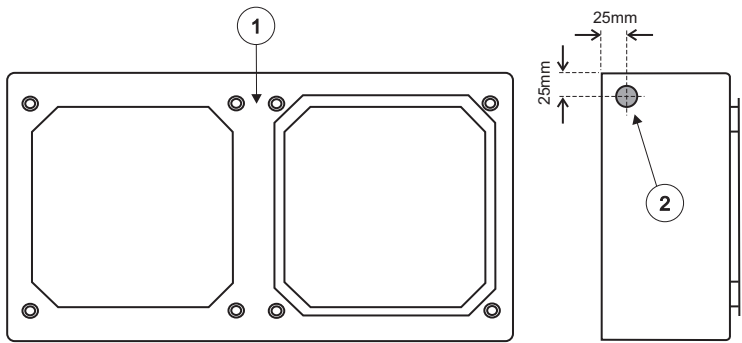


Figure 244: Double Enclosure

KEY	DESCRIPTION
1	Double Enclosure
2	20mm Blanking Plug or Hole

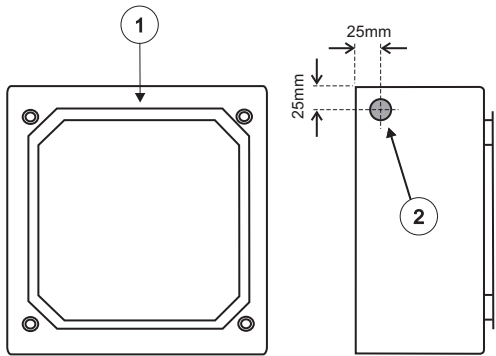


Figure 245: Power Supply Unit Enclosure

KEY	DESCRIPTION
1	Power Supply Unit Enclosure
2	20mm Blanking Plug or Hole

9.2.2 The Printer Port Cable

When installing the Internal Printer Cable (see Figure 246), there are two important issues to consider: wiring the 5-way plug that plugs into the I/O Printer Port and achieving EMC compliance.

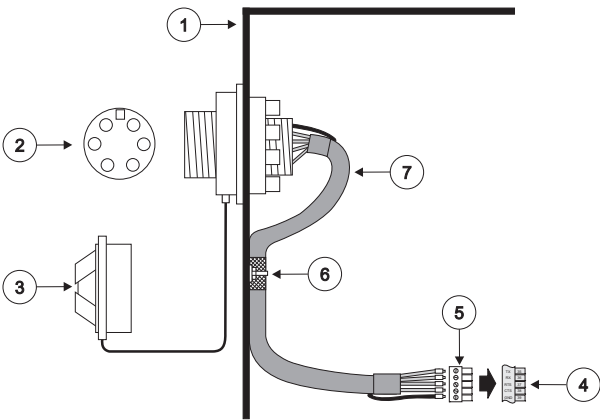


Figure 246:

KEY	DESCRIPTION
1	Profile Power Supply Enclosure
2	6-way Buccaneer Connector
3	Sealing Cap, fitted when printer is not in use.
4	Input/Output Board
5	5-way Plug, connects to the Input/Output Board
6	P-clip. EMC Compliance Requirement. Fix the cable with the P-clip to the M3 Stud, welded to the inside of the enclosure.
7	Profile Internal Printer Cable

9.2.3 Wiring the 5-Way Plug

The wires at the end of the Internal Printer Cable can be identified by their colours and by a series of numbers, 35 to 39. Having screwed the wires into the 5-way plug, insert the plug into the corresponding connectors on the Input/Output board. See Figure 247 for wiring details.

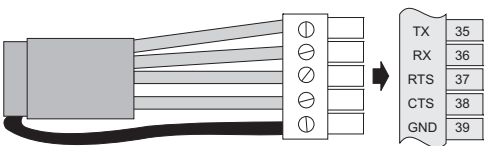


Figure 247:

KEY	DESCRIPTION
Green (35)	35
Red (36)	36
Yellow (37)	37

KEY	DESCRIPTION
Blue (38)	38
Black (39)	39

9.2.4 EMC Compliance

For a metal detector fitted with a printer port, the internal cable braid must be earthed to the power supply enclosure with a metallised P-Clip for it to retain its European EMC compliance rating, as shown in Figure 246.

The cable arrives with a section of the PVC sheath already removed. Fit the P-Clip around the exposed braid and attach it to the welded M3 stud on the inside of the power supply enclosure.

9.2.5 Wiring the Internal Printer Cable to the 6-Way Buccaneer Connector

The Internal Printer Cable arrives already attached to the 6-way Buccaneer Connector. However, if any maintenance is required, the wiring configuration is shown in Figure 248.

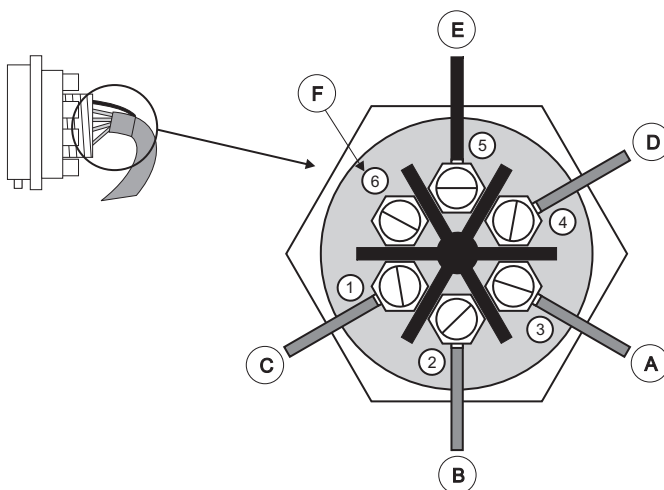


Figure 248:

KEY	DESCRIPTION
A	Green
B	Red
C	Yellow
D	Blue
E	Black
F	Pin Numbers

9.3 Printer Kits

Two printer installation kits are available from SAFELINE, should you need to print reports and settings. For more information, please contact your supplier.

9.3.1 Printer Kit 1

Printer Kit 1 is required if you already possess a printer, as it contains:

- 1 internal printer cable
- 1 P-clip

Stock Code: 4601-106

9.3.2 Printer Kit 2

Printer Kit 2 is more extensive and contains one S'Print-i printer. The whole kit contains:

- 1 S'Print-i printer
- 1 Power Supply Unit/Charger
- 1 Adapter cable
- 1 internal printer cable
- 1 P-clip

Stock Code:

- 4601-107 (UK version)
- 4601-108 (US version)
- 4601-109 (European version)

10 Setting Up the USB Adapter

This chapter explains what you need to do to set up the Safeline USB Adapter on the metal detector.

SECTION	TITLE	PAGE
10.1	USB Adapter Overview	208
10.2	Recommendations	208
10.3	Setting Up	208
10.4	Transferring Reports to the USB Memory Stick	213
10.5	USB Disk Contents	214
10.6	Troubleshooting	216

10.1 USB Adapter Overview

If the SAFELINE USB Adapter is installed on the metal detector, the metal detector can be set up to transfer all reports to a USB Memory Stick.

The USB Adapter supports the USB BOMS (Bulk Only Mass Storage) Device Class, meaning that only USB mass storage devices that support this class are supported.

10.2 Recommendations

SAFELINE recommend the following:

- Use a good quality, branded USB Memory Stick.
- Use a USB Memory Stick that supports FAT32. The Safeline USB Adapter supports both FAT and FAT32 formats but FAT32 is the preferred choice since it is more efficient at handling small report sizes.
- Make a copy of the data contained on the USB Memory Stick when it has been removed from the USB Adapter. SAFELINE cannot be held responsible for the loss of any data from the USB Memory Stick.
- Errors may occur on the USB Memory Stick if it is removed from the USB Adapter whilst reports are being transferred. Do not remove the USB Memory Stick from the USB Adapter until all reports have been transferred.
- When the USB Memory Stick is removed, the USB dust cap must be fitted back over the USB Adapter and tightened to ensure it is totally sealed.
- Ensure the clock on the metal detector is set correctly as all reports generated will be time-stamped with this time.
- Do not edit any of the data from the reports. These reports form part of an auditable traceability system and, whilst they are editable, no data should be changed.

10.3 Setting Up

To set up the metal detector to transfer reports to the USB Memory Stick, you must access the Print Functions section in the QA Setup menu.

The main User Interface is shown below.



Figure 249:

Press the **Login** key to log into the menu system.

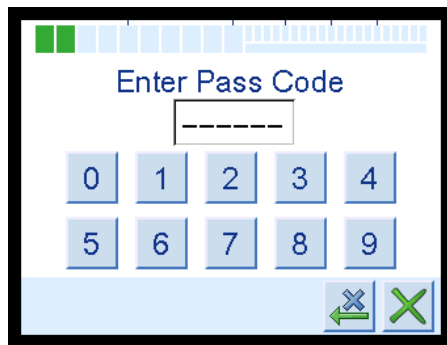


Figure 250:

The screen will display the security pass code entry screen. Note that Figure 250 is the Standard Authentication screen.

Enter the QA Setup Level access code. (The default code is **888888**.)

10.3.1 QA Setup Menu

When you enter the pass code that gives access to the QA Setup functions, the screen displays the QA Setup menu, Figure 251.



Figure 251:

10.3.2 Print Functions

Press the **Print Functions** key on the QA Setup menu to display the menu of printer-related options.

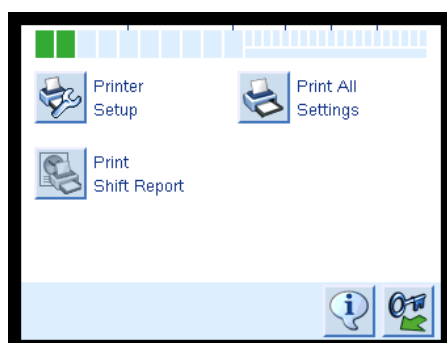


Figure 252:

Printer Setup

Press the **Printer Setup** key to display the screens used to set up the printer parameters.

Screen 1

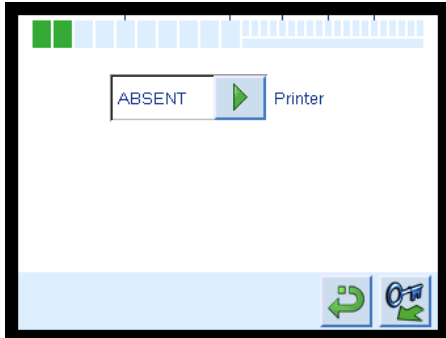


Figure 253:

Printer

This specifies whether the printer is Fixed, Portable or Absent.

To set the Printer:

1. Press the **Printer** parameter.

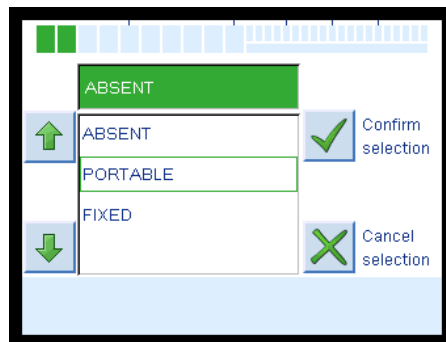


Figure 254:

2. Select **Portable** from the option list.

Selecting **Portable** means that the USB Memory Stick may not always be connected to the metal detector. If a USB Memory Stick is not connected and a report is sent to print, the report will be buffered until one is connected, at which point the report will be transferred.

Selecting any option other than Absent will enable the **Printer Type** parameter. See Figure 255. Note that Flow Control cannot be edited.

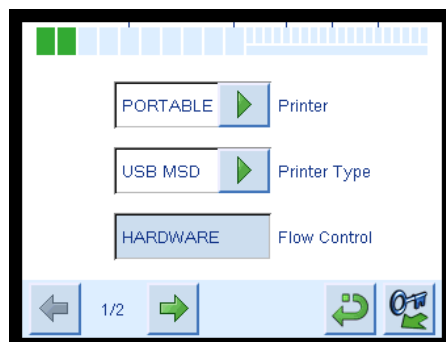


Figure 255:

Note: The **Print All Settings** and **Print Shift Report** options are enabled when the USB Memory Stick is present.

3. Press the **Confirm Selection** key to return to Screen 1.

Printer Type

This specifies the device used to capture the report.

To set the Printer Type:

1. Press the **Printer Type** parameter.

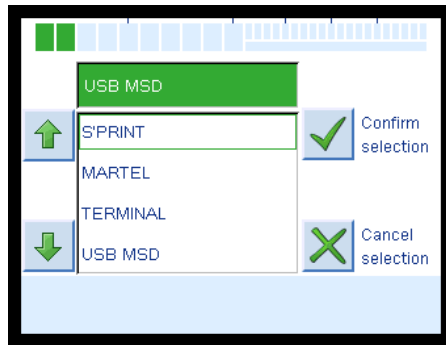


Figure 256:

2. Select **USB MSD** (Mass Storage Device) from the option list.

Selecting USB MSD sets the option to transfer report information straight to the USB Memory Stick, where it can then be transferred to a PC and viewed in applications such as Excel and Notepad. Having selected this, the settings on Screen 2 must also be configured.

Note: It is not possible to use a USB Memory Stick and a printer at the same time.

3. Press the **Confirm Selection** key to return to Screen 1.

Screen 2

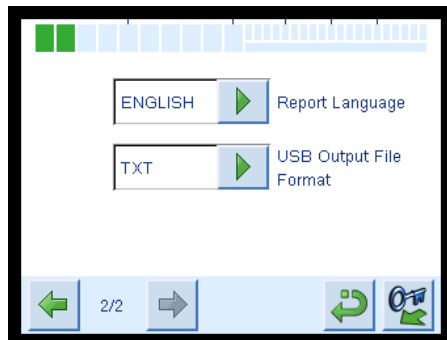


Figure 257:

Report Language

This determines the language in which reports will be produced.

To set the Language:

1. Press the **Report Language** parameter.

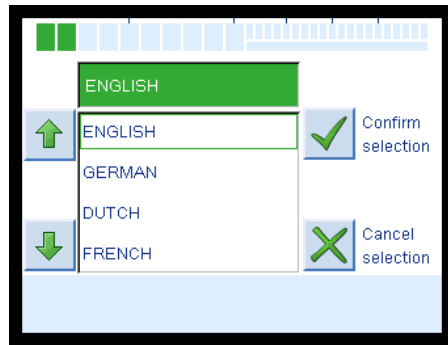


Figure 258:

2. Select the language from the option list.
3. Press the **Confirm Selection** key to return to Screen 2.

USB Output File Format

This feature will only appear if it was selected as the Printer Type option on Screen 1. Selecting one of these options will determine whether the report will be configured as a TXT, CSV or TSV file.

