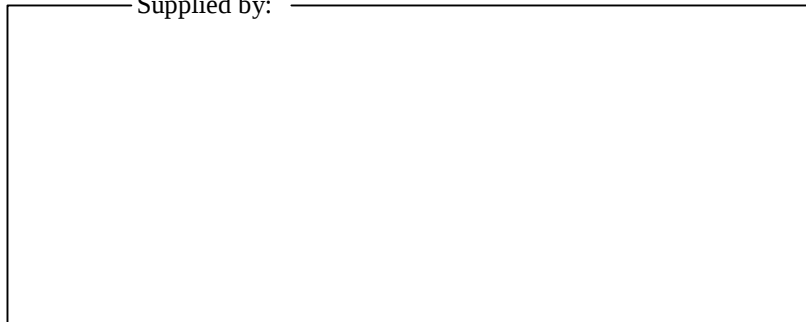


**STANDARD SERIES
METALDETECTORS
INSTRUCTION MANUAL
FIRMWARE 2.01 TO 2.49**

Supplied by:



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Safeline reserve the right to change the contents or form of this manual at any time without prior notice having been given.

This detector must only be used for the express purposes as advertised by Safeline and as referred to in this and other Safeline approved literature.

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 installation or replacement.
- 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) Arrange a maintenance schedule using the printer option.

This manual is NOT intended as either-

- 1) A Service Manual, (although some fundamental diagnosis is included in this manual).
- 2) A Workshop Manual - No detailed technical analysis, either mechanical, electrical or electronic is contained in this manual.
- 3) Commercial information - for example sales literature or publicity information.

Safeline technical publications are designed to be backwardly compatible with all previous versions of detectors in the family. 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.

NOTE.

An upgrade service is available from Safeline, at a fee, that 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.

Amendments

Safeline have a policy of updating manuals to include new features, correct erratum, or incorporate customers requests. The Amendment Record below is provided for the express purpose of the customer, or supplier, to record any amendments that may have been included in this document.

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

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 Safeline address given on the title page.

Amendment Record

If you receive an update for this manual then:

1. Attach the update sheet(s) to the rear of the manual.
2. In the row whose 'Amendment' number matches that of the received amendment:-
 - a) Print your name in the 'Incorporated By' box.
 - b) Print the 'Date' box with the date you updated the manual.

AMENDMENT	INCORPORATED BY	DATE
1. Issue 9	Safeline Ltd	May 1998
2. Issue 10	Safeline Ltd	Sept 2000
3. Issue 11	Safeline Ltd	Sept 2001
4. Issue 12	Safeline Ltd	July 2002
5. Issue 13	Safeline Ltd	October 2002
6. Issue 14	Safeline Ltd	July 2003
7. Issue 15	Safeline Ltd	Jan 2004
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Warnings and Cautions



THE ABOVE CAPTION IDENTIFIES AN OPERATING PROCEDURE OR PRACTICE THAT COULD RESULT IN PERSONAL INJURY OR DEATH.



The above caption identifies an operating procedure or practice that could result in damage, or destruction, of the detector, the process or its surroundings.



The above caption is used to draw the readers attention to a note of extra importance.



This manual is regarded as an integral part of the detector.
This manual must always be kept with the detector for the whole of its operating life.
This manual includes all the features available with the firmware version 2.01 to 2.49. Please note that all these features may not be included as standard.



WHEN THIS CAPTION IS SHOWN ON THE EQUIPMENT IT IS USED TO INDICATE THE POSSIBILITY OF ELECTRIC SHOCK.



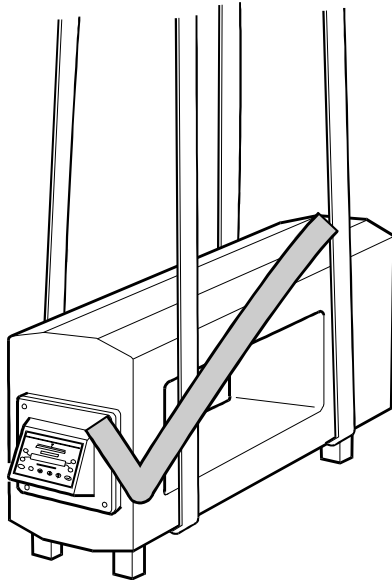
WHEN THIS CAPTION IS SHOWN ON THE EQUIPMENT IT IS USED TO INDICATE THAT THE MANUAL MUST BE CONSULTED BEFORE PROCEEDING.

Handling instructions

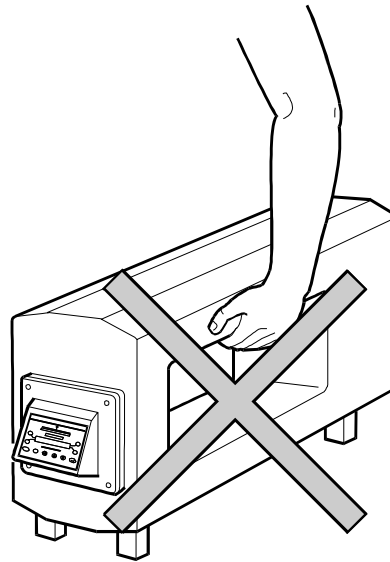
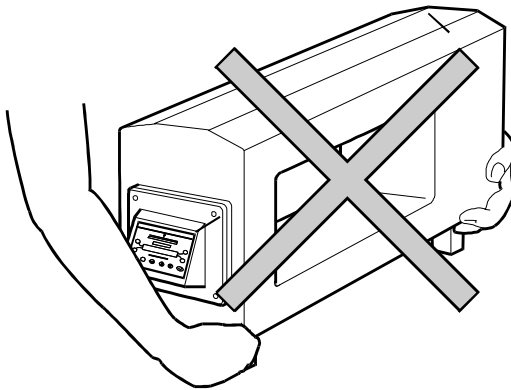
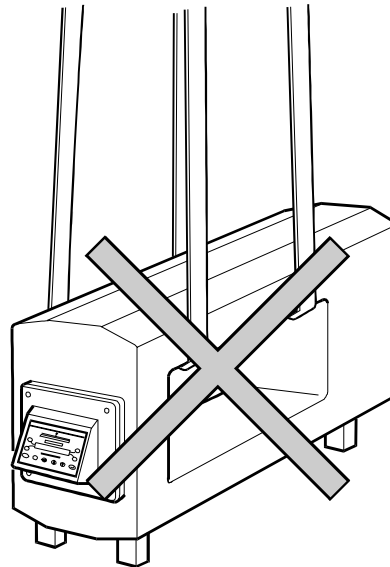
The detector does not contain any exposed noxious or dangerous substances.

When transporting and handling the detector damage may result if the lifting equipment (i.e. sling, cable assembly or by hand) passes through the aperture of the detector. The diagrams below show the incorrect way and the correct way to lift and support the detector during transportation.

CORRECT



INCORRECT



Safeline does not recommend the lifting or supporting of the detector by a person. Always use suitable lifting or supporting apparatus. Safeline will accept no liability for personal injury caused by attempting to lift or move the detector without the aid of a mechanical apparatus.

If 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.

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

The equipment should only be used in accordance with the instructions given herein. 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.



WARNING

On no account should any of the electrical panels of your 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.



CAUTION

For correct operation and to prevent any damage to the detector follow the instructions given in this document under the heading 'Installation'.



CAUTION

In accordance with EN 61010-1:1993 this equipment has been designed to be safe at least under the following conditions:

Indoor use.

Altitude up to 2000m.

Storage temperature: -10 °C to +50 °C (15 °F to 120 °F)

Operating temperature: -10 °C to +45 °C (15 °F to 110 °F)

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

For connection to TN (EN60950:1992) power distribution systems only, for connections to other power distribution systems please contact your supplier.

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

Transient overvoltages according to INSTALLATION CATEGORY III.

Pollution degree 2 in accordance with IEC 664.

Detector Precautions



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

1. Electric Arc Welding

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

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.

It is recommended that the power source for the detector should be connected via an independent spur. The power source for the detector should be fitted with an isolation switch and the appropriate circuit breaker and/or fuse.

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.