To set the file format:

1. Press the **USB Output File Format** parameter.

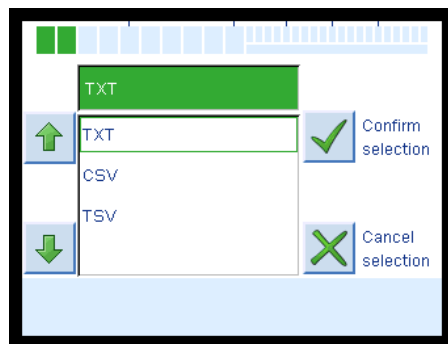


Figure 259:

2. Select **TXT**, **CSV** or **TSV** from the option list.
 - **TXT** (UTF8 text format) allows reports to be created in a plain text format so they can be viewed in an application such as Notepad.
 - **CSV** (Comma Separated Values) allows reports to be created in tabular form so they can be viewed in an application such as Excel. Here, the data is separated by commas.
 - **TSV** (Tab Separated Values) allows reports to be created in tabular form so they can be viewed in an application such as Excel. Here, the data is separated by tabs.

Note: UTF8 allows complex characters to be displayed in reports, unlike the CSV and TSV options which display only simple characters.

3. Press the **Confirm Selection** key to return to Screen 2.



Do not edit any of the data from the reports. These reports form part of an auditable traceability system and, whilst they are editable, no data should be changed.

10.4 Transferring Reports to the USB Memory Stick

The following reports can be generated and transferred to the USB Memory Stick:

- QA-Tests (PVR tests)
- Settings
- Shift

For more information on setting up reports on the metal detector, see the original operating manual that accompanied this metal detector.



Ensure the clock on the metal detector is set correctly as all reports generated will be time-stamped with this time.

10.4.1 QA-Tests

QA-Tests are automatically sent to print when a QA-Test (PVR) is performed.

Note: If a USB Memory Stick is not connected and a report is sent to print, the report will be buffered until one is connected, at which point the report will be transferred.

10.4.2 Settings

Press the **Print All Settings** key on the Print Functions menu to transfer a report of the current detector settings available from the QA Setup Level.

10.4.3 Shift

Press the **Print Shift Report** key on the Print Functions menu to transfer a report of all the recorded entries. The stored information available at the point of printing will depend on the Report Mode selected. Refer to the original operating manual about setting up Manual and Automatic Shift reports.

10.4.4 The USB Data Transfer

If the USB Memory Stick is inserted into the USB Adapter and a report is printed, Figure 260 will be displayed until all reports have been transferred to the USB Memory Stick.



Figure 260:

If the **Cancel** button is pressed whilst USB data is being transferred, a message will be displayed informing that printing shall be delayed one minute.



Errors may occur on the USB Memory Stick if it is removed from the USBAdapter whilst reports are being transferred. Do not remove the USB Memory Stick from the USB Adapter until all reports have been transferred.



If the **USB Disk Full** message appears onscreen, it means there is no more space available on the USB Memory Stick to write any more data. Swapping the USB Memory Stick for a different one will enable the metal detector to continue transferring reports.



To avoid any data being lost, reports should be regularly transferred to the USB Memory Stick and backed up on a PC. If not, the reports will be temporarily stored in the metal detector's buffer until they are transferred. However, there is a limit to the amount of data that the buffer can hold. If there is no USB Memory Stick inserted into the USB Adapter and the **Data Collection Memory Full** message appears onscreen, it means the buffer is reaching its limit. It is therefore important to insert a USB Memory Stick and transfer the reports, otherwise some data may be overwritten and lost.



When the USB Memory Stick is removed, the USB dust cap must be fitted back over the USB Adapter and fully tightened to ensure the dust cap is totally sealed.

10.5 USB Disk Contents



Do not edit any of the data from the reports. These reports form part of an auditable traceability system and, whilst they are editable, no data should be changed.

Figure 261 represents what happens when the USB Memory Stick is inserted into a PC. The folder in the main window contains all of the reports generated by the metal detector. The example shown in Figure 261 has the folder named **123456**, however the folder will actually be named with the metal detector's serial number.

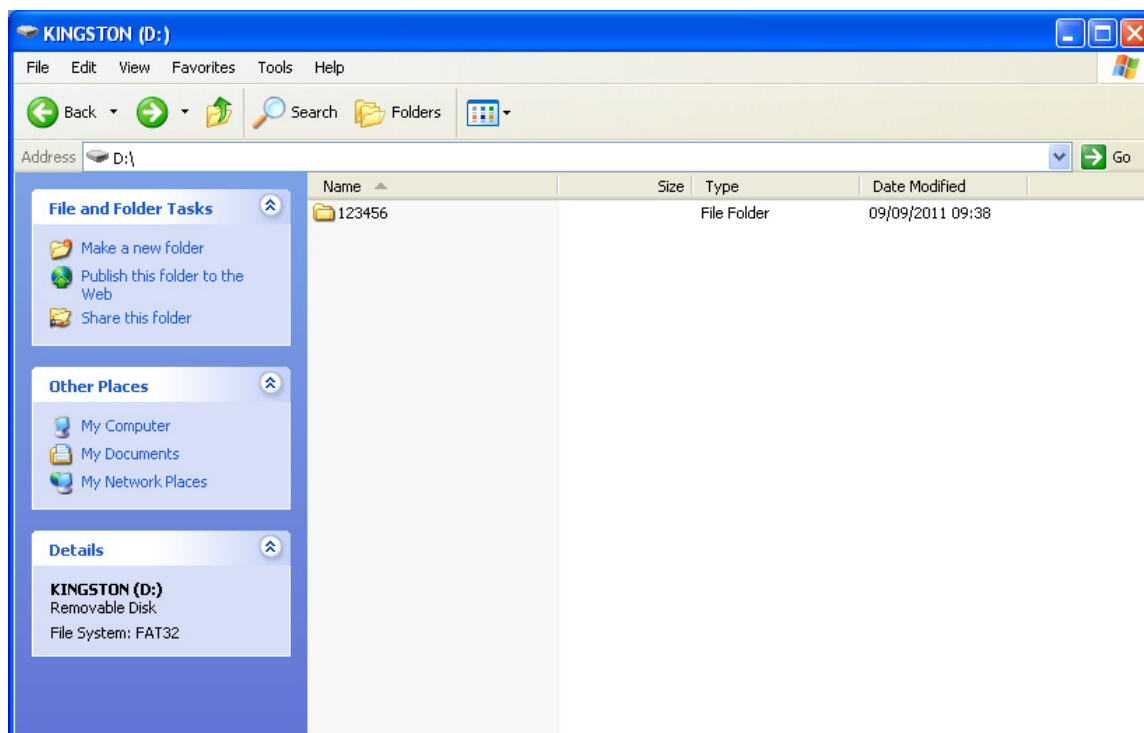


Figure 261:

Double-clicking on the main folder will display the folders containing the reports, that have been categorised by the date on which they were generated. See Figure 262 and note that the **Year-Month-Day** naming convention has been used.

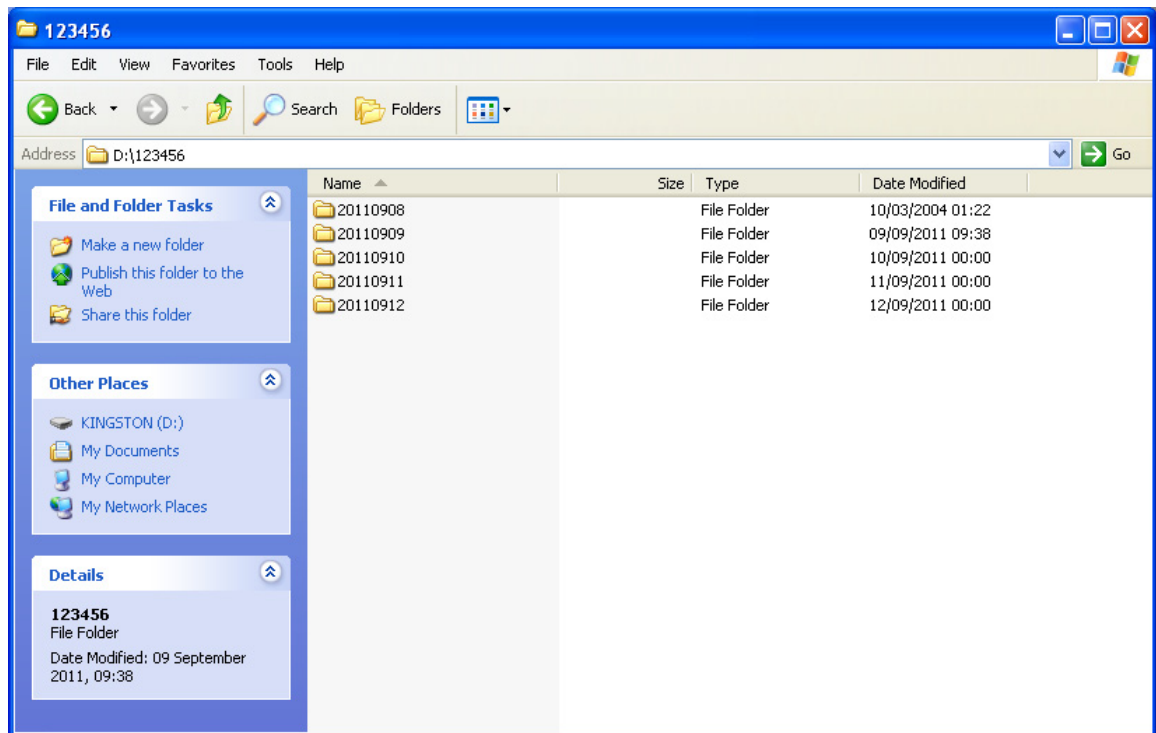


Figure 262:

Double-clicking on a folder, in this case **20110912**, will display the report folders. See Figure 263.

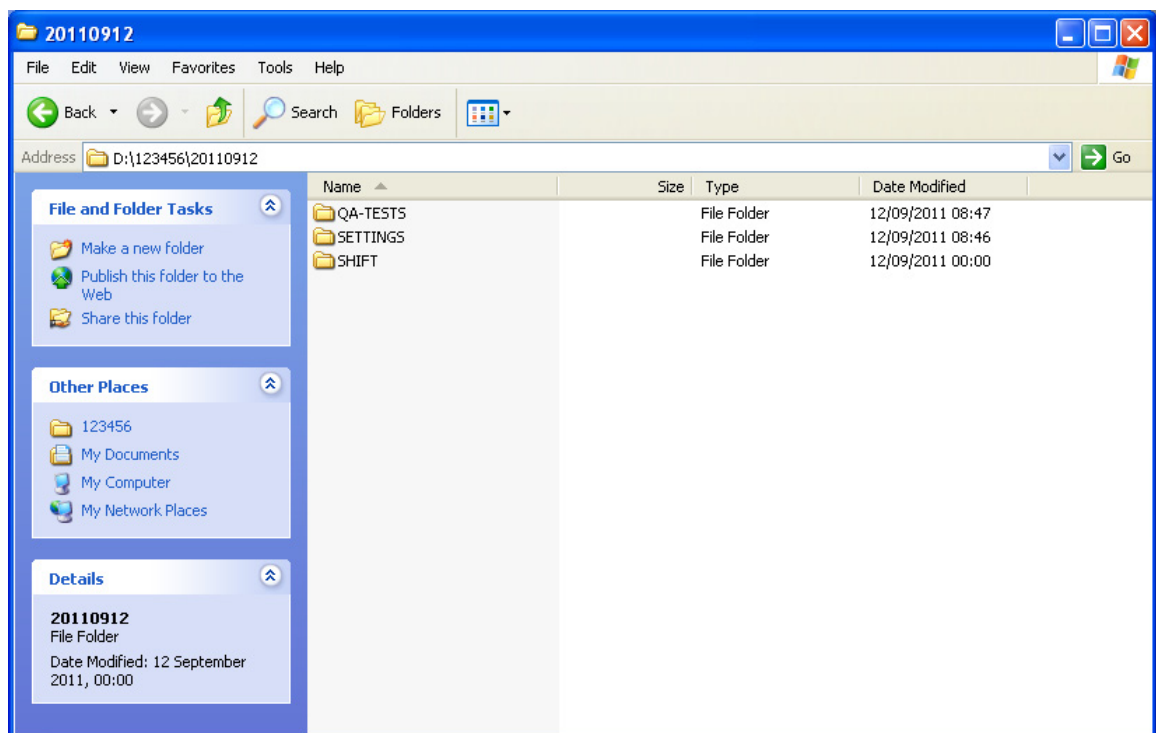


Figure 263:

Figure 264 displays the reports contained in the QA-Tests folder. Note that each file is named with the time that each report was generated.

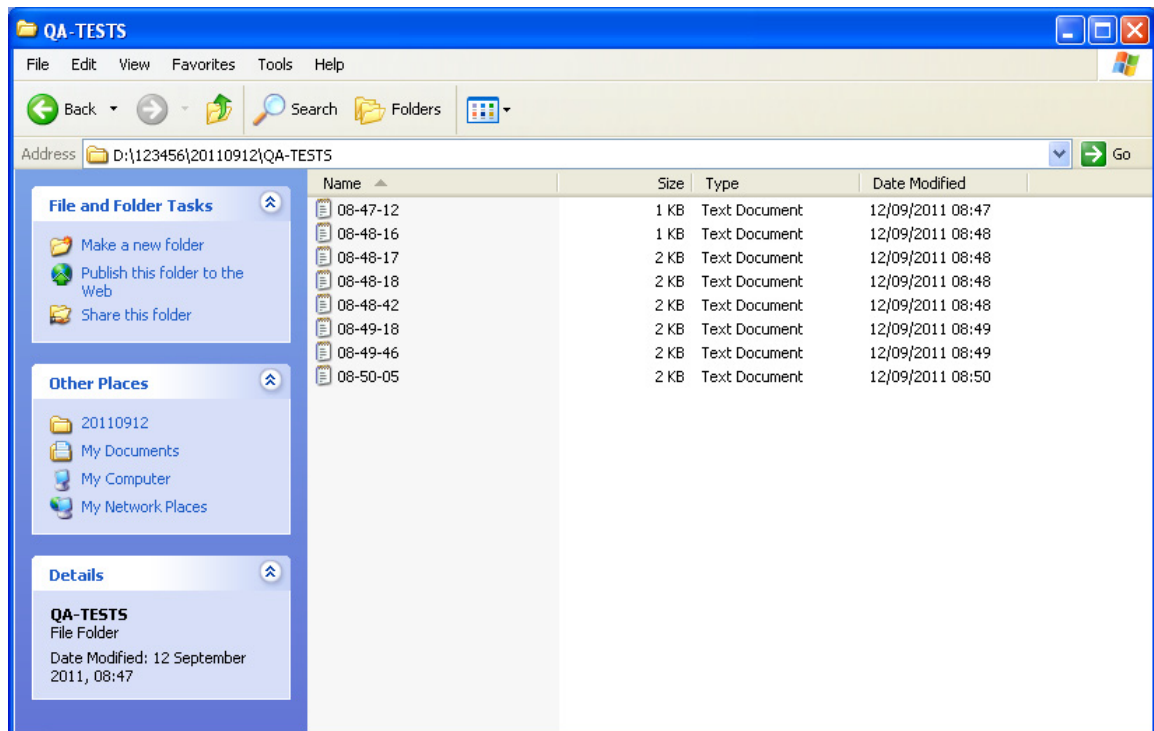


Figure 264:

10.6 Troubleshooting

If a problem occurs, try using a different USB Memory Stick before contacting your local SAFELINE Service representative.