4. Magnetic Fields (Ferrous Detectors Only)

It is recommended that this type of detector should not be installed in close proximity to any potential source of magnetic fields.

5. Metal Free Zone (M.F.Z.)

To achieve the optimum detector performance, an area surrounding the aperture of the detector known as the Metal Free Zone (M.F.Z.) must be kept free of metal.

The size of this zone will be dependant upon the type of detector, the detector's aperture height and the detector's operating sensitivity.

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

Typical values of M.F.Z for standard metal detectors are:

M.F.Z. = 1.5 x aperture-height for stationary metal

M.F.Z. = 2.0 x aperture-height for moving metal.

Typical values of M.F.Z for Ferrous detectors are:

M.F.Z. = 1.5 x aperture-height for stationary non-Ferrous metal

M.F.Z. = 2.0 x aperture-height for moving non-Ferrous metal.

M.F.Z. = 2.0 x aperture-height for stationary Ferrous metal

M.F.Z. = 3.0 x aperture-height for moving Ferrous metal.

6. 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.

7. Handling and lifting

When transporting and handling the detector damage may result if the lifting equipment (e.g. sling, cable assembly or by hand) passes through the aperture of the detector.

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

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

8. 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.

9. 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:

- a) 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.
- b) Clean the conveyor belt regularly.

10. Orientation of contaminants

Metal detector sensitivity is expressed as the diameter of the smallest spherical object which 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.

11. 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.

12. 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.

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ATEX DIRECTIVE	ERROR! BOOKMARK NOT DEFINED.
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ATEX system label	Error! Bookmark not defined.
ATEX Static warning label	Error! Bookmark not defined.
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THIS MANUAL INCLUDES ALL THE FEATURES AVAILABLE WITH THE FIRMWARE VERSION 2.01 to 2.49

PLEASE NOTE THAT ALL THESE FEATURES MAY NOT BE INCLUDED AS STANDARD.

NOTICE

The information contained in this document is subject to change without notice.

All efforts have been made to ensure the accuracy of this manual. However, should any error be detected, Safeline would greatly appreciate being informed of them.

The above notwithstanding, Safeline can assume no responsibility for error in this manual or their consequences.

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SPECIFICATION - STANDARD SERIES DETECTORS

BASIC TECHNOLOGY

High frequency low power electromagnetic coil system.

Frequency of Operation

Crystal controlled in the range 10 kHz to 500kHz staggered frequency versions available.

Input Power

Voltage 85 to 265 V AC, Current 1.5 amps max.
Frequency 47 to 440 Hz.

For cases where conformance to various safety specifications (UL, CSA, etc.) are required, input voltage range will be 85 to 250 V AC.

For connection to TN (EN60950:1992) power distribution systems only. For connections to other power distribution systems please contact your supplier.

Temperature Range

Operating -10 °C to +45 °C (14 °F to 110 °F)

Storage -10 °C to +50 °C (14 °F to 120 °F)

Humidity Range

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

Warm Up Time

Zero seconds at an ambient temperature of 20 °C

Balancing

Automatic - fast switch on (5 seconds typical)

Internal Battery Backup

Cell life - 5 years

Discharge time - 6 months from power off at temp. of 20°C

Product speed

Selectable high and low from the control panel,
low - x 1, high - x 3

Low - 0.05 to 2.5 metres / min. / mm. of aperture height
(4 to 200 feet / min. / inch of aperture height)

High - 0.05 to 7.5 metres / min. / mm of aperture height
(12 to 600 feet / min. / inch of aperture height)

Higher and lower speeds available on request

Relay Output

Two sets of volt free change over contacts

Rating 5 amps at 250 V AC/30 V DC non- inductive

Alarm Timers

See timer section in manual.

Counters

If the maximum counter value is reached, the next increment will change the digits to *.

Both counters are independently resetable from the control panel.

Reject Counter.

Counts reject relay operations, not the number of detections or the number of rejects.

Maximum counter value - 9999

Pack Counter

Requires an on line Pack Sensor if a gated timer is not used.

Maximum counter value - 16777214

Maximum count rate - 3000 packs/minute at a pack space ratio of 1:1.

Spherical Sensitivity

Dependent on aperture size, and frequency of operation, all sensitivity information is expressed in diameters of spherical samples.

Non spherical objects such as wires will exhibit an orientation effect, ie. they can be more easily detected in certain axis. If the diameter of the wire is less than the spherical sensitivity setting the sample may not be detected in all orientations.

Sensitivity Ratios

Dependent on frequency of coil system e.g. at 300 kHz

Non Ferrous x 1.1 Fe to 1.3 Fe diameter
(depending on the metal)

Stainless Steel type A x 1.2 Fe dia.
Stainless Steel type B x 1.3 Fe dia.
Stainless Steel type C x 1.5 Fe dia.

Sensitivity Gradient

Less than two diameters.

This is the difference in sensitivity measured at the centre of the aperture and the sensitivity at any other point in the aperture not closer than 10 mm to the surface.

Environmental Protection

Painted version IP66, NEMA 4

Stainless steel version IP66, NEMA 4X

For more hostile environments a protective cover is available for the control panel.

To achieve the specified protection the module and power unit cover must be torqued down to 5 N.m (45 in.lbs), or 4.5 N.m (40 in.lbs) for the module if the environmental protection cover is used.

Sound Output

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

RS232 Communication

Two communication ports COM1 and COM2 both accessible from the P/S Connection PCB within the Power Unit Enclosure.

Both communication ports are typically ± 9 V levels and use the following data format:-

Baud rate:	9600
Data bits:	7
Start bits:	1
Stop bits:	1
Parity bits:	1 Odd

COM1

4 or 2 wire control.

COM2

2 wire control.

BASICS ABOUT METALDETECTORS

Basic Principles of Operation

Safeline detectors utilise a low power high frequency magnetic field coil system which has the ability to sense minute disturbance created by metal particles. A metal particle passing through the aperture of the detector will create changes in the magnetic field inside the detector.

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

The amplitude/size of the signal is related to the size of metal particle, the larger the metal particle the greater the amplitude of the signal.

Different types of metal generate signals which differ in phase. Phase or more precisely phase angle, it is a comparative term and is a measurement of phase relationship relative to some reference.

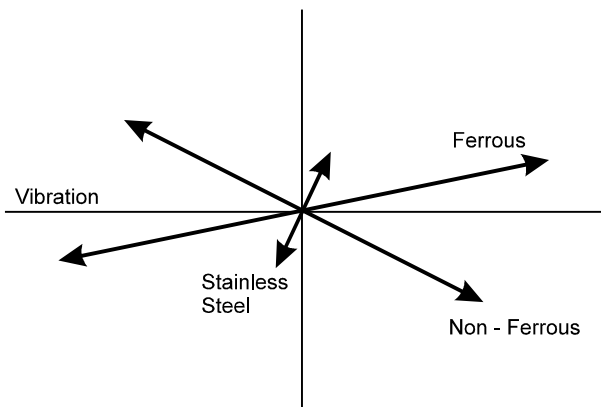


Fig. 1

Diagram Fig. 1 shows the typical phase relationship of various signals from the detector. All signals generated by the metal detector coil system can be represented in this manner, i.e. a vector with amplitude and phase angle.

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. ie a vector 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.

Product Effect

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

Some products exhibit a 'product effect'. ie the product itself generates a signal in the same way as a metallic particle. This results from the bulk conductivity of the product at high frequency.

For most products, usually dry products, the product effect is negligible. However, wet or moist products, e.g. meat, sauces, soups etc generate a large product effect signal which will influence the effective operating sensitivity of the detector.

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

Phase Discrimination

The Safeline detector contains phase discrimination circuits which discriminate between the wanted signals from metal particles and the unwanted signals from vibration and product effect, i.e. it minimises 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 reduces the sensitivity to all signals, metallic signals, vibration and product signals alike.

What is required is a more selective adjustment that will discriminate between different signals. The phase discriminator does this, it selectively reduces the signals from vibration or product effect with minimal effect on the metallic signals.

A comparison can be made with a commercial/domestic Hi-Fi system. The volume control of the Hi-Fi increases/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 discrimination circuit, however the phase discrimination circuit in the Safeline metal detector is very much more selective.