11 PackML V3.0

This chapter explains what PackML (Packaging Machinery Language) is and how to configure the settings.

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11.1 Introduction to PackML

SAFELINE's implementation of PackML (Packaging Machinery Language) works on the concept that the metal detector can only operate in one of five possible PackML states within five possible PackML modes. PackML is a methodology that standardises machines operating on a packaging line, establishes a common identity between machines and improves operational consistency.

One of the benefits of PackML is that Overall Equipment Effectiveness OEE can be calculated, enabling the performance of a production line to be assessed and improved if possible.

Using PackML ensures consistency across devices from all vendors due to the standard terminology of PackML modes and states. This PackML data is also versatile enough to be exposed through either the metal detector's user interface or an external communications mechanism, such as the SAFELINE Communications Protocol, OPC or one of the available Fieldbus interfaces.

11.1.1 Accessing PackML Data

There are three ways to view PackML data gathered on the metal detector, via:

- The Running Menus on the Metal Detector's User Interface.
- The Advanced Settings level on the Metal Detector's User Interface.
- External Communication Mechanisms.

Accessing PackML Data via the Running Menus

Two Running Menus provide a degree of local visibility via the metal detector's user interface. The first menu (Figure 265) displays the current PackML mode and state via a PackML state machine. The second menu (Figure 266) displays the real-time OEE calculations as well as several other key PackML parameters, allowing performance data to be viewed immediately.

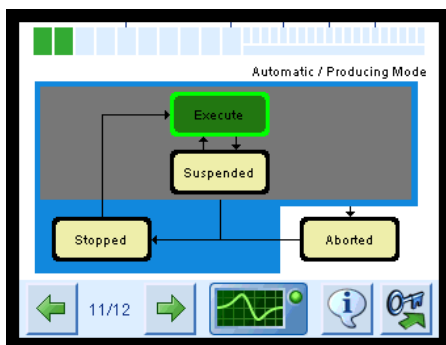


Figure 265: The PackML Running Menu



Figure 266: The OEE Running Menu

To enable the PackML and OEE Running Menus, see page 139.

Accessing PackML Data via the Advanced Settings Level

The raw PackML counters, timers and alarms can be viewed at any time by logging into the metal detector at the Advanced Settings level.

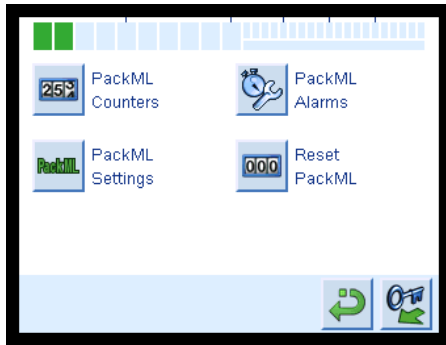


Figure 267:

For more information on this section, see Section 11.3 "Configuring PackML", page 225.

Accessing PackML Data via External Communication Mechanisms

PackML and OEE data can also be exposed to the user as a set of standard parameter names called PackTags, that can be accessed via the SAFELINE Communications Protocol or a range of industrial Fieldbus and Ethernet protocols. This ultimately allows the metal detector to be incorporated into a higher level network management system.

Section 11.5 provides examples and descriptions of the standard set of PackTags available. However, each protocol may represent the PackML information slightly different to one another in order to adhere to particular standards imposed by the protocol in question. It is therefore important to refer to the appropriate protocol documentation.

11.2 PackML V3.0 Modes and States

11.2.1 Overview

With the SAFELINE PackML implementation, the metal detector can operate in one of five modes where each mode represents a specific operating scenario. The possible modes are:

- Automatic/Producing Mode (see page 221)
- Maintenance Mode (see page 222)
- Setup Mode (see page 223)
- PVR Mode (see page 223)
- Undefined Mode (see page 224)

Within each mode a number of states exist that the equipment can be operate in. The possible states are:

- Aborted
- Undefined
- Stopped
- Suspended
- Execute



The metal detector can only transition into the Stopped state if a conveyor is configured as a programmable input and stops running.

The State Machine Running Menu

If enabled, a graphical representation of the Automatic/Producing mode can be viewed on the metal detector's Running Mode, as seen in Figure 268.

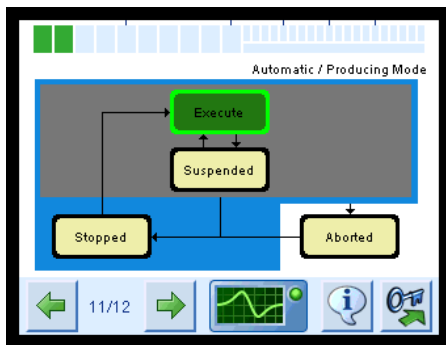


Figure 268:

The current PackML mode is displayed at the top right of the state machine. The current state is indicated by a green border colour on the relevant state and will be filled with an appropriate identifying colour. To enable or disable this display, see page 139.

PackML Colours

The SAFELINE PackML implementation uses a colour-coded system to highlight the current PackML state and determine the health of the metal detector. The current state is highlighted by a green border then filled with a particular colour to define its condition.

In Figure 269, the Suspended state is highlighted with the green border and filled amber to indicate one of the following:

- One or more warnings are present.
- A PVR is overdue.
- The Reject Inhibit has been activated.

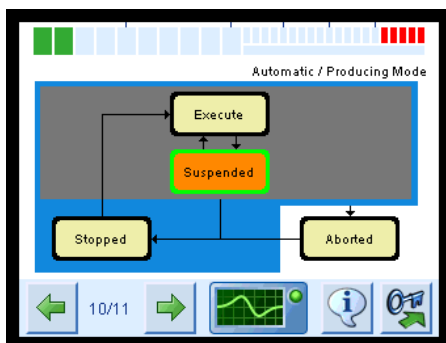


Figure 269:

Figure 270 shows the Aborted state has been highlighted with the green border and filled red, indicating that the metal detector has developed a fault and transitioned into the Aborted state.

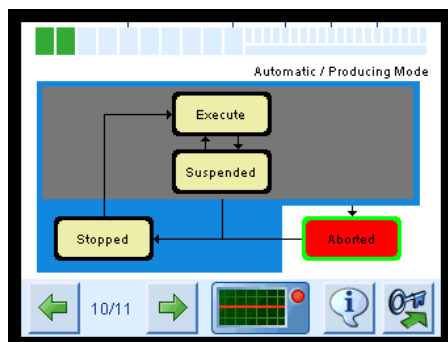


Figure 270:

Table 74 documents the applicable colours and the states to which they apply.

STATE	STATE FILL COLOUR	MEANING
Execute Suspended	Green	There are no faults or warnings.
Execute Suspended Stopped	Amber	There are one or more warnings present on the metal detector. A PVR is overdue. The Reject Inhibit has been activated.
Stopped	White	There are no faults or warnings.
Aborted	Red	There are one or more faults present on the metal detector. This is the highest priority colour and takes precedence over any other colour.

Table 74:

The PackML modes and states are explained in the following section.

11.2.2 Automatic/Producing Mode

This mode indicates that the metal detector is currently in a position to detect and reject metal according to the current configuration. This should be the primary mode of operation for a metal detector.

Possible states include:

- Execute
- Suspended
- Stopped
- Aborted

AUTOMATIC/PRODUCING MODE	
State	Description
Execute	This is the ideal state as it means that product is passing through the metal detector. It assumes that a pack sensor is fitted and calibrated. If no pack sensor is fitted or the pack sensor is not calibrated, this state indicates an assumption that product is continuously being inspected by the metal detector.
Suspended	This state indicates that the metal detector is ready to inspect products, however, no product is currently passing through as indicated by the pack sensor. This assumes the metal detector has a pack sensor fitted and calibrated. The state will transition to Execute when any packs are detected. However, if the metal detector enters a period of inactivity for a period of time that exceeds the value set for the Execute Timeout, the state will transition back to Suspended. If no pack sensor is fitted, the metal detector state will transition immediately to Execute. For more information on the Execute Timeout parameter, see page 235.
Stopped	The conveyor has stopped running.
Aborted	A fault is present whilst operating in Automatic/Producing mode. Details about the fault (or faults) can be found in the PackML Alarms section, on page 230.

Table 75:

11.2.3 Maintenance Mode

This mode indicates that the metal detector is undergoing maintenance by a SAFELINE service representative.

Possible states include:

- Execute
- Stopped
- Aborted

MAINTENANCE MODE	
State	Description
Execute	A service representative is currently performing maintenance on the metal detector. If there are no faults present and the conveyor is configured as a programmable input, and running, the metal detector will transition to Execute.
Stopped	The conveyor has stopped running.
Aborted	A fault is present whilst operating in Maintenance mode. Details about the fault (or faults) can be found in the PackML Alarms section, page 230.

Table 76:

11.2.4 Setup Mode

This mode indicates that the user is accessing a setup feature on the metal detector with a possible intention of changing the operating parameters and subsequent performance.

Possible states include:

- Execute
- Stopped
- Aborted

SETUP MODE	
State	Description
Execute	The user is accessing a setup feature on the metal detector. If there are no faults present and the conveyor is configured as a programmable input, and running, the metal detector will transition to Execute.
Stopped	The conveyor has stopped running.
Aborted	A fault is present whilst operating in Setup mode. Details about the fault (or faults) can be found in the PackML Alarms section, page 230.

Table 77:

Logging on at the following levels and accessing specific menus will transition the metal detector into Setup mode:

- User Level 2 (222222) — Auto Setup and Product Settings Menus.
- User Level 3 (333333) — Auto Setup, Product Settings, Reject Settings & Create Product Menus.
- QA Setup (888888) — Quality Assurance Settings Menus.
- Install Level (999999) — Install Settings & Advanced Settings Menus.

NOTICE!

Whilst in this mode, the metal detector may or not be capable of detecting or rejecting metal.

11.2.5 PVR Mode

This mode indicates that the process of performing a Performance Validation Routine (PVR) test is in progress, either locally via the metal detector's interface or remotely via the SAFELINE Communications Protocol.

Possible states include:

- Execute
- Suspended
- Stopped
- Aborted

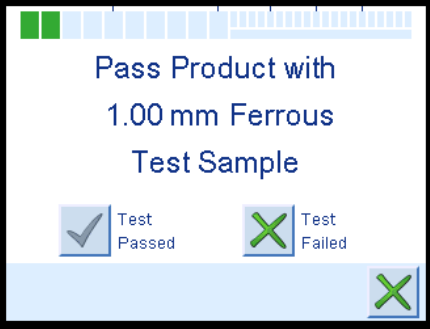
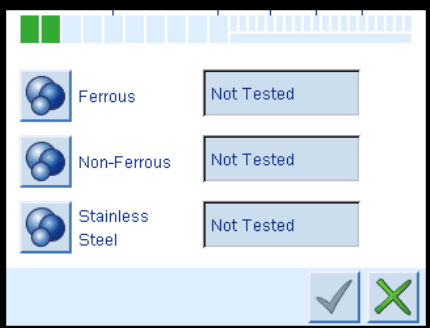
PVR MODE		
State	Description	
Execute	The user is currently executing a PVR test. The state will transition to Execute if the user reaches this stage via the user interface (Figure 271) or an external communications link.	 Figure 271:
Suspended	The user is ready to start a PVR test. The state will transition to Suspended if the user reaches this stage via the user interface (Figure 272) or an external communications link.	 Figure 272:
Stopped	The conveyor has stopped running.	
Aborted	A fault is present whilst operating in PVR mode. Details about the fault (or faults) can be found in the PackML Alarms section, page 230.	

Table 78:

11.2.6 Undefined Mode

This mode indicates that the metal detector is currently initialising (powering up).

Possible states include:

- Undefined

UNDEFINED MODE	
State	Description
Undefined	This is the only state in the Undefined mode. It is a special state used to indicate that the metal detector has not yet fully initialised. When the metal detector is powered up, it is immediately placed into the Undefined mode. When the metal detector has completed initialising, the metal detector naturally transitions from the Undefined mode to the Automatic/Producing mode.

Table 79:

NOTICE!

Whilst in this mode, the metal detector may or not be capable of detecting or rejecting metal.

The Undefined State Machine Running Menu

If enabled, a graphical representation of the Undefined mode will display briefly on the Running Menu until the metal detector fully initialises, as seen in Figure 273. It will then transition to the Automatic/Producing mode.

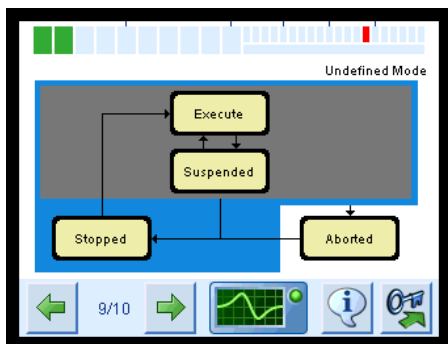


Figure 273:

The current PackML mode is displayed at the top right of the display. The Execute, Suspended, Stopped and Aborted states are represented on screen, however, they are exempt of any colour to indicate an Undefined State. To enable or disable this display, see page 139.

11.3 Configuring PackML

To configure the PackML settings, you must access the **PackML V3.0** section in the Advanced Settings menu.

The main User Interface is shown below.



Figure 274:

Press the **Login** key to log into the menu system.

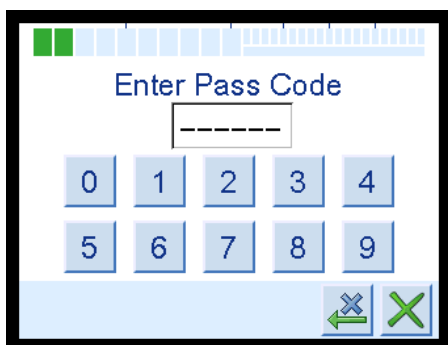


Figure 275:

The screen will display the security pass code entry screen. Note that Figure 275 is the Standard Authentication screen.

Enter the Advanced Settings Level access code. (The default code is **999999**.)

11.3.1 Advanced Settings Menu

When you enter the pass code that gives access to the Advanced Settings Menu, the screen displays the Advanced Settings Menu, Figure 276.

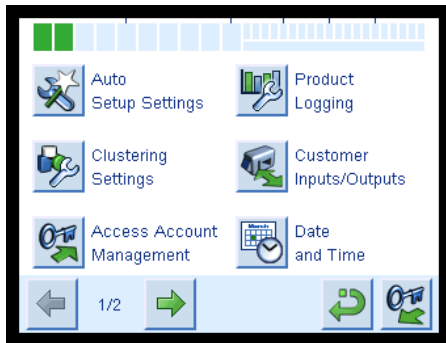


Figure 276:

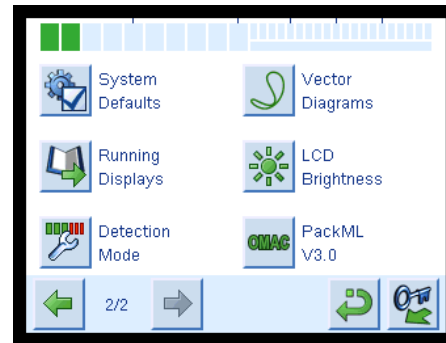


Figure 277:



Press the **PackML V3.0** key on screen 2, Figure 277, of the Advanced Settings menu to set the PackML Settings. Figure 278 will appear.

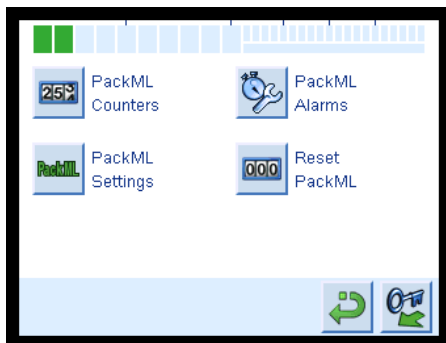


Figure 278:

For more information on:

- What PackML is, see Section 11.1
- PackML Modes and States, see Section 11.2.
- OEE (Overall Equipment Effectiveness), see Section 11.4.
- PackML PackTags, see Section 11.5.
- Resetting the PackML Counters and Alarms values, see page 236.

PackML Counters



Press the **PackML Counters** key to view the current the PackML Counters and Timers values.

The information is split into three screens:

- PackML Counters
- PackML Mode Timers

- PackML State Timers

Screen 1: PackML Counters

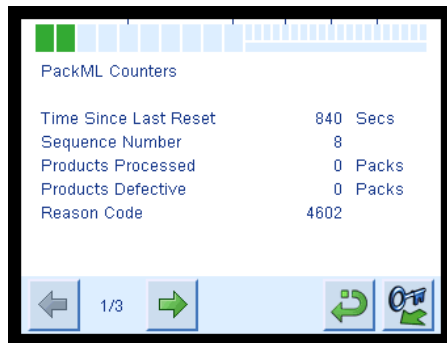


Figure 279:

This screen contains generic PackML counters that are not related to any specific mode or state.

PACKML COUNTERS: TIME SINCE LAST RESET	
This is the time (in seconds) from when the PackML counters were last reset.	
PackTag Reference	Name: AccTimeSinceReset (See page 240.)
	Category: PMLa

Table 81:

PACKML COUNTERS: SEQUENCE NUMBER	
This value represents the total number of changes in PackML state and mode. The value starts at zero and is incremented when the PackML mode or state changes. Note that when the mode changes, the sequence number is incremented twice: once for the mode change and once for the state change.	
PackTag Reference	Name: SeqNumber (See page 240.)
	Category: PMLa

Table 82:

PACKML COUNTERS: PRODUCTS PROCESSED	
This is the total number of packages inspected by the metal detector. This value is device-specific rather than product-specific and is only reset when the PackML Timers are cleared or the detector is power-cycled. Note that if no pack sensor is fitted, the value will default to 0.	
PackTag Reference	Name: ProdProcessedCount (See page 240.)
	Category: PMLa

Table 83:

PACKML COUNTERS: PRODUCTS DEFECTIVE	
This is the total number of rejects on the metal detector. This value is device-specific rather than product-specific and is only reset when the PackML Timers are cleared or the detector is power-cycled.	
PackTag Reference	Name: ProdDefectiveCount (See page 240.)
	Category: PMLa

Table 84:

PACKML COUNTERS: REASON CODE	
This is a code relating to reason for the most recent change of mode or state. See page 230 for more information.	
PackTag Reference	Name: Reason (See Table 103.)
	Category: PMLs

Table 85:

Screen 2: Mode Timers

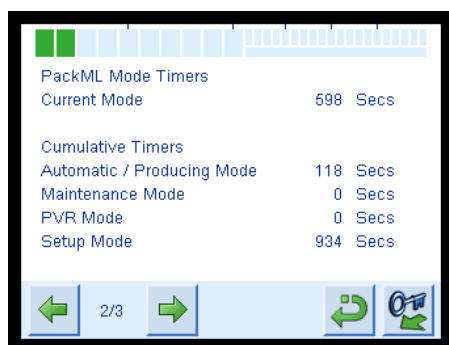


Figure 280:

This screen contains timer information for the current mode together with individual timers for each mode.

PACKML MODE TIMERS: CURRENT MODE	
This is the time (in seconds) that has been spent in the current mode. This is reset to 0 when the current mode changes.	
PackTag Reference	Name: ModeCurrentTime (See page 240.)
	Category: PMLa

Table 86:

CUMULATIVE TIMERS: AUTOMATIC/PRODUCING MODE	
This is the total time (in seconds) that has been spent in the Automatic/Producing mode.	
PackTag Reference	Name: ModeCumulativeTimeAuto (See page 240.)
	Category: PMLa

Table 87:

CUMULATIVE TIMERS: MAINTENANCE MODE	
This is the total time (in seconds) that has been spent in the Maintenance mode.	
PackTag Reference	Name: ModeCumulativeTimeMaintenance (See page 240.)
	Category: PMLa

Table 88:

CUMULATIVE TIMERS: PVR MODE	
This is the total time (in seconds) that has been spent in the PVR mode.	
PackTag Reference	Name: ModeCumulativeTimePVR (See page 240.)
	Category: PMLa

Table 89:

CUMULATIVE TIMERS: SETUP MODE	
This is the total time (in seconds) that has been spent in the Setup mode.	
PackTag Reference	Name: ModeCumulativeTimeSetup (See page 240.)
	Category: PMLa

Table 90:

Screen 3: State Timers



Figure 281:

This screen contains timer information for the current state together with individual timers for each state.

NOTICE!

The Cumulative Timers track the states available in the Automatic/Producing mode and not those found in the Maintenance, Setup, PVR and Undefined modes.

PACKML MODE TIMERS: CURRENT STATE	
This is the time (in seconds) that has been spent in the current state. This is reset to 0 when the current state changes.	
PackTag Reference	Name: StateCurrentTime (See page 240.)
	Category: PMLa

Table 91:

CUMULATIVE TIMERS: EXECUTE STATE	
This is the total time (in seconds) that has been spent in the Execute state of the Automatic/Producing mode.	
PackTag Reference	Name: StateCumulativeTimeAutoExecute (See page 240.)
	Category: PMLa

Table 92:

CUMULATIVE TIMERS: SUSPENDED STATE	
This is the total time (in seconds) that has been spent in the Suspended state of the Automatic/Producing mode.	
PackTag Reference	Name: StateCumulativeTimeAutoSuspended (See page 240.)
	Category: PMLa

Table 93:

CUMULATIVE TIMERS: STOPPED STATE	
This is the total time (in seconds) that has been spent in the Stopped state of the Automatic/Producing mode.	
PackTag Reference	Name: StateCumulativeTimeAutoStopped (See page 240.)
	Category: PMLa

Table 94:

CUMULATIVE TIMERS: ABORTED STATE	
This is the total time (in seconds) that has been spent in the Aborted state of the Automatic/Producing mode.	
PackTag Reference	Name: StateCumulativeTimeAutoAborted (See page 240.)
	Category: PMLa

Table 95:

PackML Alarms/Reason Codes



Press the **PackML Alarms** key to view the last 10 PackML alarms and reason codes that have occurred on the metal detector. Figure 282 will appear. An entry is generated when an internal fault occurs on the metal detector or when the PackML state changes to Aborted or Stopped.

Index	ID / Text	Timestamp
0	(1357) Pack Sensor Blocked	14/05/2013 14:57:09
1	(1357) Pack Sensor Blocked	14/05/2013 14:57:15
2	(1357) Pack Sensor Blocked	14/05/2013 14:57:46
3	(0) Undefined	
4	(0) Undefined	
5	(0) Undefined	
6	(0) Undefined	
7	(0) Undefined	
8	(0) Undefined	
9	(0) Undefined	

Figure 282:

Table 96 explains the parameters that determine PackML alarms/reason codes.

ELEMENT	DESCRIPTION
ID	This is the alarm/reason code identification as specified in Table 97. It helps the user to identify the exact alarm type/reason code.
Message	This is a text description (English only) of what the alarm/reason code is.
Timestamp	The date and time that the alarm was originally raised. When the list is full, use the Timestamp to accurately identify the latest PackML alarm/reason code entry.

Table 96:

The PackML alarms and the Reason Code use the same enumeration (list of codes). They are, however, subtly different.

A Reason code can be anything from the list as it refers to whatever caused the last change of mode or state. For example, a pack passing the pack sensor may cause a transition from Suspended to Execute. In this case, the reason code will be updated to be 1312 (Product Inspected). Equally, if a power drive fault occurs, this will cause a transition to an Aborted state so the reason code will be 1354 (Power Drive Fault).

PackML Alarms can only be something that has caused the device to transition to an Aborted or Stopped state; for example, either an internal fault or stopping the conveyor. For example, whilst alarms will be generated for either 'Power Drive Fault' or 'Conveyor Stopped', alarms cannot be generated for 'Product Inspected' or 'PVR Started'.

See Table 97 for a full list of available ID values, alarm messages and their descriptions.

Whilst the alarms can be viewed on the metal detector, they can also be queried using the appropriate alarm PackTag via one of the external communication mechanisms. See Section 11.5 for more information.

To reset the PackML Alarms, see page 236.

ALARM ID/REASON CODE	ALARM MESSAGE	DESCRIPTION
0	Undefined	This is the default when an alarm slot is not populated or reset. This represents the lack of an alarm rather than a specific alarm.
1300	Device Initialisation Completed	The metal detector has successfully initialised. This scenario occurs only once at start up and forces a transition out of the Undefined mode.
1301	Device Faults Cleared	All machine faults have been cleared.
1302	PVR Started	Either a local or a remote PVR has been started.
1303	PVR Sample Completed	A PVR test for a single sample has been completed.
1304	PVR Waiting For Test Sample	The detector is waiting for a test sample to be selected for test.
1305	PVR Completed	Either a local or remote PVR test has been completed and there are no more samples to follow.
1306	Conveyor Stopped	The conveyor has been stopped.
1307	Conveyor Started	The conveyor has been started.
1308	Conveyor Status Unconfigured	This occurs when the conveyor status is driven by the conveyor status' programmable input, and has either been removed or disabled.
1309	Conveyor Status Configured	This occurs when there is initially no conveyor status available and then the user assigns the conveyor running programmable input.
1310	Pack Sensor Fitted	A pack sensor has been selected and calibrated.
1311	Pack Sensor Removed	The pack sensor has either been uncalibrated or deselected.
1312	Product Inspected	A product has been detected (by activating the pack sensor).
1313	No Product Infeed	The pack sensor has not detected any product for longer than the execute timeout period.
1320	Configuration Issues	The metal detector is not configured correctly at a fundamental level. Contact your local SAFELINE Service representative.
1321	Fault Relay Activated	This indicates that the system is in an Aborted state due to the fact that the fault relay is active. This will likely be triggered by a user configurable input.

ALARM ID/REASON CODE	ALARM MESSAGE	DESCRIPTION
1322	Fault Relay Deactivated	This indicates that the system has just exited an Aborted state due to the fact that the fault relay has deactivated. This will likely be triggered by a user configurable input.
1350	F07 (Internal Fault 1)	A software upgrade has failed to download to the DSP. Contact your local SAFELINE Service representative.
1351	F08 (Internal Fault 2)	There is a communication failure between the CPU and DSP boards. Contact your local SAFELINE Service representative.
1352	F05 (Calibration Fault)	An error has occurred within the internal calibration loop. Contact your local SAFELINE Service representative.
1353	F02 (Balance Fault)	The Out of Balance (OOB) level has exceeded the operational range. Contact your local SAFELINE Service representative
1354	F01 (Power Drive Fault)	The drive level to the head transmitter coil has exceeded +/- 50% of initial reference level. Contact your local SAFELINE Service representative.
1355	F03 (Self Check Phase Error)	The self-check phase has exceeded a pre-defined threshold from its calibrated value. Contact your local SAFELINE Service representative.
1356	F04 (Self Check Magnitude Error)	The self-check signal magnitude has exceeded a pre-defined threshold from its calibrated value. Contact your local SAFELINE Service representative.
1357	F09 (Pack Sensor Blocked)	The pack sensor is in a permanently blocked state, making the reject relay not activate.
1358	F06-1 (IO Comms Error 1)	There is a serial IO Read/Write error.
1359	F06-2 (IO Comms Error 2)	There is a serial IO monitor error.
1360	F06-3 (IO Comms Error 3)	There is a reject confirmation relay monitor error (must be enabled).
1361	F06-4 (IO Comms Error 4)	There is a fault relay monitor error.
1362	F06-5 (IO Comms Error 5)	There is a reject relay monitor error.
1363	Reserved	Reserved
1364	F10 (Reject Check Sensor Blocked)	The Reject Check Sensor has been blocked for longer than 4 pack lengths. Remove the blockage.
1365	F11 (Reject Confirmation Sensor Blocked)	The Reject Confirmation Sensor has been blocked for longer than 4 pack lengths. Remove the blockage.

ALARM ID/REASON CODE	ALARM MESSAGE	DESCRIPTION
1366	F12 (Speed Sensor Fault)	This is only available when a Speed Sensor is used with the RCU. The Speed Sensor pulses are compared against the External RCU Sensor pulses and a fault generated if the two are not comparable.
1367	F13 (External RCU Clock Fault)	This is only available when a Speed Sensor is used with the RCU. The Speed Sensor pulses are compared against the External RCU Sensor pulses and a fault generated if the two are not comparable.
1368	F14 (Overcurrent Fault)	Profile Select only.
1369	F15 (Bin Unlocked Fault)	If the active fault relay is configured a fault condition is generated if the bin is unlocked or the wiring is faulty.
1370	F16 (System CPU Fault)	The CPU is no longer synchronized. Reboot the metal detector.
1371	F06-6 (IO Comms Error 6)	There is a communication failure between the module and User IO board.
1372	F17 (USB Interface Error)	This is only available when a USB adapter is fitted. There is a USB communication failure. Reboot the metal detector.
4600	Maintenance Started	Maintenance has been started.
4601	Maintenance Completed	Maintenance has been completed.
4602	Setup Started	Setup mode has started.
4603	Setup Completed	Setup has been completed.
4604	Local Setup Started	Setup mode has started due to a user logging on and changing settings via the interface.
4605	Local Setup Completed	A local user setup has been completed.
4606	Remote Auto Mode Started	Remote auto mode has started due to a remote auto mode procedure. For example, Auto Setup.
4607	Remote Auto Mode Completed	Remote auto mode has been completed.
4608	Balancing Started	Setup mode has been entered due to balancing.
4609	Balancing Completed	Setup mode has been completed due to balancing being completing.
4610	Reject Inhibit Enabled	The Reject Inhibit has been enabled.
4611	Reject Inhibit Disabled	The Reject Inhibit has been disabled.

Table 97:

PackML Settings



Press the **PackML Settings** key to modify the PackML settings.