Signals from the detector coil system can also be represented as shown in Fig 2.

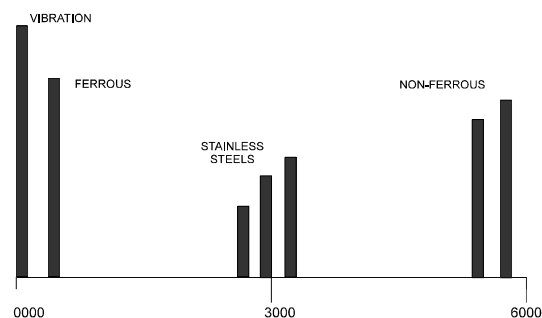


Fig. 2

The characteristic of the phase discrimination circuit is as shown in Fig. 3 and may be positioned by changing the phase setting.

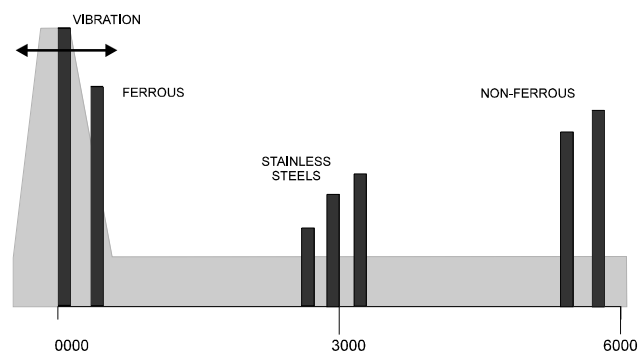


Fig. 3

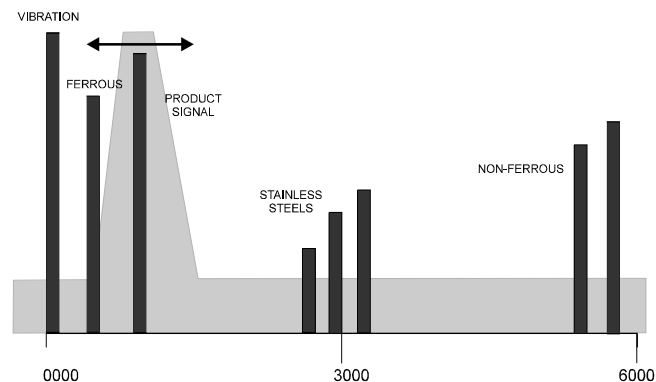


Fig. 4

It can be seen from Fig. 4 that the effects of unwanted signals may be minimised by aligning the phase discrimination with the unwanted signal, such as product signals. When aligned the amplitude of unwanted signal required to trigger the detector will be increased.

Fortunately, most products do not give a significant product effect signal, this allows the phase discriminator to be used for rejecting vibration signals. The optimum setting of phase is 0000. ie aligned to vibration this gives the maximum rejection of vibration signals and equalised sensitivity.

In general, if the phase discrimination is aligned to some angle other than vibration, the detector's sensitivity to ferrous metal will increase and the non ferrous/stainless steel sensitivity decrease. Vibration effects will also become more noticeable.

INSTALLATION

GENERAL

Safeline advise users to carefully study the installation advice provided; a little care taken during installation will avoid the detectors performance from being severely impaired.

Safeline detectors utilise a low power high frequency magnetic field coil system which has the ability to sense minute disturbances created by metal particles.

Steel, aluminium, stainless steel any type of metal particle when passed through the aperture of the detector will create changes in the magnetic field of the detector. These changes generate electrical signals in the coil system.

Most of the detectors 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 detectors performance and can give rise to spasmodic detection signals and inconsistent performance.

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

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 size of this surrounding area will be dependent upon the aperture size, the type of detector and the operating sensitivity.

Stationary metal may be positioned closer to the detector than moving metal. MFZ guidelines for standard series detectors are as shown in fig 5. Please consult the product data sheet for MFZ of other types of metal detector.

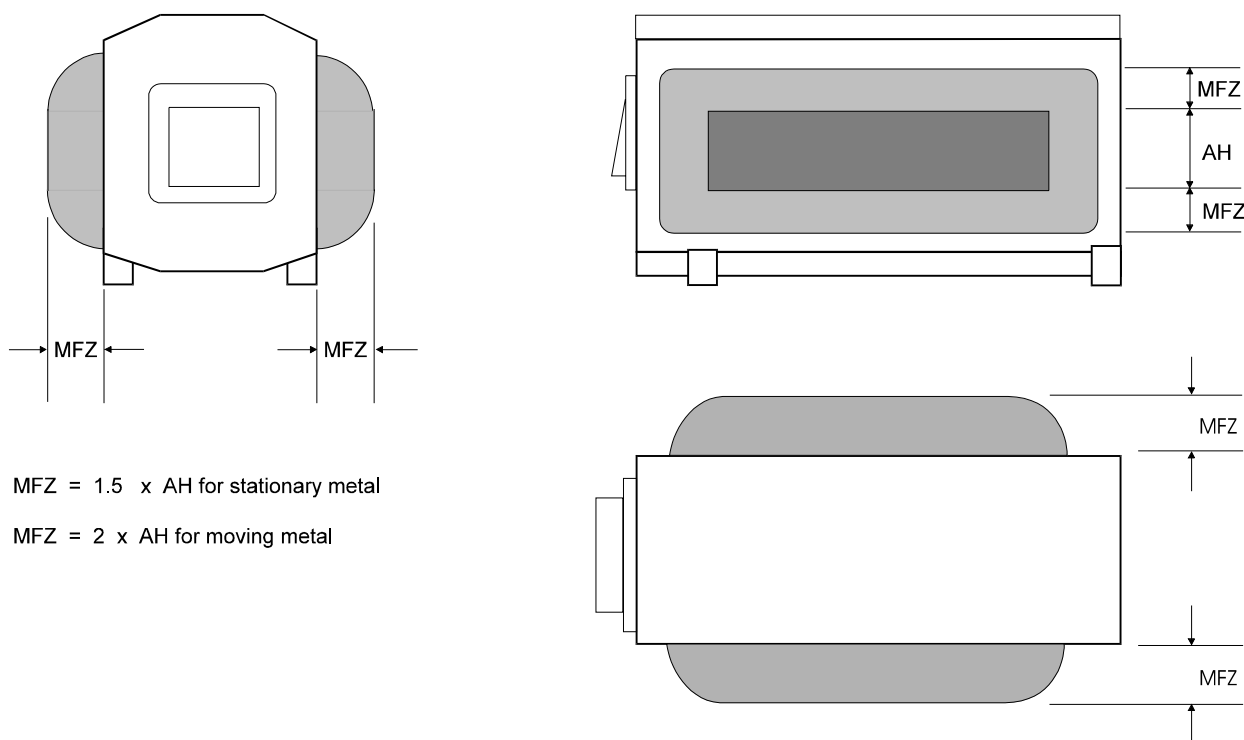


Fig. 5 Metal Free Zone Guidelines - Standard Series Detectors

Magnetic Loops

The design and Construction of the metal detector support framework can be very influential on the overall performance of the detector. 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.

A typical installation could be a standard series detector mounted on a metallic conveyor frame with rollers positioned across the frame, page 60.

The magnetic field from the detector can radiate into the conveyor frame, and this in turn would create minute electrical currents which can flow through the closed path or loop created by the rollers across the conveyor frame.

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 detector.

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 (see fig. 7). 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.

Installing the Detector Head

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.

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

Also, remember to position the detector in such a way to allow removal of the control unit for servicing.

Provided with the detector are four plastic insulation sets for mounting the detector feet on to the support structure. It is important these items are used to mount the detector to its support framework.

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.

If other ground paths to the detector exist they will create a ground loop which will cause intermittent triggering of the detector.

Installing the Power Unit



WARNING

Ensure all power has been disconnected from the detector before attempting to work on any electrical components of the detector.



WARNING

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

The power unit may be situated at a convenient position remote from the detector head. Detection heads are normally shipped from the factory with a cable length of three metres.