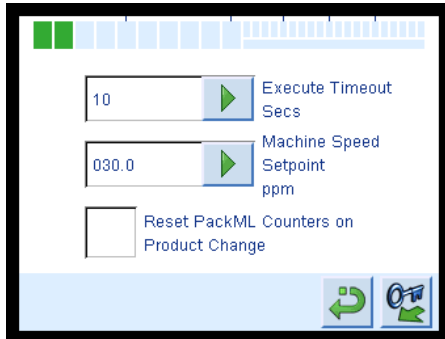


Figure 283:

EXECUTE TIMEOUT	
Select this parameter to specify a timeout (in seconds) from transition from an Execute to a Suspended state in the Automatic/Producing mode only (normal production). The Execute Timeout concerns the pack that most recently passed the pack sensor. It is a pre-determined period of time that, once exceeded, the machine is deemed to be not producing.	
PackTag Reference	Name: ExecuteTimeout (See page 240.)
	Category: PMLs

Table 98:

MACHINE SPEED SETPOINT	
This should be a pre-determined figure representing the maximum number of packages per minute (ppm) that the metal detector can inspect. This should be the optimum for the machine if the line is running as fast as it possibly can, giving consideration to any restrictions or constraints imposed by the environment, surrounding equipment and the products being inspected. This figure is utilised to calculate the OEE Performance of the metal detector which is basically a measure of how much is produced compared to how much could have been produced. This value must be specified to ensure a meaningful OEE calculation. Furthermore, it is imperative that a realistic value for the Machine Speed Setpoint is selected if the on-board OEE Performance calculation is to be utilised.	
PackTag Reference	Name: MachSpeed (See page 240.)
	Category: PMLs

Table 99:



When a valid Machine Speed Setpoint is set or changed, it is recommended to reset the PackML Counters & Timers as well. This clears any previous PackML and OEE data, allowing valid results to be calculated from this point onwards.

RESET PACKML COUNTERS ON PRODUCT CHANGE	
Enable this box to reset the PackML counters when the current running product is changed.	
PackTag Reference	Name: ResetCountersOnProductChange (See page 242.)
	Category: PMLc

Table 100:

Reset PackML



Press the **Reset PackML** key to reset either the PackML Counters & Timers or the PackML Alarms to their default value.

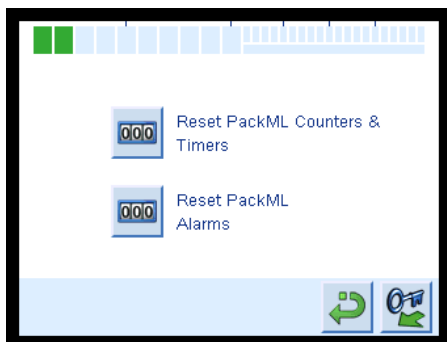


Figure 284:

Whilst the PackML Counters and Alarms can be reset in this section, they can also be reset in the following ways:

- When the metal detector is either powered up or power cycled.
- Through a supported external communication mechanism that uses PackTags.

RESET PACKML COUNTERS & TIMERS	
Enable this box to reset the PackML counters when the current running product is changed.	
PackTag Reference	Name: ResetAllTimers (See page 242.)
	Category: PMLc

Table 101:

RESET PACKML ALARMS	
Enable this box to reset the PackML counters when the current running product is changed.	
PackTag Reference	Name: ResetAllAlarms (See page 242.)
	Category: PMLc

Table 102:

NOTICE!

Alarms are maintained across all product and batch changes. It is only when the values are physically reset that they return to their default values.



Resetting the Counters or the Timers will also reset the OEE values.

11.4 Overall Equipment Effectiveness (OEE)

Overall Equipment Effectiveness (OEE) is a measure of how well the current production line is actually performing compared to its potential. One of the benefits of PackML is that OEE can be calculated, enabling the performance of a production line to be assessed and improved if possible. The higher the OEE, the closer the production line is to maximum capacity. Therefore, an increase in OEE is an increase in capacity and output.

The OEE calculations are updated every second and utilise PackML data to determine whether the machine is operating effectively. This real-time calculation, together with other key parameters, can then either be viewed on the Running Mode Displays, as in Figure 285, or accessed remotely.

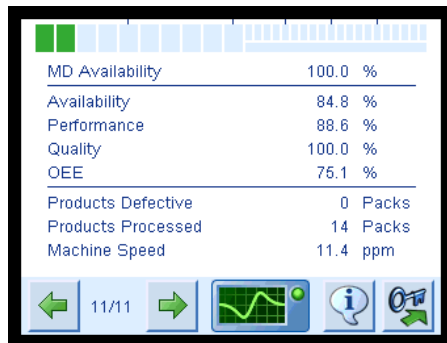


Figure 285:

To enable or disable this display, see "Screen 3", page 139.

NOTICE!

The calculation of all OEE parameters will only begin once the metal detector has fully initialised. Until then, the parameters will remain at their default values of 0%.

NOTICE!

If no pack sensor is fitted or calibrated, the Machine Speed and the Products Processed parameters are hidden from the display.

11.4.1 MD Availability

This indicates the percentage of time that the metal detector has been operational; for example, not in a fault condition. This value is specific to the metal detector and is not influenced by external factors. The metal detector is considered to be available and inspecting regardless of whether any product is passing through the detector. If no faults have occurred since the PackML counters were last reset, this value will be 100%.

11.4.2 Availability

This indicates the percentage of time that the metal detector spends actively inspecting product compared to its total available time; for example, the time since the PackML counters were last reset. It measures the percentage of time that the metal detector has been in an Execute state whilst running in the Automatic/Producing mode.

For example, following the PackML counters being reset, if the metal detector inspects product for 30 minutes, Availability at this moment will be 100%. If the production line is then idle for a further 30 minutes, Availability will drop to 50%.

11.4.3 Performance

This is a measure of the performance of the metal detector. It indicates whether or not the metal detector is inspecting product at its maximum potential rate, as defined by the installer via the Machine Speed Set-point parameter.

For example, if the metal detector can inspect 30 ppm in optimum conditions but only achieves 15 ppm, Performance will be determined to be at 50%. This is a long-term average calculated from the time the PackML counters were last reset, and is therefore not greatly affected by instantaneous performance.

NOTICE!

It will not be possible to accurately calculate the performance parameter if a pack sensor is not fitted. In this instance, the metal detector will use a performance value of 100% to effectively eliminate it from the overall OEE calculation.

NOTICE!

If the Performance parameter exceeds 100% the text will turn red to warn the Machine Speed Setpoint has been incorrectly set. To set the Machine Speed Setpoint, see page 235.

11.4.4 Quality

Quality indicates the percentage of non-contaminated product inspected by the metal detector since the PackML counters were last reset.

For example, following the PackML counters being reset, if the metal detector inspects 200 products and rejects 2, the OEE Quality indicator will read 99%.

NOTICE!

It will not be possible to accurately calculate the quality parameter if a pack sensor is not fitted. In this instance, the metal detector will use a quality value of 100% to effectively eliminate it from the overall OEE calculation.

11.4.5 OEE

OEE is a combination of the Availability, Performance and Quality indicators, and illustrates how well the current production process is performing compared to how well the process can potentially be performing. As an equation, this can be represented as:

$$\text{OEE} = \text{Availability} \times \text{Performance} \times \text{Quality}$$

It is important to remember that the OEE value (and the indicators from which it is derived), can be adversely affected by factors that are both internal and external to the metal detection system. One of the key benefits of OEE is that it helps identify any issues or inefficiencies that are present in the production process so that the root cause can be investigated with a view to rectifying the issue and ultimately improving overall line efficiency.

The following is a list of example factors that are likely to have a negative effect on the OEE value calculated by the metal detector:

- The production line is not running and so the metal detector is not inspecting any product. Although the metal detector is 'ready and able' to actively detect and reject metal, the metal detector is not being used efficiently as it is not doing what it is designed to do. During times that no product is being inspected, the value of the Availability indicator will begin to decrease meaning a reduction in

OEE. The metal detector has no control over the amount of product it is given to inspect and so this would be classified as an external factor.

- A piece of equipment on the production line causes the conveyor speed to be reduced. In this instance, the rate at which products are inspected by the metal detector decreases. This causes a reduction in the Performance indicator value and, ultimately, the OEE value. This would be classified as an external factor.
- A piece of equipment on the production line deteriorates or experiences a critical part failure, that causes products on the line to be contaminated with metal. This will have a large impact on the Quality indicator value and, therefore, the OEE value. This would be classified as an external factor as the metal detector is operating as intended.
- In the event that the user does not correctly set up the core product parameters (Sensitivity, Phase etc) it is possible that a large number of false rejects will be reported by the metal detector. This can potentially impact greatly on the Quality indicator value and, ultimately, the OEE value. This would be classified as an internal metal detector factor.
- The metal detector system develops a fault that causes the line to stop; for example; a pack sensor fault caused by a blockage or degraded sensor. This has the effect of lowering the Availability and Performance indicator values and the OEE value.

More generally:

- Any planned or unplanned downtime of the metal detector, including maintenance, product setup, and PVR testing will lead to a reduction in the OEE calculated by the metal detector.
- Any planned or unplanned downtime of other production line equipment will potentially affect the OEE calculated by the metal detector.

11.4.6 Products Defective

This is the number of rejected packages since the PackML Counters were last reset.

11.4.7 Products Processed

This is the number of processed packages since the PackML Counters were last reset.

11.4.8 Current Machine Speed

This is the current operational speed of the metal detector in ppm. This value is for information only and allows the current speed of the line to be viewed. It is not used to calculate the OEE, instead taking a relatively small sample of packs to determine the current speed. The default speed is 0 ppm.

11.5 PackML PackTags

The PackML standard defines a set of data tags called 'PackTags' that can be used to represent internal metal detector data. These data tags are grouped in to three specific categories:

- PMLs (PackML Status)
- PMLa (PackML Administration)
- PMLc (PackML Command)

The sections below detail the PackTags that will be implemented on the metal detector.

11.5.1 PMLs

This is a group of status tags that represent the internal status of the metal detector. Table 103 shows the PackML Status tags implemented on the metal detector.

PACKTAG NAME	DESCRIPTION
UnitModeCurrent	This describes the current unit mode of the metal detector, as described in Section 11.2. Possible modes include: PVR, Maintenance, Setup, Automatic/Producing and Undefined.
StateCurrent	This describes the current state of the metal detector, as described in Section 11.2. Possible states include: Stopped, Suspended, Execute and Aborted.
StateColourCurrent	This the PackML colour associated with the current PackML state.
SeqNumber	This value represents the total number of PackML state and mode changes. The value starts at zero and is incremented each time the PackML mode or state changes. This value is persisted across product and batch changes and is reset on power up / power cycles. It can also be explicitly reset by the user either via the HMI or remotely via a ResetAllTimers command. A given state is not classed as the same between two different modes. Therefore, when the mode changes, the sequence number is incremented twice, once for the mode change and once for the state change.
MachSpeed	This is the current speed setpoint, or the ideal speed that the user would like to achieve in packs per minute (ppm).
CurMachSpeed	This is the current operational speed of the metal detector in ppm.
StatusCurrent	This is a bit string representing the current status of the metal detector.
FaultsStatus	This is a bit string representing the current faults on the metal detector.
WarningsStatus[0]	This is a bit string representing the current [0] warnings on the metal detector.
WarningsStatus[1]	This is a bit string representing the current [1] warnings on the metal detector.
ExecuteTimeout	When using a pack sensor, this is the period of time that is allowed to pass before the Execute state times out and returns to Suspended. Each time a pack is detected, the timer is reset. The execute timeout is measured in seconds.
Reason	This is the reason code for the last change of PackML mode or state. See page 230 for full list of reason codes.

Table 103:

11.5.2 PMLa

This is a group of administration tags that are used to expose PackML information (such as PackML cumulative times) that would be of interest to high level control systems. For example, the amount of time spent in the current PackML state. Additionally, the most recent alarms of the metal detector are exposed in the administration group.

PACKTAG NAME	DESCRIPTION
ModeCurrentTime	This is the time spent (in seconds) in the current unit mode. This is reset to 0 when the unit mode changes.
ModeCumulativeTimeAuto	This is the total time spent (in seconds) in the Automatic/Producing unit mode.
ModeCumulativeTimeMaintenance	This is the total time been spent (in seconds) in the Maintenance unit mode.
ModeCumulativeTimePVR	This is the total time been spent (in seconds) in the PVR unit mode.
ModeCumulativeTimeSetup	This is the total time spent (in seconds) in the Setup unit mode.
StateCurrentTime	This is the time spent (in seconds) in the current state. This is reset to 0 when the state changes.
StateCumulativeTimeAutoStopped	This is the total time spent (in seconds) in the Stopped state of the Automatic/Producing unit mode.
StateCumulativeTimeAutoSuspended	This is the total time spent (in seconds) in the Suspended state of the Automatic / Producing unit mode (represented by a number of seconds).
StateCumulativeTimeAutoExecute	This is the total time spent (in seconds) in the Execute state of the Automatic/Producing unit mode.
StateCumulativeTimeAutoAborted	This is the total time spent (in seconds) in the Aborted state of the Automatic/Producing unit mode.
ProdProcessedCount	This is the total number of packages inspected by the metal detector. This value is metal detector specific rather than product specific and is only reset when the PackML timers are cleared or the metal detector is power cycled. If a pack sensor is not fitted, the value will default to 0.
ProdDefectiveCount	This is the total number of rejects on the metal detector. This value is metal detector specific rather than product specific and is only reset when the PackML timers are cleared or the metal detector is power cycled.
AccTimeSinceReset	This is the total time (in seconds) since the last reset of the PackML timers.
OEEAvailability	The value of the SAFELINE OEE Availability calculation. For more information, see Section 11.4.
OEEPerformance	The value of the SAFELINE OEE Performance calculation. For more information, see Section 11.4.
OEEQuality	The value of the SAFELINE OEE Quality calculation. For more information, see Section 11.4.
OEE	The value of the SAFELINE Real-time OEE calculation using Availability, Performance and Quality. For more information, see Section 11.4.
OEMDAvailability	The value of metal detector Availability. For more information, see Section 11.4.
OEEPerformanceOverflow	Performance value exceeds 100% which indicates an incorrect mach speed setpoint.
Alarm[x].ID	This contains the reason code of the alarm, for example 1304. See page 230 for full list of reason codes. (x = 0 to 9)
Alarm[x].Message	Contains a textual description of the alarm as an alternative to using the alarm ID. This is limited to 50 characters in length and is in English only. (x = 0 to 9)
Alarm[x].TimeEvent	This is the Timestamp when the alarm was generated. (x = 0 to 9)

Table 104:

11.5.3 PMLc

This is a group of command tags that provide a degree of external control of the metal detector.

PACKTAG NAME	DESCRIPTION
MachSpeed	This sets the target value for the machine speed (in ppm).
ExecuteTimeout	This sets the execute timeout (in seconds).
CmdChangeRequest	Executing this command attempts to transition the metal detector into the state specified by the previous CntrlCmd. Write a value of 1 to issue the command.
ResetAllTimers	This clears all current alarms stored on the metal detector. Write a value of 1 to issue to the command.
ResetAllAlarms	This clears all current alarms stored on the metal detector. Write a value of 1 to issue to the command.
ResetCountersOnProductChange	Sets flag indicating whether PackML counters are reset on either a product or a cluster change. 0 = Reset Counters on Product Change Disabled. 1 = Reject Counters on Product Change Enabled.

Table 105:

12 The Quad Band GSM Gateway

This chapter explains how to configure the SAFELINE Quad Band GSM Gateway, if installed.

To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

SECTION	TITLE	PAGE
12.1	Installing the Gateway	244
12.2	Changing and Inserting a SIM Card	247
12.3	Configuring the Gateway	250
12.4	Gateway Troubleshooting	258

12.1 Installing the Gateway

NOTICE!

Quad Band functionality is not available in all countries. To learn whether this is available in your country, please contact your local SAFELINE service representative.

The Gateway may be supplied with the metal detector or bought as a separate item. These instructions apply equally to both scenarios.

Refer to Section 3.8 for additional information on the metal detector's User Input/Output board.

! WARNING!

Ensure all power has been disconnected from the metal detector before work is attempted on any electrical component of the metal detector.

Any electrical work carried out on the metal detector must be performed by a qualified electrical engineer.

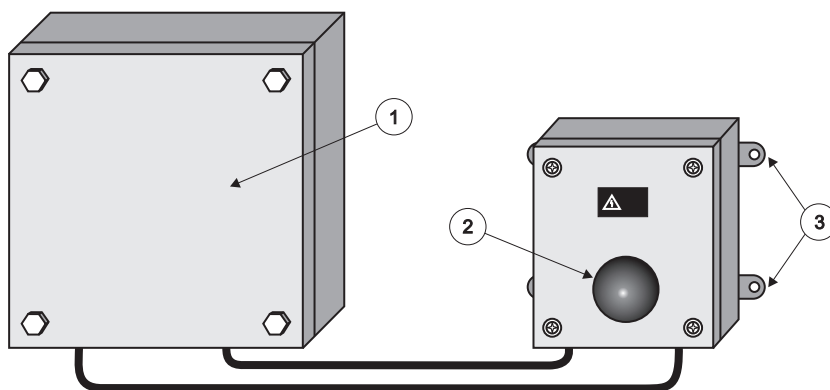


Figure 286: Overview

KEY	DESCRIPTION
1	Profile PSU Enclosure
2	Dome Antenna
3	Fixing Centres

12.1.1 Mounting the Gateway

1. Choose a location that allows the antenna to receive GSM signals and within 1 metre of the metal detector's PSU Enclosure. For example, the Gateway can be mounted on the metal detector's support framework or on a nearby wall, see Figure 287.



Figure 287: The Gateway Mounted

2. If a mounting plate is available, drill the holes for the Fixing Centres using the dimensions stated in Figure 288.

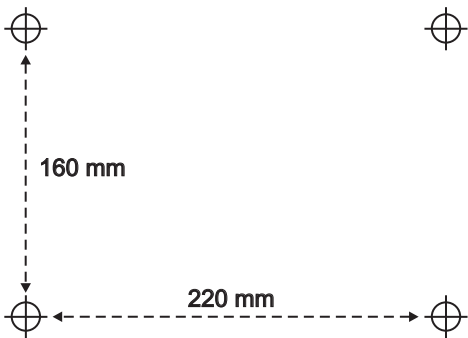


Figure 288: Drilling Details

3. Fit the Gateway and secure it as shown in Figure 289.

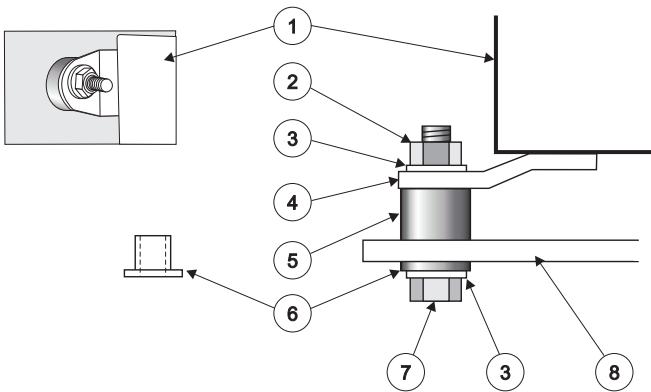


Figure 289: Enclosure Fixings

KEY	DESCRIPTION
1	Gateway Enclosure
2	M6 Nylon Nut
3	M6 Plain Washer
4	Gateway Bracket
5	Insulation Spacer

KEY	DESCRIPTION
6	M6 Insulator
7	M6 Hex Bolt
8	Panel

12.1.2 Wiring the Gateway into the Metal Detector's PSU

⚠ WARNING!

Ensure all power has been disconnected from the metal detector before work is attempted on any electrical component of the metal detector.

Any electrical work carried out on the metal detector must be performed by a qualified electrical engineer.

To wire the Gateway into the PSU:

1. Remove the power unit box lid from the metal detector. To do this:
 - Remove the four screws.
 - Raise the power unit box lid.
 - Remove the box lid earth wire (if fitted).
 - Lift the power supply box lid completely away from the power supply box.
2. Connect the Serial Communications cable to Terminal Block CN6 as shown in Figure 290. Note that the Polarisers are removed at positions 48 and 51.

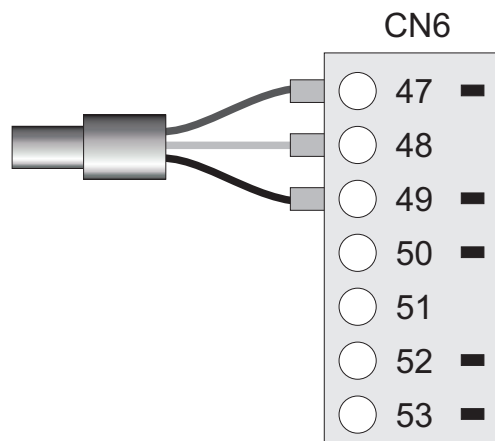


Figure 290: Serial Communications Cable Wiring

KEY	DESCRIPTION
PSU TML/Identification Number	Serial Communication Cable
47	D-Type Pin: 3 Colour: Blue Profile: TXD3
48	D-Type Pin: 2 Colour: Red Profile: RXD3
49	D-Type Pin: 5 Colour: Black Profile: 0 V

3. Connect the Mains Cable to Terminal Block CN1 as shown in Figure 291.

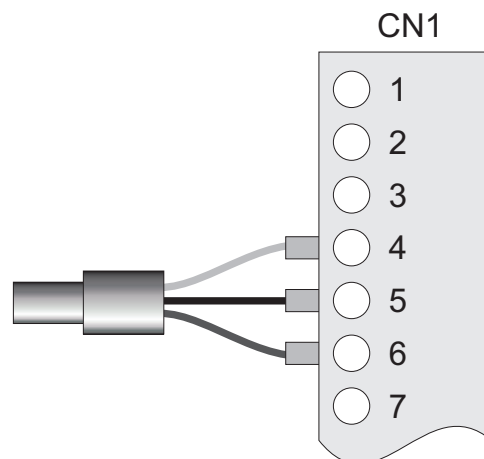


Figure 291: Mains Cable Wiring

KEY	DESCRIPTION	COMMENT
PSU TML/Identification Number	Mains Cable	Colour
4	Ground/Earth	Green
5	Live	Brown
6	Neutral	Blue

4. Refit the Power Unit Box Lid, ensuring that the seal around the box lid is in place and undamaged then carry out the procedure found in Step 1 in reverse order.

12.2 Changing and Inserting a SIM Card

NOTICE!

Quad Band functionality is not available in all countries. To learn whether this is available in your country, please contact your local SAFELINE service representative.

⚠ WARNING!

Ensure all power has been disconnected from the metal detector before work is attempted on any electrical component of the metal detector.

Any electrical work carried out on the metal detector must be performed by a qualified electrical engineer.

1. Remove the box lid from the Gateway.

To do this:

- a. Remove the four screws.
- b. Raise the Gateway box lid.
- c. Remove the box lid earth wire (if fitted).
- d. Lift the box lid completely away.

The overview of the Modem is shown in Figure 292.

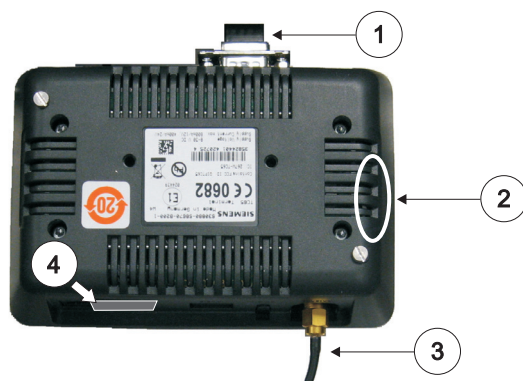


Figure 292:

KEY	DESCRIPTION
1	9-way D-Type PC Compatible Data cable
2	Flashing Blue LED for the Network Status Indicator
3	Antenna Lead
4	SIM Card Adapter Slot

2. Locate the SIM Card Adapter Slot on the Modem. The SIM card is located in the Adapter.
3. Eject the SIM Card Adapter containing the SIM card (if fitted) from the Modem by pressing a pointed object onto the SIM Eject Button, located next to the SIM card slot.

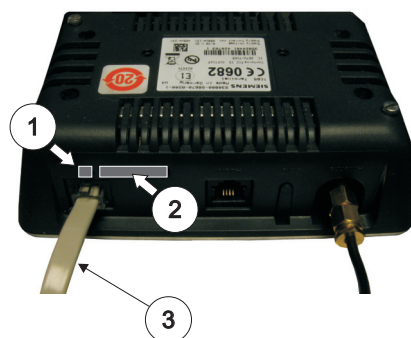


Figure 293:

KEY	DESCRIPTION
1	SIM Eject Button
2	SIM Card Adapter Slot
3	Power Lead

4. Remove the SIM card (if fitted) and insert the new one into the Adapter. A notch at one corner avoids incorrect insertion.

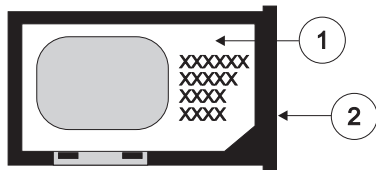


Figure 294:

KEY	DESCRIPTION
1	SIM Card
2	SIM Adapter

5. Slot the SIM Card Adapter carefully back into the Modem. The SIM card should be face down as shown in Figure 295.

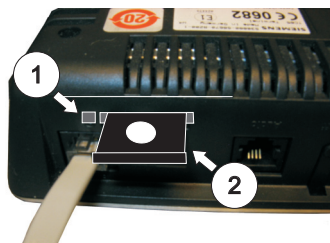


Figure 295:

KEY	DESCRIPTION
1	SIM Eject Button
2	SIM Card Adapter

6. Refit the Gateway box lid, ensuring that the seal around the box lid is in place and undamaged then carry out the procedure found in Step 1, on page 247, in reverse order.
7. Power up the metal detector.

12.2.1 Testing the Gateway Module

If the Gateway can be powered up safely without its cover fitted, further tests can be made to confirm that the Gateway is operational. This can be achieved by observing the Network Status Indicator (see Figure 292) and confirming the outcome against the information contained in Table 106.

ON TIME	OFF TIME	DIAGNOSIS
0	Continuous	Gateway or internal modem is powered OFF.
600ms	600ms	Searching for Network.
75ms	3000ms	Successfully registered with mobile Network.
Other	Other	Internal Gateway error, which needs the Gateway to be power cycled to rectify the issue.

Table 106:

12.3 Configuring the Gateway

NOTICE!

Quad Band functionality is not available in all countries. To learn whether this is available in your country, please contact your local SAFELINE service representative.



To determine whether this option is installed on the Metal Detector, press the **Information** key then use the **Left** and **Right** Arrows to go to the Options Installed screen, Figure 46 on page 65.

This section gives step-by-step instructions on how to configure the Gateway.

12.3.1 SIM Cards

If Email messaging is required, the following information must be obtained from your Mobile Phone Network Service provider before SAFELINE can offer practical installation and set-up support:

- GPRS Enabled SIM Card.
- Access Point Name and Authentication Details.
- SMTP Server Address, IP Port and Authentication Details.
- Ensure the SIM is unlocked (via a mobile handset) before inserting it into the Gateway module.

Before proceeding with the configuration, it is necessary to acquire a SIM card and some important pieces of information. Without this information, it will not be possible to complete the configuration of the Gateway.

The following is required for sending Email messages from a R/RB/RZ-Series Profile metal detector. If the sending of SMS text messages to a mobile device is required, the following steps are unnecessary (only the Recipient's phone number will be required).

Acquiring a GPRS enabled SIM card

In order to be able to receive Email notifications from the Gateway, it is important that the SIM card is GPRS enabled. "Pay as you talk" SIM cards are not enabled to receive GPRS data and are therefore not suitable.

Determining APN Details (Access Point Name)

Access Point Name information is required to allow the Gateway to communicate over the Internet via the mobile network.

All GPRS enabled SIM cards are configured by the SIM card provider with one or more 'Access Point Networks'.

The SIM card provider will be able to provide the following information either via the internet on information or support web pages or by contacting them directly:

- Access Point Name, E.g. 'stream.co.uk'
- Access Point Username, E.g. 'streamip'
- Access Point Password, E.g. 'streamip'

Determining SMTP Server Details

The Gateway requires an SMTP server to be defined, in order to transmit Email notifications. Typically, SIM card providers may provide web email facilities free of charge. Your SIM card provider will be able to advise you where to register. You will require the following information:

- SMTP Server (Outgoing Server) Address, E.g. 'apnmail.stream-communications.com'

- Email Username, E.g. 'streamip'
- Email Password, E.g. 'streamip'
- IP Port Value, E.g. 25 (default)
- Email Address, E.g. 'MetalDetector@mt.com'

The SMTP Server MUST be visible to the mobile service provider. In other words, it must not be hidden behind a firewall. The SMTP server may be:

- Hosted by the organisation.
- Provided by a specialist third party (E.g. Internet based).
- Provided by the network operator.

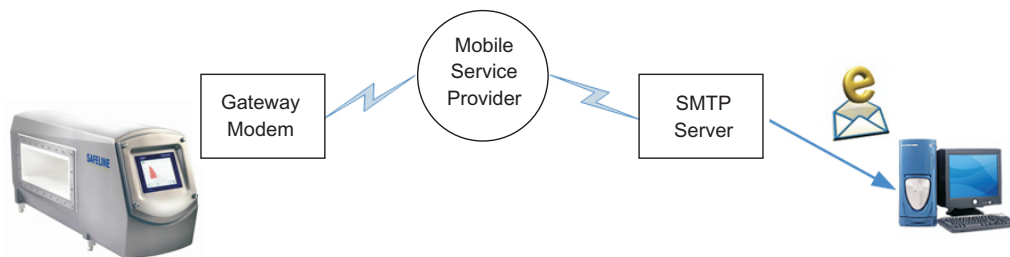


Figure 296:

Examples of Internet based third party providers are:

- www.smtp.com
- www.authsmtp.com
- www.smtp2go.com
- www.mysmtp.eu
- www.fasthosts.com

These are examples and SAFELINE cannot guarantee the quality of service provided.



Third party SMTP service providers may ask that all email addresses that will use the account be individually validated by the user.

By default, the detector will send an email from an address similar to SAFELINE.V45.XXXXXX@mt.com (where XXXXXX is replaced by the head serial number).