When installing the power unit cables avoid running the cable adjacent to other cables carrying switched or heavy loads. This will reduce the possibility of problems with electrical interference.

Electrical connections to the power unit are as shown in Fig. 6A. Details of power supply

connections and the position and rating of the recommended circuit breaker are shown in Fig. 6B.

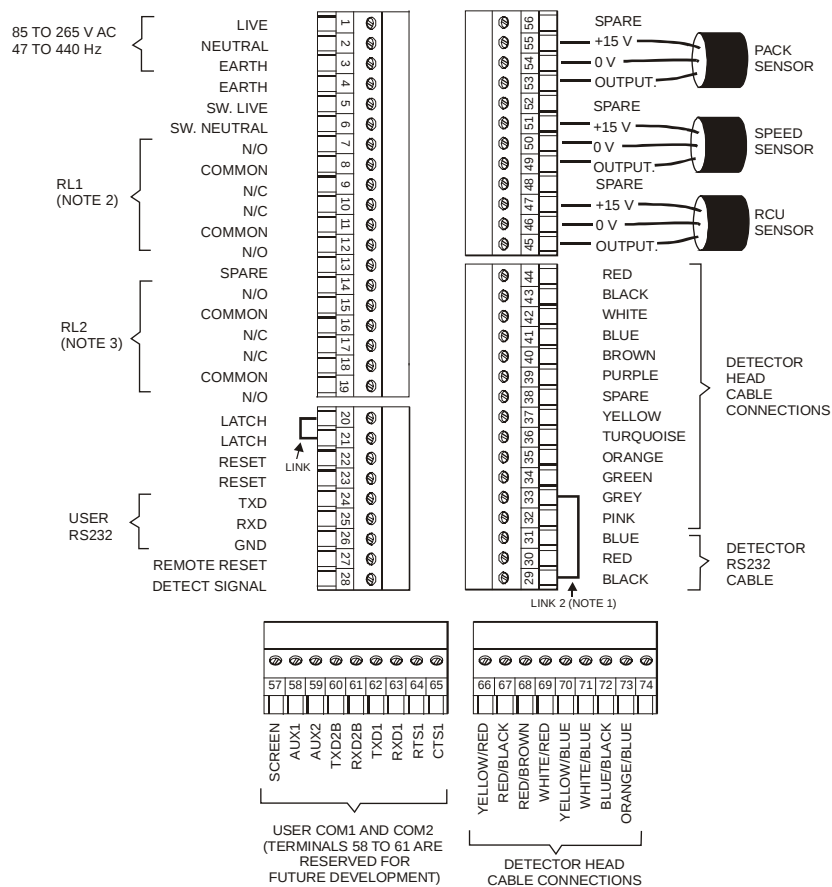
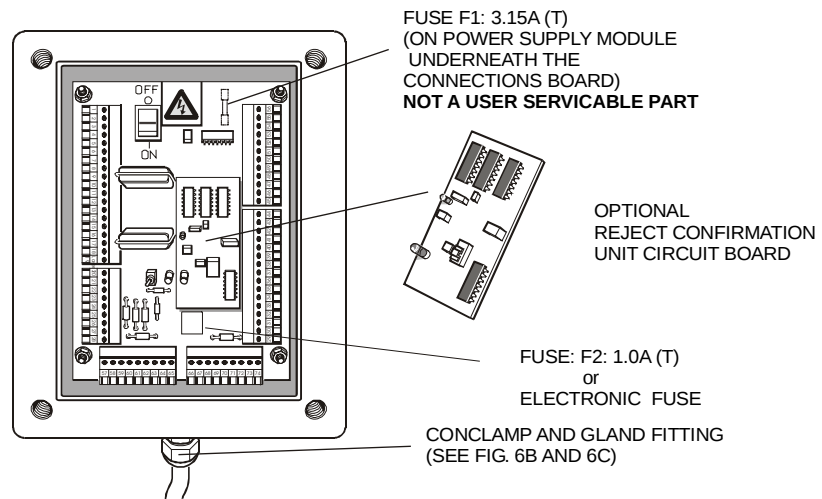
Arrangement of the gland assemblies for connecting the power cable to the power unit box are shown in Fig. 6C.

NOTE - with reference to Fig. 6A

If the P/S Connection PCB fitted is an earlier unit (Issue 4 or 5) then it will not include the two connectors for terminals 57 to 74. However all other connectors (for terminals 1 to 56) remain the same allowing earlier P/S Connection PCB units to be used, providing the user does not require the functions offered by the missing terminals.

These instructions are for connection to TN (EN60950:1992) power distribution systems only. For connections to other power distribution systems please contact your supplier.

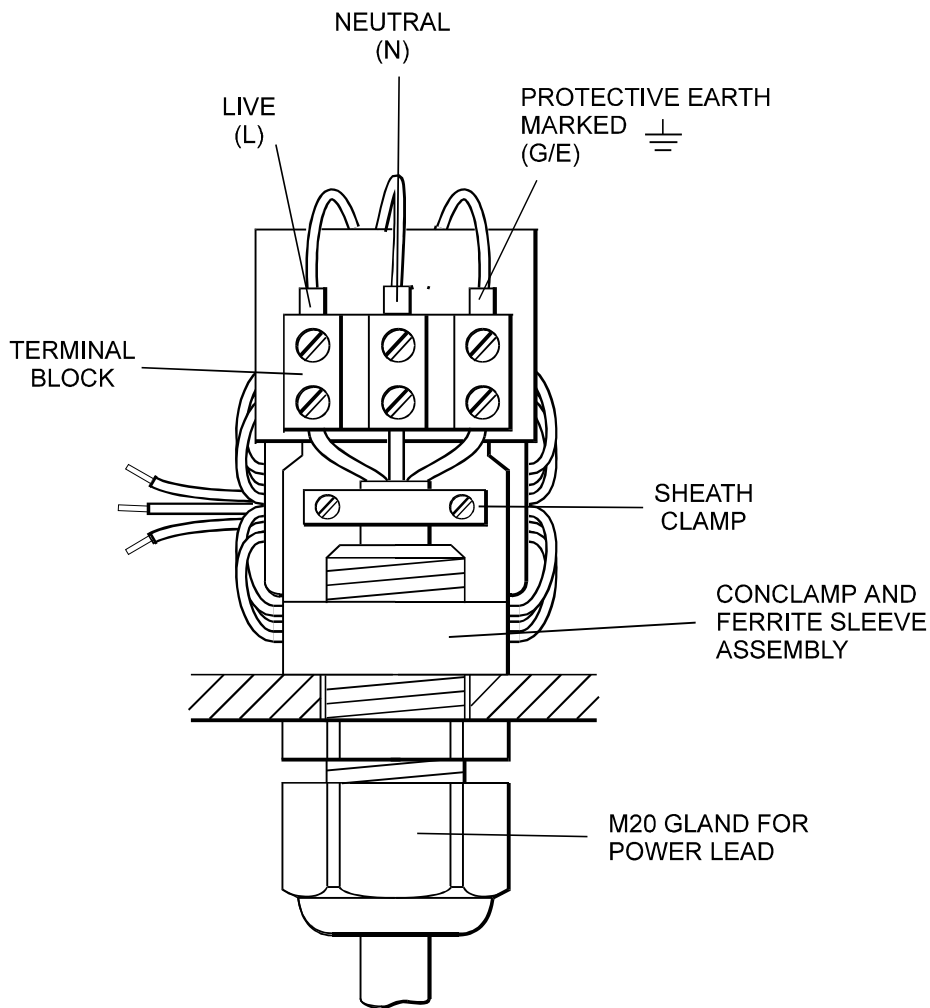
An information booklet is available with more detailed Guidelines regarding metal detection conveyor design.