The SMTP provider may ask that this address be validated by sending an email back to this address for the user to validate it. It is not possible to validate this address from the metal detector. In order to validate the address, it may be necessary to read the email using a programme like Microsoft Outlook. The 'Email Address (from)' (default SAFELINE.V45.XXXXXX@mt.com) field has been provided to assist.

Having gathered the information for the SIM card, please ensure that the SIM card is fitted in the modem and the metal detector system is powered up. The Profile metal detector software needs to be F4.3.2 or above to operate the Gateway. The software version can be obtained by pressing the information button. For instructions on how to fit the SIM card, please refer to Section 12.2.

12.3.2 Enabling the Gateway Settings

To enable the Gateway Settings:

1. Log into the metal detector at the INSTALL access level (default access code: 999999).
2. Press **Advanced Settings > Customer Inputs/Outputs > Comms Settings > Direct Port**.
3. Press the **Comms Mode** parameter then select **TC65 GATEWAY** from the list.
4. Press the **Confirm Selection** key. The **Gateway Settings** key is revealed.



Figure 297:

12.3.3 Gateway Settings



Press the **Gateway Settings** key to begin configuring the Gateway.

Some of the options contain sub-sections. Figure 298 gives a general overview about the structure of the Gateway Settings menu and its sub-sections.

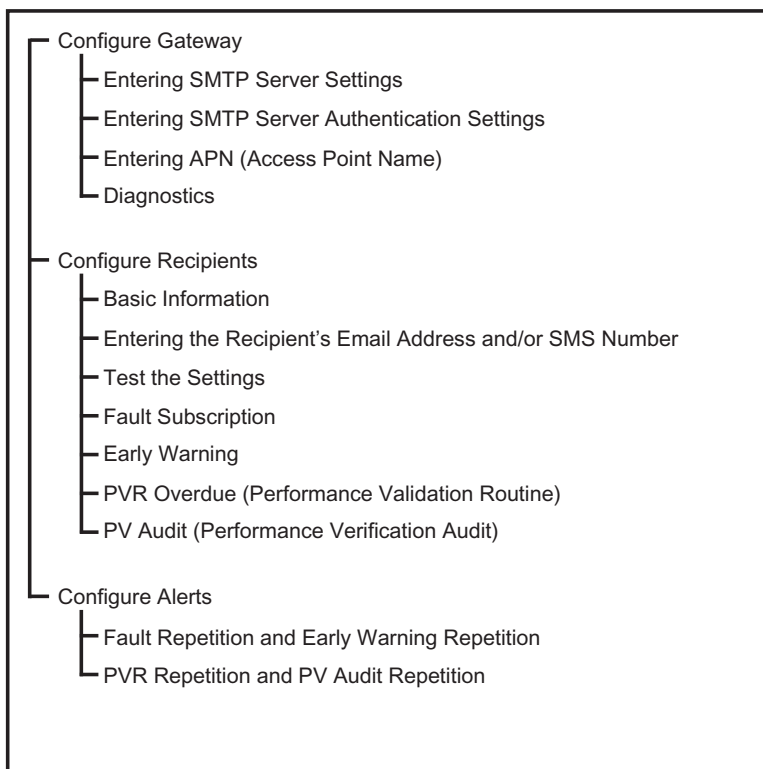


Figure 298:

Configure Gateway



Press the Configure Gateway to enter the SIM Card information gathered in page 250.

Entering SMTP Server Settings

Figure 299:

1. Press the **Outgoing Server** parameter to set the SMTP provider's SMTP Address. The alphabetic keypad is displayed for you to edit the server name — the operation, of which, is described in Section 4.9.
2. Press the **IP Port** parameter to set the SMTP port number received from the provider.
3. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

Entering SMTP Server Authentication Settings

Figure 300:

1. Press the **Email Username** parameter to set the SMTP account user name.
2. Press the **Email Password** parameter to set the password for the SMTP account.
 Note: If the SMTP provider will not accept unverified emails, press the **Email Address (from)** parameter to set an email address that can be verified. See page 250, for more information.
3. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

Entering APN (Access Point Name) Settings

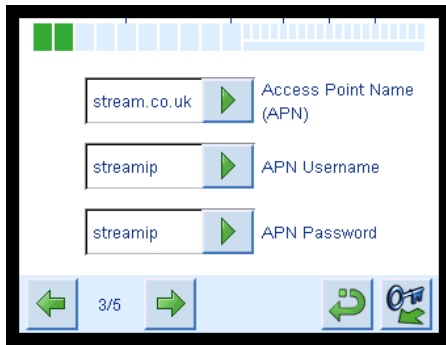


Figure 301:

1. Press the **Access Point Name (APN)** parameter to set the Access Point Name issued by the SIM provider.
2. Press the **APN Username** parameter to set the Access Username issued by the SIM provider.
3. Press the **APN Password** parameter to set the APN Password issued by the SIM provider.
4. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

Diagnostics

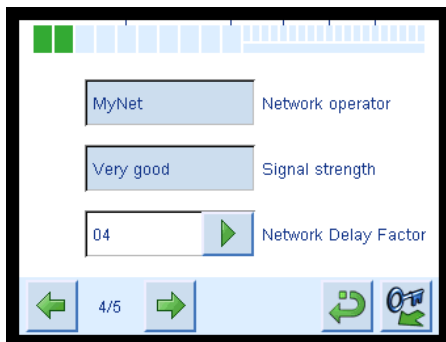


Figure 302:



Figure 303:

Screens 4 and 5 allow you to diagnose any connection issues of the Gateway to the metal detector.

Please refer to the Troubleshooting section, page 258, for further information on how these can be of any help if you experience any problems.

Press the **Left Arrow** to go to the previous screen, or **Return** to return to the Gateway Settings menu.

Configure Recipients

Having configured the Gateway, each person who wants to 'subscribe to' and 'receive' notifications (Recipients) shall need to be configured.



Press the **Configure Recipient** key from the Gateway Settings Menu. The detector offers a list of Recipients to configure.

To configure a Recipient:

1. Use the **Up** and **Down Arrow** keys to select the recipient you want to configure.
2. Press the **Confirm Selection** key.

The screen will change to show the first of six screens.

Basic Information



Figure 304:

1. Press the **Name** parameter to set or change the Recipient's name. The alphabetic keypad is displayed for you to edit the name — the operation, of which, is described in Section 4.9.
2. Press the **Delivery** parameter to set the delivery method by which the Recipient wants to receive notifications. The options are SMS, Email or SMS and Email.
 Note: When the **SMS & EMAIL** feature is selected, any failure in the transmission of the alert to either the SMS or to EMAIL shall see the alert sent again to both. Only on the successful transmission of both alerts to the SMS and the EMAIL shall the alert be classed as transmitted.
3. Press the **Language** parameter to set the Language that the Recipient wants to receive messages in.
4. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

Entering the Recipient's Email Address and/or SMS Number

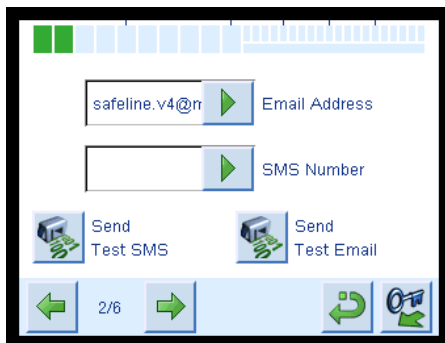


Figure 305:

1. Press the **Email Address** parameter to set the Recipient's email address, for example name@domain. The alphabetic keypad is displayed for you to edit the email address — the operation, of which, is described in Section 4.9.
2. Press the **SMS Number** parameter to set the Recipient's SMS number, for example +441234567890 or 01234567890 (UK SIM).

Test The Settings

1. If SMS Delivery was configured in Screen 1, press the **Send Test SMS** button to send a test message to the configured SMS Number.
2. If Email Delivery was configured in Screen 1, press the **Send Test Email** button to send a test Email to the configured Email Address.
3. When the test message has successfully been transmitted to the mobile network, a confirmation message will be displayed.



Figure 306:

4. Press the **Confirm** key.
5. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

Fault Subscription

A Recipient who is subscribed to Fault notifications will receive messages when any Fault condition becomes active.

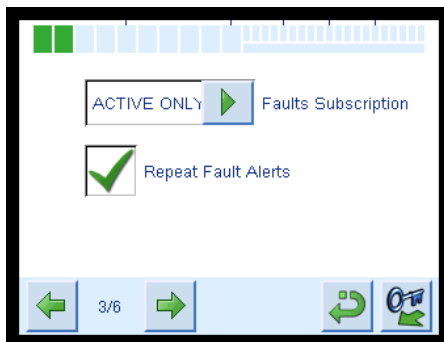


Figure 307:

1. Press the **Faults Subscription** parameter to set whether the Recipient is notified when the condition is **Active & Cleared** (when it first occurs and clears) or **Active Only** (when it first occurs only).
2. Tick the **Repeat Fault Alerts** box if the Recipient wants to be continuously reminded when an alert remains active.
3. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

Early Warning

A Recipient who is subscribed to Early Warning notifications will receive messages when any Early Warning condition becomes active.



Figure 308:

1. Press the **Early Warnings Subscription** parameter to set whether the Recipient is notified when the condition is **Active & Cleared** (when it first occurs and clears) or **Active Only** (when it first occurs only).
2. Tick the **Repeat Early Warning Alerts** box if the Recipient wants to be continuously reminded when an alert remains active.
3. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

PVR Overdue (Performance Validation Routines)

A Recipient who is subscribed to PVR Overdue notifications will receive messages when the PVR state changes to Overdue. Repetition time is linked to 50% of the Overdue period but will not be less than 10 minutes.

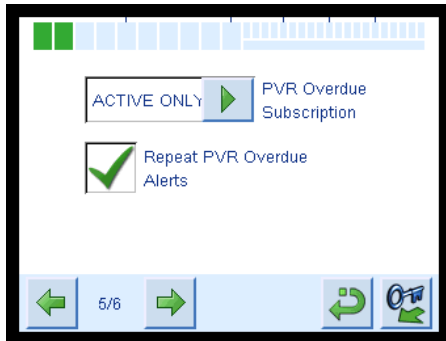


Figure 309:

1. Press the **PVR Overdue Subscription** parameter to set whether the Recipient is notified when the condition is **Active & Cleared** (when it first occurs and clears) or **Active Only** (when it first occurs only).
2. Tick the **Repeat PVR Overdue Alerts** box if the Recipient wants to be continuously reminded when an alert remains active.
3. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

PV Audit (Performance Verification Audit)

A Recipient who is subscribed to PV Audit notifications will receive messages when the PV Audit alarm becomes due/overdue. Repetition time is fixed at **Weekly**, when due, and **Daily**, when overdue.

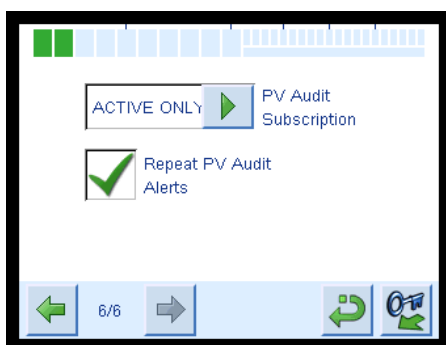


Figure 310:

1. Press the **PV Audit Subscription** parameter to set whether the Recipient is notified when the condition is **Active & Cleared** (when it first occurs and clears) or **Active Only** (when it first occurs only).
2. Tick the **Repeat PV Audit Alerts** box if the Recipient wants to be continuously reminded when an alert remains active.
3. Press the **Left Arrow** to go to the previous screen, or **Return** to return to the Gateway Settings menu.

Configure Alerts

Each alert subscription can be set to send a repeat notification at a preset interval. Changes to repetition timings will only be acted upon when the condition next changes from CLEARED to ACTIVE.

The Fault and Early Warning Repeats can be user configured, but the PV Audit and PVR Repetitions cannot be configured and are derived from other settings (see Figure 312).

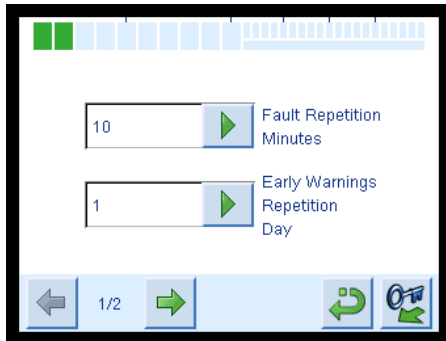


Figure 311:

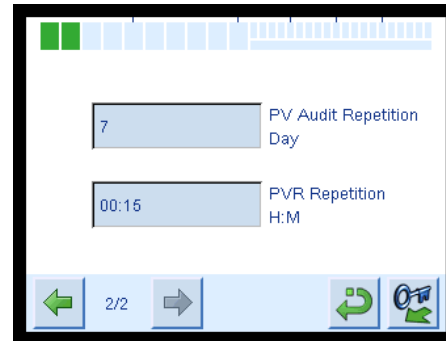


Figure 312:

1. Press the **Fault Repetition** parameter to set the repeat interval time, configurable in the range 10 to 60 minutes (in increments of 1 minute).
2. Press the **Early Warnings Repetition** parameter to set the repeat interval time, configurable in the range 1 to 7 days (in increments of 1 day).
3. Press the **Right Arrow** to go to the next screen, or **Return** to return to the Gateway Settings menu.

PV Audit Repetition

PV Audit Repetition is fixed at 7 Days when the PV Audit state is DUE.

PV Audit Repetition is fixed at 1 Day when the PV Audit state is OVERDUE.

PVR Repetition

PVR Repetition will be shown in Time.

PVR Repetition is only calculated when PVR state changes to OVERDUE.

If PVR Overdue (Time) is less than 20 minutes, PVR Repetition is 10 minutes.

12.4 Gateway Troubleshooting

The following information can be used to help diagnose Gateway communication problems.

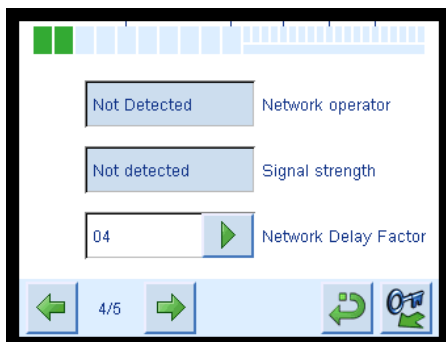


Figure 313:

Problem: The Network Operator and Signal Strength has not been detected.

Diagnosis: The Gateway is not connected.

Solution: Check the wiring between the Gateway and the metal detector. Check the power to the Gateway.

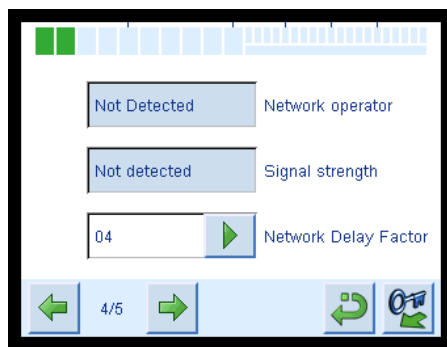


Figure 314:

Problem: The Network Operator has not been Detected.