NOTES

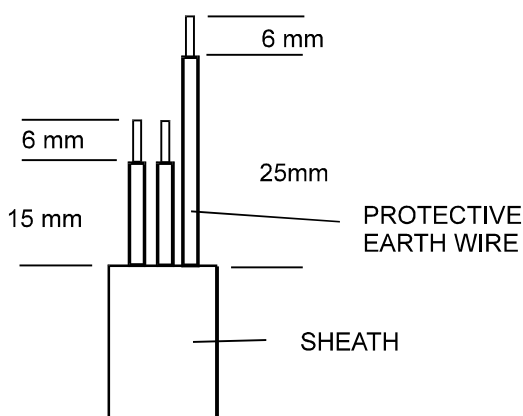
- 1) LINK 2 MUST BE FITTED IF THE MODULE HARDWARE IS LESS THAN VERSION 62 (INTRODUCED 25/10/93) AND DOES NOT INCLUDE REJECT CONFIRMATION.
- 2) METAL DETECTION RELAY CONTACTS - RL1. THE RELAY CONTACTS CHANGE FROM THE STATE SHOWN WHEN METAL IS DETECTED
- 3) SYSTEM FAULT RELAY CONTACTS - RL2.(OPTIONAL). THE RELAY CONTACTS CHANGE FROM THE STATE SHOWN IF THE REJECT CONFIRMATION UNIT SIGNALS A REJECT FAULT OR THE METAL DETECTOR SIGNALS A HEAD OR MODULE FAULT.

Fig. 6A Layout of Components and Terminals for P/S Connection PCB issue - 6 and 7



CONCLAMP TERMINAL ASSEMBLY

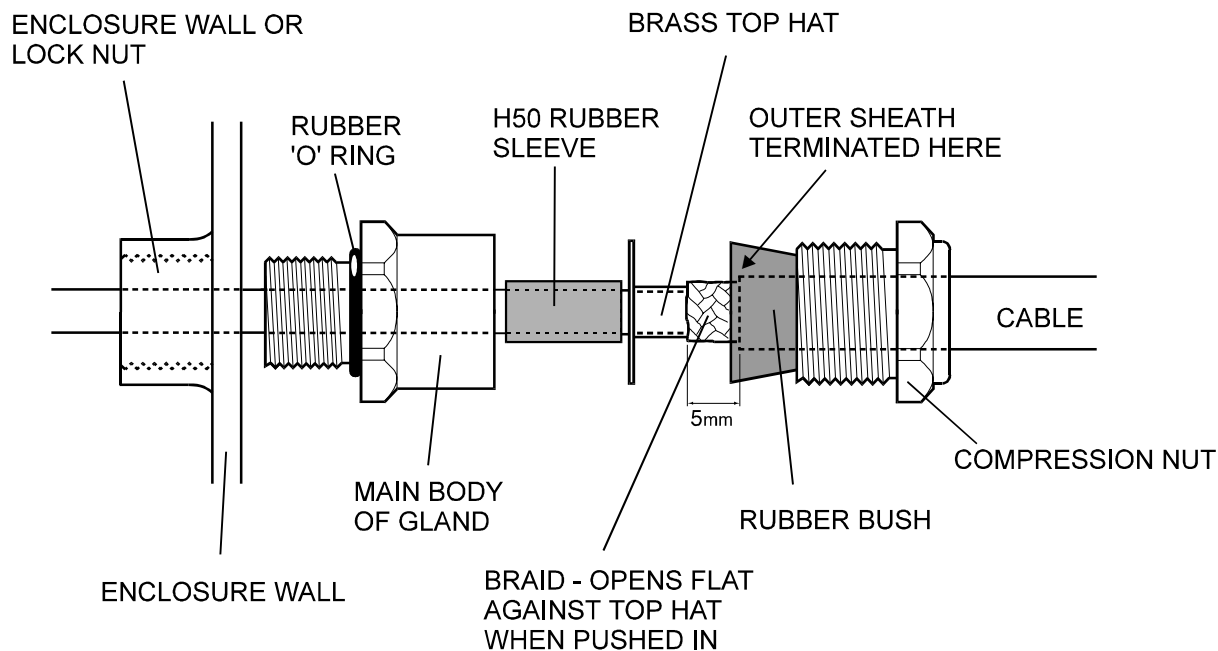
RATINGS



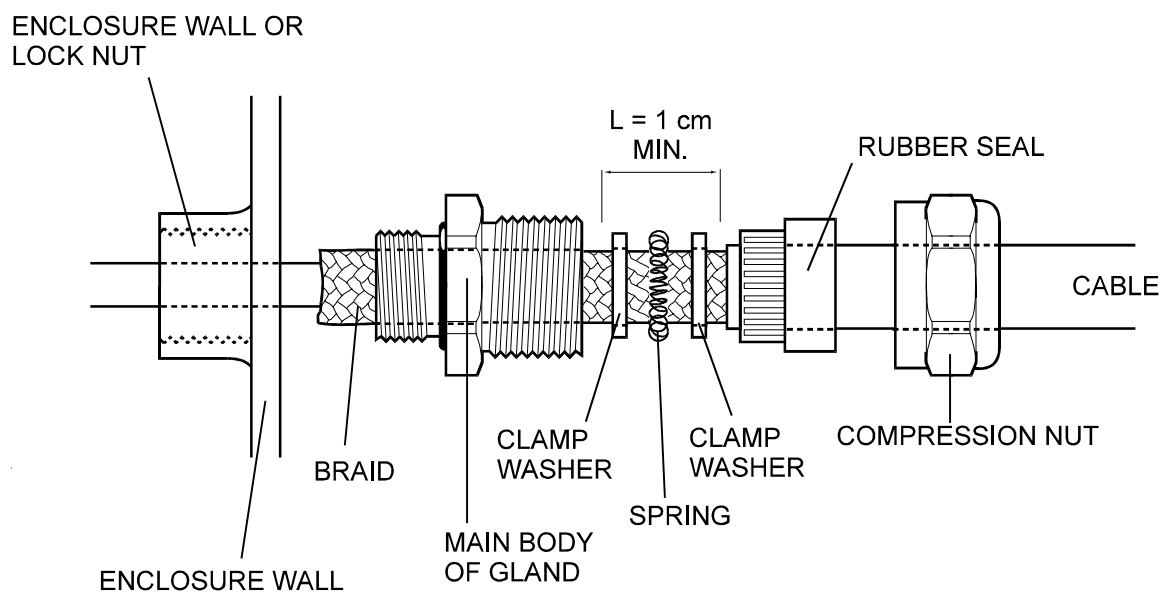
POWER LEAD PREPARATION

- 1) RECOMMENDED POWER LEAD
 AREA 0.75 mm^2
 CONSTRUCTION $24 \times 0.2 \text{ mm}$
 CURRENT RATING 6 AMP.
 COLOURS BROWN-LIVE, BLUE-NEUTRAL,
 GREEN/YELLOW-EARTH.
- 2) a) RECOMMENDED CIRCUIT BREAKER DOUBLE
 POLE, CURRENT RATING 3 AMP OR 4 AMP,
 TYPE C CIRCUIT BREAKER TO BE MOUNTED
 CLOSE TO EQUIPMENT.
 OR
 b) RECOMMENDED FUSE RATING CURRENT RATING
 4 AMP OR 5 AMP ANTI-SURGE (T).