Diagnosis: The SIM card has failed to register with the Network Operator.

Solution: Check Screen 5 and see if the SIM number is visible. If not, check the SIM is inserted correctly. Failing this, contact your Network Operator.

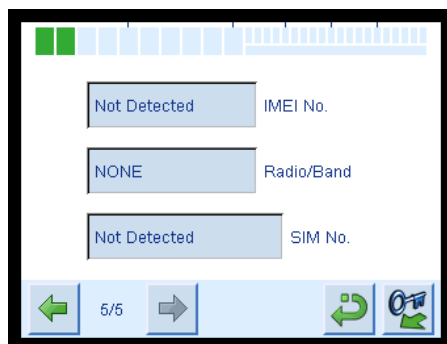


Figure 315:

Problem: The IMEI Number has not been Detected.

Diagnosis: The Gateway Module is not communicating.

Solution: A jumper-link needs to be fitted on the PSU Inter-connection board, across the LK1 and RS232 connections of the Direct Port. See Section 3.8 for connection details.



Figure 316:

Problem: The Test Email has not been sent.

Diagnosis: The APN/Email Settings are incorrect.

Solution: Check the APN and Email settings in the "Configure Gateway" section. Gradually increase the Network Delay Factor. A higher setting may be required when responses from the mobile phone network are slow.



Figure 317:

Problem: The Test Email has not been sent.

Diagnosis: The Gateway is not connected.

Solution: Check the wiring between the Gateway and the metal detector. Check the power to the Gateway.

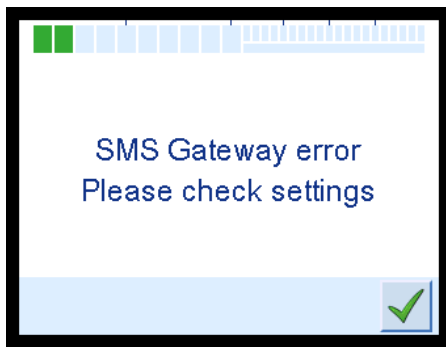


Figure 318:

Problem: Test SMS has not been sent.

Diagnosis: The Network response is too slow.

Solution: Gradually increase the Network Delay Factor. A higher setting may be required when responses from the mobile phone network are slow.



Figure 319:

Problem: The Test SMS has not been sent.

Diagnosis: The Gateway is not connected.

Solution: Check the wiring between the Gateway and the metal detector. Check the power to the Gateway Module.



Figure 320:

Problem: The subscribed Email has not been sent by the metal detector to the Recipient shown in the display.

Diagnosis: Use the **Test Email** feature and confirm all the settings are correct.



Figure 321:

Problem: The subscribed SMS has not been sent by the metal detector to the Recipient shown in the display.

Diagnosis: Use the **Test SMS** feature and confirm all the settings are correct.

12.4.1 Other Faults

PROBLEM	SOLUTION
Test SMS Not received.	Check Delivery enabled Check the SMS Number

PROBLEM	SOLUTION
The Test Email Not received.	Check Delivery enabled Check the Email Address.



If the problem still cannot be resolved please contact your SAFELINE Service Organisation.

13 Integrating with Other Equipment

This chapter explains the process of installing various optional items which you may want to add to your Metal Detector.

SECTION	TITLE	PAGE
13.1	Serial Communications	264
13.2	Installing a Speed Sensor for Reject Timers	264

13.1 Serial Communications

The R/RB/RZ-Series Profile series Metal Detector features a comprehensive serial communications interface. A range of physical interfaces are available to cater for a wide range of host applications.

Three communications ports are provided via the User Input/Output Board connection area. These are shown in Table 120. Refer to page 22 for details of the communications interfaces, and to the Added NoticesConnector Descriptions on page 42 for specific wiring information.

	FUNCTION	RS232	RS422	RS485	ETHERNET	GSM GATEWAY
Serial Port 1	✓	✓				
Serial Port 2	✓	✓	✓		See notice	
Serial Port 3	✓	✓	✓			✓

Table 120:

NOTICE!

Ethernet capability requires an optional plug-in Ethernet adapter.

NOTICE!

RS485 is currently not supported.

13.1.1 Printer

Enables hardcopies of Performance Test Reports, Shift Reports and Metal Detector Settings to be produced.

13.1.2 Network

This communications port enables interfacing with network packages such as Freeweigh.NET and other factory management / SCADA (Supervisory Control And Data Acquisition) systems.

13.1.3 Direct

Intended for direct, one-to-one, communications with equipment such as Check-weighers.

SAFELINE provides a range of communications solutions to simplify integration with new or existing communication networks. For further information regarding Profile serial communication and the solutions available, please contact SL-UKSERVICE@mt.com for a communications information pack.

13.2 Installing a Speed Sensor for Reject Timers

13.2.1 Speed Sensor Requirements

The speed sensor can be:

- A purpose bought item, known as a Rotary Encoder, or
- A Proximity/Photo-electric sensor together with the necessary hardware to produce a pulse output from rotary movement.

In either case, the device must be coupled up to the conveyor drive system to give a pulse output signal in direct relation to the distance moved by the conveyor.

The device chosen must adhere to the speed sensor electrical requirements detailed in page 21.

Speed Sensor Electrical Connections

Refer to Section 3.8 for specific connection details.

Connect the sensor to the connector CN11 when powering it from the detector local +15V DC supply.

A Rotary Encoder Using a Proximity or Photo-electric Sensor

Figure 322 shows a possible technique for producing a rotary encoder using a proximity or photo-electric sensor.

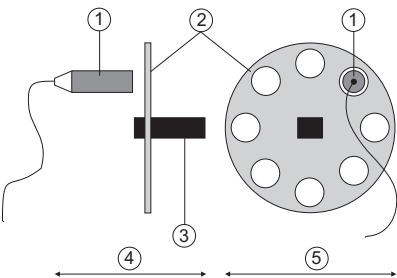


Figure 322:

KEY	DESCRIPTION
1	Sensor
2	Disk
3	Drive Shaft
4	Side View
5	Front View

The disk shown has been drilled so that the sensor will give a pulse output as the rotating disk intermittently interrupts its sensing area.

The sensor shown would typically be a proximity type and the disk would be fabricated from mild steel. Alternatively a two part photo-electric sensor could be used, i.e with separate transmitter and receiver or with combined transmitter and receiver and reflector.



Avoid the use of photoelectrics that require the disk itself to reflect the beam.



Both proximity and photo-electric devices are available in a slot sensor type construction, which can be mounted to sit astride the disk. If this technique is used the disk should be slotted rather than drilled.

Disk Construction

The disk diameter and number of holes/slots can be determined when the required Shift Distance of the speed sensor is known. If the required shift distance is 25 mm/shift then the hole/slot pitch of the disk should be designed so the sensor gives one pulse cycle out for 25 mm moved by the conveyor, see Figure 322

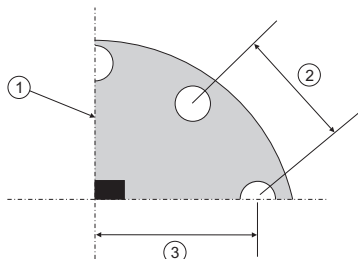


Figure 323:

KEY	DESCRIPTION
1	Section of Disk
2	Hole Pitch
3	Radius

The Hole Pitch = $6.283 \times \text{radius} / \text{number of holes}$.



In building the disk, make sure that the solid and gap width are such as to keep the pulse width and frequency within the specified limits.

Determining the Shift Distance of the Speed Sensor

The speed sensor provides digital pulses in relation to the distance moved by the conveyor. The incremental distance moved between pulses is known as the PULSE Distance and is the smallest interval measurable by the detector (i.e. its resolution).

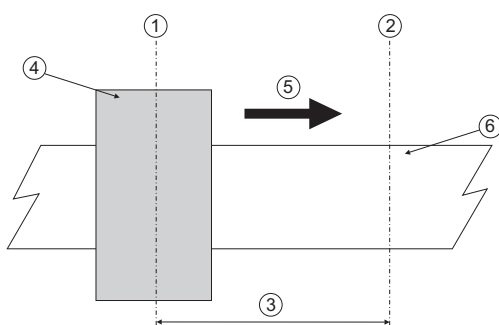


Figure 324:

KEY	DESCRIPTION
1	Detection Point
2	Reject Point
3	Distance

KEY	DESCRIPTION
4	Detector Head
5	Direction
6	Conveyor Belt

Table 121 can be used to determine the Pulse Distance for the system, using the Distance between the detection and rejection points, as in Figure 324.

To determine the Shift Distance:

1. Find the point on Table 121 where the maximum conveyor speed does not exceed the limit specified. If this value lies at more than one point in the Reject Distance table, select the point that corresponds to the smallest distance per pulse.

For example, when the maximum conveyor speed is 135 m/min (442.91 ft/min), which lies at three points in the table, which correspond to a distance per pulse of 6 mm, 8 mm and 10 mm, choose the 6 mm column.

2. Check that the Distance lies between the minimum and maximum limits for the distance per pulse chosen.

For example, when the Distance = 1000 mm (39.37 inch) and a distance per pulse of 6 mm, the detection to rejection distance minimum and maximum limits are 180 mm (7.08 inch) to 5892 mm (229.14 inch).

If the Distance exceeded the detection to rejection maximum limit, you should choose the next point up, where in our example the distance per pulse is 8 mm. If the the Distance still exceeds the detection to rejection maximum limit, again choose the next point up.

SHIFT DISTANCE OF THE SPEED SENSOR			
Maximum Conveyor Speed	Detection to Rejection Distance		Distance Per Pulse
	Maximum	Minimum	
60 m/min (196.85 ft/min)	1940 mm (76.37 inch)	60 mm (2.36 inch)	2 mm (0.078 inch)
120 m/min (393.7 ft/min)	3988 mm (152.76 inch)	120 mm (4.72 inch)	4 mm (0.157 inch)
180 m/min (590.55 ft/min)	5982 mm (229.14 inch)	180 mm (7.08 inch)	6 mm (0.235 inch)
240 m/min (787.4 ft/min)	7976 mm (305.51 inch)	240 mm (9.44 inch)	8 mm (0.314 inch)
300 m/min (984.25 ft/min)	9970 mm (381.88 inch)	300 mm (11.81 inch)	10 mm (0.392 inch)

Table 121:

13.2.2 Inverters

Figure 325 shows a typical layout of the Inverter supplied by SAFELINE

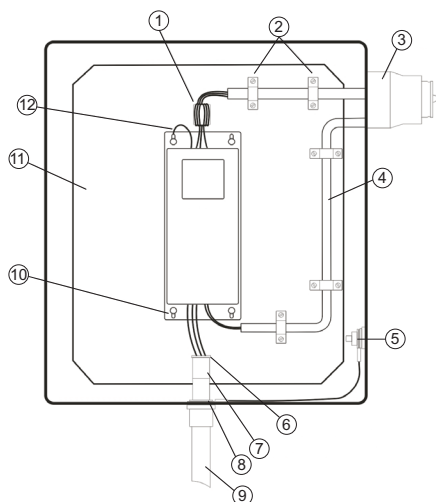


Figure 325:

KEY	DESCRIPTION
1	Ferrite Core (two turns)
2	Cable Clamps
3	Isolator
4	Control Wiring
5	Earth Stud
6	Plastic Gland
7	Conduit Couplings
8	Screening Tag
9	Screened Cable to Motor
10	Inverter
11	Back Plate
12	Earth Wire

CAUTION!

Do not attempt to install, operate, maintain or inspect the inverter until you have read through the instruction manual supplied with the inverter.



SAFELINE use Mitsubishi as our supplier of inverters: we know this works well with the metal detector and we have carried out extensive tests to meet the requirements of the CE regulations.

General Precautions

- The inverter is positioned directly on top of the RFI filter. Keep the wiring from the filter to the inverter as short as possible.
- Expose the inner core of the supply cable to the inverter under all the cable clamps (No. 2 in the diagram).
- The minimum size for the earth wire to the Earth Stud (No. 5 in the diagram) is 2.5 mm.
- Keep the wiring inside the control box as far away from the inverter as possible.
- Motor cables should be run separately from any other cables and as far from the metal detector as possible.
- External screened cables should be grounded at suitable intervals where possible.
- Remove the insulation only where screening clamps are shown to provide good earth continuity at that point.
- Do not run the power cables (I/O cables) and signal cables of the inverter in parallel with each other and do not bundle them.
- Use twisted shield cables for the detector connecting and the control signals.
- Ground the inverter at one point.
- Capacitances exist between the inverter's I/O wiring, other cables, earth and motor, through which leakage currents flow to cause the earth leakage circuit breaker or earth leakage relay to operate unnecessarily. To prevent this, take appropriate measures such as setting the carrier frequency to a lower value, using an earth leakage circuit breaker designed for suppression of harmonics and surges, and using the electronic overcurrent protection built in the inverter.

14 Setting Sheets

This chapter provides you with blank Setting Sheets to record the settings of your Metal Detector.

SECTION	TITLE	PAGE
14.1	Product Settings	272
14.2	Install Settings	273
14.3	Advanced Settings	274
14.4	QA Setup	275

14.1 Product Settings

[illegible]

Table 122:

14.2 Install Settings

Language		
Measurement Units		
Pack Sensor		
Pack Sensor Distance		
Head to reject Distance		
Timer		
	Non-Gated	
	Gated	
Speed Sensor		
	Pulse/metre (ft)	
RCU Sensor Present		
Extension Time		
Detector Speed Range		
	Low	
	Nominal	
	High	
Speed Setting		
	Fixed	
	Variable	
System Speed		

Table 123:

14.3 Advanced Settings

Auto Setup Settings		
Auto Setup Level		
Auto Freq. Selection		
Optimise For SS		
Product Type		
	Dry	
	Wet	
Sensitivity Limit		
	Low	
	Nominal	
	High	
Clustering Settings		
	Clustering Enabled	
Product Logging		
	Sample Rate	
	Sample Time	
	Phase Display	
	Phase Interval	
	Auto Scaling	
Customer Inputs/Outputs		
	Input 1	
	Input 2	
	Input 3	
	Input 4	
	Output State — Multiple	
	Output 1	
	Output 2	
	Output 3	

Table 124:

14.4 QA Setup

14.4.1 Performance Testing

Test Setup		
Line ID		
Synchronise Next Test To		
	First	
	Last	
Alarm Output When		
	Due	
	Overdue	
Test Mode		
	Off	
	Time	
	Packs	
Test Interval Time		
Test Overdue Time		

Table 125:

14.4.2 Shift Report

Report Mode		
	Off	
	Manual	
	Auto	
Reject Relay Operations		
Modified Settings		

Table 126:

14.4.3 Printer Functions

Printer		
	Absent	
	Portable	
	Fixed	
Printer Type		
	S'Print	
	Martel	
	Terminal	
Flow Control		Hardware

Table 127:

14.4.4 Test Sample Setup

[illegible]

PRODUCT NAME	FERROUS	NON-FERROUS	STAINLESS STEEL

Table 128:

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