Figure 6B Power Connections

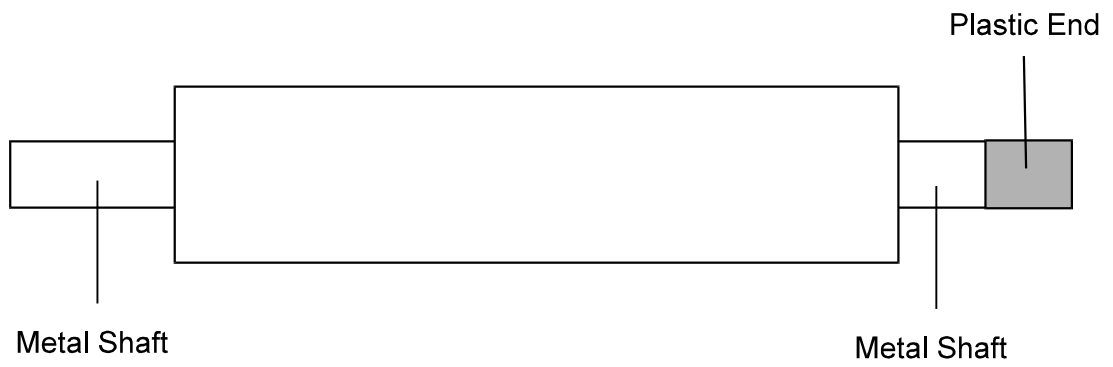


STANDARD HEAD TERMINATION CABLE GLAND ASSEMBLY



EMC FEEDTHROUGH TYPE CABLE GLAND ASSEMBLY

Figure 6C Cable Gland Assemblies for Power Supply Unit



**Figure 7 Roller Shaft Insulation
(one end only)**

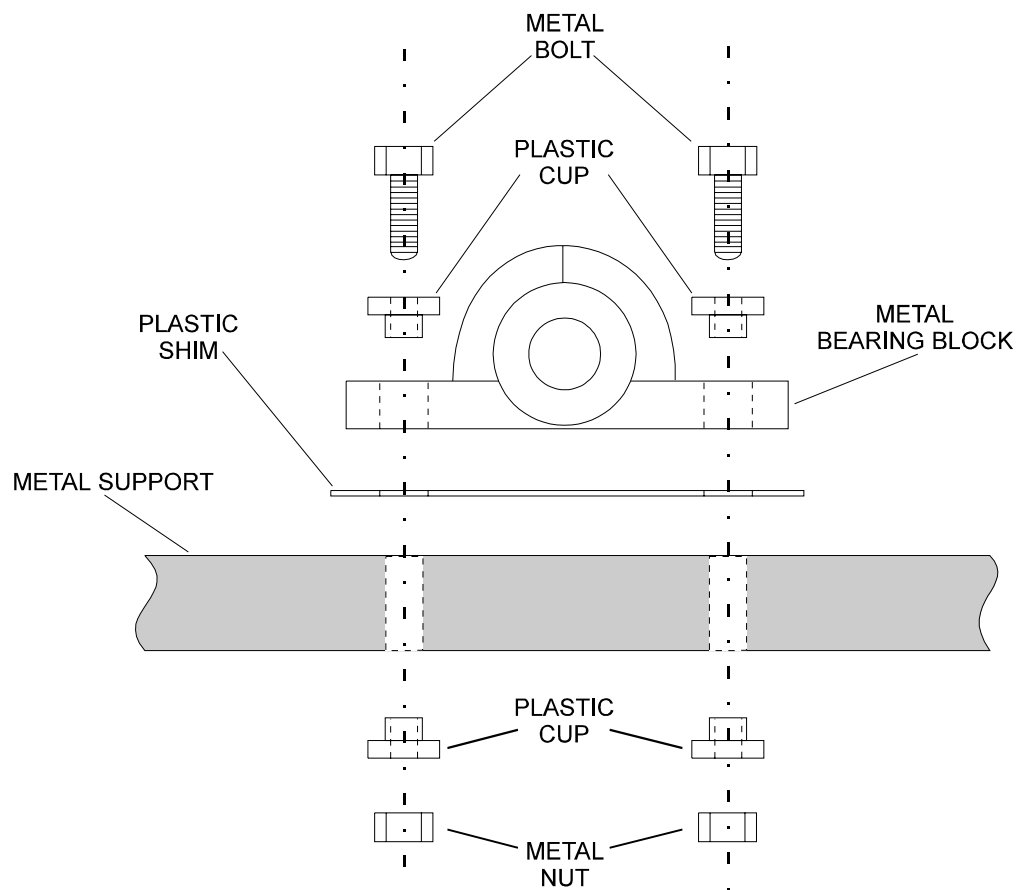
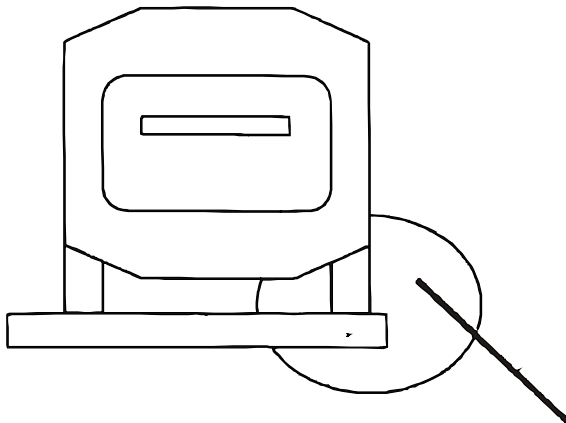
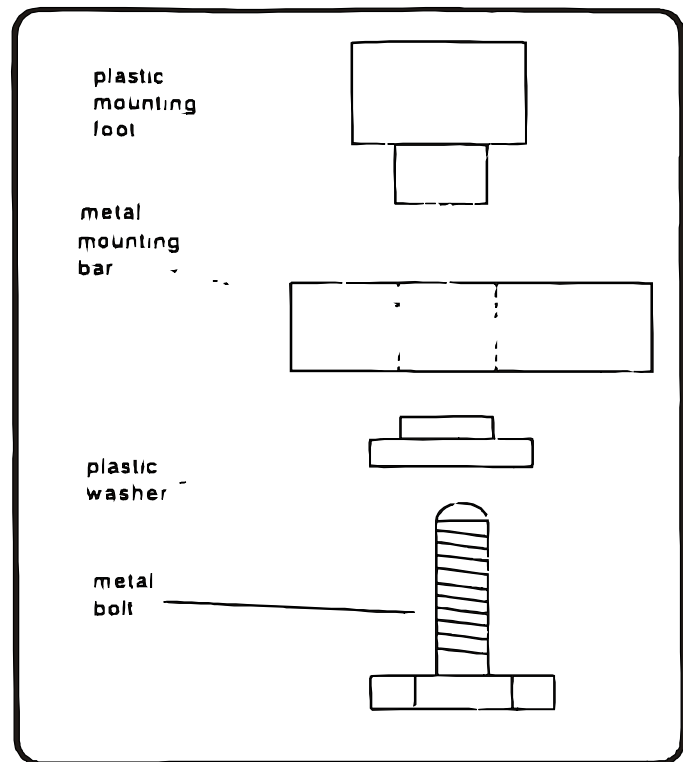


Figure 8 Bearing Block Insulation

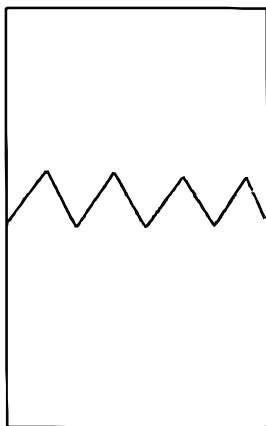
THIS PAGE IS LEFT BLANK INTENTIONALLY



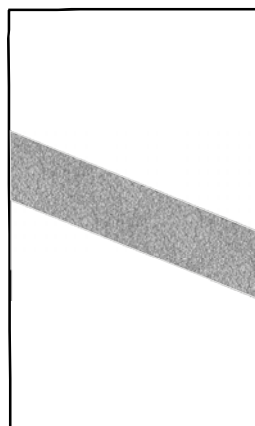
**Mounting Foot
Insulation**
Fig 9



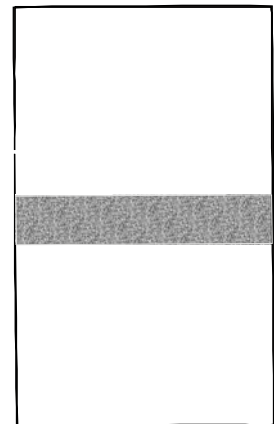
Finger / 'Z' Joint
Preferred Type



Diagonal Lap Joint
OK



Straight Lap Joint
Not Recommended



Belt Joints
Fig 10,

THE CONTROL PANEL

Introduction

The metal detector control panel (see Fig 11) is the interface by which the user may observe and control the metal detectors performance. All of the metal detectors operating characteristics may be programed through the control panel.

A Liquid Crystal Display 'LCD' shows the information contained in the metal detectors computer, with this display and by use of the touch keys the metal detectors performance is controlled.

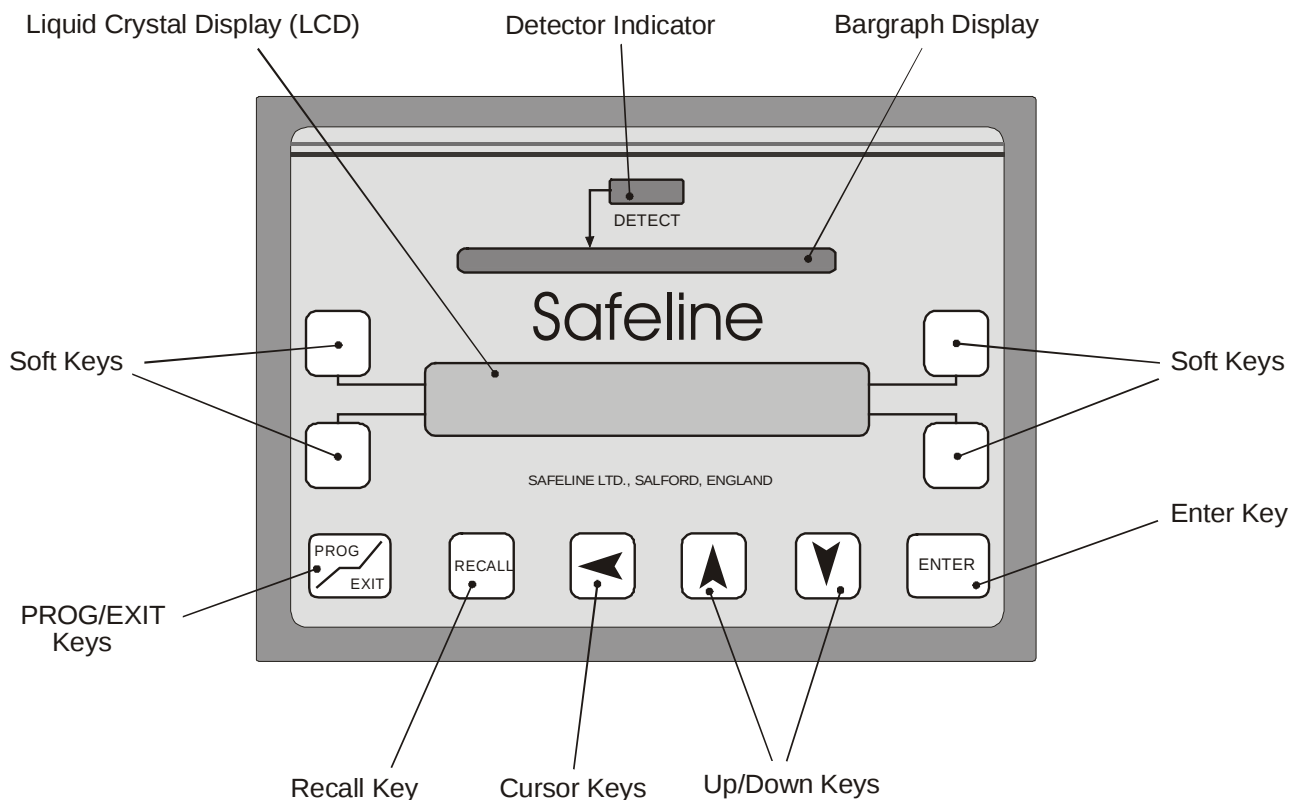
Certain keys on the panel are known as soft keys. The function of these keys is controlled by the computers software and changes dependent upon the situation,

With the help of the two colour bar graph display the user may observe the signals generated by metal contaminants or products passing through the detector head.

During normal operation data may be observed

on the LCD display but not altered.

Changing the metal detection characteristics can only be achieved by gaining access to the metal detectors computer. Access is restricted by the use of a four digit pass code/access code. Different access codes enable different levels of access. In this way the control of particular parameters may be restricted to certain personnel or user groups. When installed on a product line many different types of product may pass through the detection head. To obtain optimum metal detection performance for each product the Safeline metal detector may be programmed to memorise the required setting for up to 21 different products. This is particularly usefui with products such as soups, meat, cheese etc, also metallized films. The Safeline digital detector is a very sophisticated high performance but user friendly metal detector.



THE DISPLAY AND TOUCH KEY FUNCTIONS

Liquid Crystal Display (LCD)

Used to display the information in the metal detector's computer.

Bar Graph Display

Displays the level/amplitude of signals generated in the detector head. If green the signal is below the level required to trigger the metal detector. When red the signal is in excess of the level required to trigger the output signal.

Detect

A red LED indicates that the output has been triggered.

Prog/Exit

Used to enter or exit the metal detectors computer programme

Recall

Used to step back to the previous page in the menu system (see using the page display menu system)

Cursor Move Key

Used to control the movement of the cursor when entering a digital value.

Up/down key

Used to increase or decrease a digital value.

Enter

Transfers data from the display and enters it into the computers memory.

Soft keys

Controlled by the software the function of these keys will vary dependent upon the page display.

OPERATING AND ACCESS MODES

Running Mode

This represents the normal running display of the metal detector. In this mode information may be observed but the display values cannot be changed.

By pressing the RECALL key the user may observe the following settings:
Serial No #4W# – Metal detector head serial number.

M/C Model ### - The least significant digit indicates the module stagger frequency.

The centre digit indicates the metal detector head frequency.

The most significant digit indicates the metal detector head memory size.

Ver #.## - Metal detector module Firmware issue/version.

By pressing the ETC soft key the user may observe the following settings:

Pack count #####

Reject count ####

Current time ##.##

Next QA test ##.## - If selected

Operator Access Mode

The operator may change the following parameters
Product Number (Prod No ##)

Sensitivity settings (Sens4##)*

* Access may be full or limited set from the engineers mode. If set to limited, sensitivity cannot be adjusted.

OPERATING

AND ACCESS MODES - Continued

Supervisor Access Mode

The supervisor may change the following parameters.

Product Number (Prod No##)

Sensitivity Setting (Sens ###)

Phase Setting (Phase #####)

Select Timer A B or C

Reset Reject Count

Reset Pack Count

QA Operator Access Mode

Allows Performance Checks to be carried out.

QA Inspector Access Mode

Allows the Performance Validation Routine (PVR) and the Local Printer Unit (LPU) report information to be configured to the users particular requirements. Used when first installing the metal detector or making changes to the set up characteristics.

Allows shift report and settings information to be output to the LPU.

Allows Performance Checks to be carried out.

Engineer Access Mode

Gives access to all variables and is used to configure the metal detector to the users particular requirements. Used when first installing the metal detector or making changes to the set up characteristics.

THE PAGE DISPLAY SYSTEM

There is a requirement to display more information than the LCD can display at any one time.

To expand the display capabilities a page display menu system is used. This can be compared to the pages of a book. When there is more than one page of information to be displayed an etc prompt will appear on the display. Pressing the appropriate 'soft key' adjacent to 'etc' will cause the display to move to the next page or scroll forward. To turn back to the previous page or scroll backwards press the 'recall' key. Using this technique many pages of information can be stored in the computers memory and displayed as required.

On the display a small o pointer may appear adjacent to the soft key. This indicates that you may change a particular parameter. If the pointer is not visible the parameter cannot be changed.

If the parameter to be changed is a digital value and the appropriate soft key is pressed the pointer will now point inwards towards the digital value to be adjusted and a cursor bar appear under the digit to be changed. Using the cursor move keys the digital value may be changed. (See 'changing digital values' for further information)

If the parameter to be changed is not a digital value but requires the user to make a choice, ie ON or OFF, YES or NO the selection will be indicated by a flashing marker on the display.

ENTERING THE ACCESS CODES

All Safeline metal detectors are shipped from the factory with the following access codes.
Code 0001 = Operator Access

Code 0002 = Supervisor Access

Code 0003 = Engineer Access

Code 0004 = QA Inspector Access

These codes may be changed in the Engineer's access mode.

Please take care to memorise or record your new access codes

To enter the access codes use the following procedure.

1) Press PROG/EXIT

Display reads 0000 note the cursor bar under the left digit.

2) Press UP/DOWN keys and set to required value.

3) Press ENTER 4) Repeat steps 2) and 3) for each digit.

For security reasons the number changes to a after each entry.

If a digit is entered in error the RECALL key may be used to move back to the erroneous digit.

When entering the security code a time of sixty seconds is allowed between each key operation, if this time period is exceeded the programme will automatically return to the running mode.

Similarly having entered the security code a period of five minutes is allowed between key 'operation before automatically reverting back to the running mode.

USING THE TOUCH KEYS

Cursor Move Key

This key is used to control the movement of the cursor bar when changing the setting of a digital value.

A small cursor bar will appear under the active digit on the LCD display when a parameter is available for adjustment

Example 1 2 3 4

one press of the cursor move cursor bar one step to the left. this key and the Up/Down adjustment of all the digits.

key will move the Combined use of keys will enable.

Note:- This key will only operate when the cursor bar is visible on the LCD display.

Up/down keys

Use of these keys will increase or decrease the value of a particular digit.

Note:- This key will only operate when the cursor bar is visible on the LCD display.

Prog/Exit

When operated in running mode will bring up the 'ENTER SECURITY CODE' display and is the first step to gain access into the programme. If operated whilst in any of the access modes will exit the programme and return to the running mode display.

Enter

Used to enter data into the computer memory. For example when changing the sensitivity on the display it is necessary to press the ENTER key to memorise the new value.

Recall

Use this key to scroll backwards to the previous display page on the LCD

NB:- The ETC soft key is used to scroll forward.

Soft Keys

The function of the four soft keys is controlled by software and will change dependent upon where you are in the programme.

CHANGING DIGITAL VALUES

Various settings in the programme are stored as digital values, eg product number, sensitivity, phase etc.
Digital values can only be adjusted if a pointer > is visible on the LCD display adjacent to the parameter to be adjusted and pointing toward the appropriate soft key.

If a > pointer is not visible the value of that parameter cannot be changed in that particular programme.

To change the digital value of a particular setting use the following procedure.

- 1) Enter ACCESS code
- 2) Press appropriate soft key adjacent to the parameter to be adjusted. The > pointer will now point inwards towards the parameter and a cursor bar appear under the first digit of the number.
- 3) Press the Up/Down keys and adjust to the required value.
- 4) Press cursor move key to move the cursor bar to the next digit.
- 5) Repeat step 3)
- 6) Repeat step three and four for each digit to set required value
- 7) Press enter key to store new value in memory

NB:– Remember to keep a separate record of product numbers and to which products they apply.

PROGRAMMABLE SETTINGS

General

Twenty one presettable programmes can be stored in the computers memory. Each programme is identified by a product number. For each programme the various settings are entered or programmed in one of the three access modes.

Sensitivity (Sens # # #)

A digital value between 000 & 199, setting 000 represents the minimum setting but not zero sensitivity.

Phase (Phase # # # #)

A digital value between 0000 and 5788. 0000 represents zero degrees phase angle and 5788 represents 180 degrees.

The zero setting represents the optimum setting for the metal detector. At this setting the detector will have the maximum immunity to mechanical vibration and will give the best detection sensitivity to stainless steel.

NB:– Product Number 00 is preset to phase value 0000 and cannot be adjusted.

Some products generate a 'Product Effect' signal, by adjusting the phase setting these unwanted signals can be minimised and the overall detection performance improved.

Timer Selection (Select timer A/B/C)

One of three preset reject timers A, B or C can be allocated to a particular Prod No. In most cases the same timer setting will be applicable to all product numbers. With certain reject Situations e.g. a photogated pusher with highly variable pack length, optimum rejection can only be achieved with different timer settings.

The timer setting can only be changed in the Engineers access mode. See section on timers for further information.

PROGRAMMABLE SETTINGS – continued

Inverse Detection (Inverse Detect Yes/No)

This feature allows the action of the reject timer to be reversed, such that product containing no metal contamination is rejected whilst metal contaminated product is not rejected.

This feature is often used to verify that a product contains a metallic premium.

NB:– This feature can only be selected when using a gated timer.

Power Drive (Power Drive # # #)

A digital value between 0 and up to a maximum of 255 (this maximum value will vary from head to head), which represents the level of high frequency power being fed into the coil system.

Power drive can be changed by the user in Prod No. settings 18, 19, 20 only, this facility is useful when a lower sensitivity than that obtainable via the sensitivity control is required.

On product setting 0 to 17 the power level is fixed at the time of manufacture and is not adjustable.

CONFIGURING THE DETECTOR

Various operating characteristics of the detector are programmable and may be altered or configured to suit the particular requirements of the application. The configuration process should be performed by the engineer when first installing the detector.

From the Engineers mode the following are alterable:

SELECT AND UPDATE TIMER

See 'Reject Timers' section in manual.

ADJUST REFERENCE PHASE

Factory set to give best vibration immunity of the detector and should not normally require adjustment.

The setting should align phase 0000 to the vibration signal.

If the setting requires re-alignment adjust the reference phase in a similar manner as adjusting phase discrimination to minimise product effect (see section 'programming the detector').

Create a vibration signal by striking/hitting the detector, use the sensitivity adjustment to give a signal of suitable amplitude.

The phase of ferrite material (not ferrous) is very similar to vibration and may be used as an alternative to striking the detector to produce a reference signal.

OPERATOR ACCESS

Full/Limited - if limited prevents adjustment of sensitivity in Operator mode.

DETECTION BUZZER

On/Off - an internal alarm buzzer will sound when metal is detected if set to On.

CHANGE MODE

Operator / Supervisor / Engineer / QA Inspector access code may be changed as required.

DETECTOR SPEED

Hi/Lo - select to suit product throughput speed. See specification for speed range. Will normally be set to Lo for most conveyor applications and Hi for free fall applications.

REJECT INHIBIT

Yes/No - when selected will override operation of reject device. Useful during setting up operations. Select No for normal operation, if left in Yes condition will cause bar graph display to flash. For maintenance work remove the supply to the reject mechanism, do not rely on the software inhibit.

REJECT CONFIRMATION

Yes/No - the reject confirmation unit is an optional board which fits into the power supply unit. Select Yes when the board is fitted.

REJECT CONFIRMATION EXTENSION TIME

See 'Reject Confirmation Unit Instruction Manual' for details.

BOOST MODE

Yes/No - when selected will give approximately 20% sensitivity improvement at full sensitivity.

LANGUAGE

Select one of six languages (including English). The parameters under 'Configuring The Detector' remain in English.

Firmware version 2.10 (and greater) has eight languages and has all displays and printouts translated.

Firmware version 2.21 (and greater) has nine languages

SET DATE - Firmware 2.21 or less

Allows the setting of YEAR, MONTH and DAY. Refer to 'Changing Digital Values' for adjustment.

SET TIME - Firmware 2.21 or less

Allows the setting of HOUR and MINUTE. The clock uses the 24 hour format. Refer to 'Changing Digital Values' for adjustment.

PRINTER HANDSHAKE - Firmware 2.10 or greater

HW/SW controls the handshaking mode the Module uses with Local Printer Unit (LPU).

If software (SW) handshake is selected the Module uses X-ON and X-OFF flow control.

Normally set to hardware (HW) handshake.

To programme any of the above facilities enter the Engineer Access code and press the 'ETC' key until the required parameter is displayed by using the 'ETC' and 'RECALL' keys the Engineer may scroll backwards and forwards through the various pages of the programme. When completed press Prog/Exit key to return to running mode.

REJECT TIMERS – GENERAL

TIMER TYPES

A wide range of timer types and settings are available to the engineer. Five different timer types, each with variable settings can be programmed for use within the metal detector.

The types are as follows:

tm1

Simple reject timer without delay time Variable reject time, range 50 millise. to 60 sec

tm2(G)

Delayed reject timer for fixed speed applications Variable reject time, range 50millise. to 60 sec Variable delay time, range 50 millise. to 60 sec, it may also be set to zero.

Photogated and non-gated modes.

tm3(G)

A delayed reject timer for variable speed applications. Requires external sensor to monitor speed

Variable signal shift, range 0 to 128

Variable reject shift / time, range 3 to 256 / 50millise. to 60 sec.

Photogated and non-gated modes.

Timers tm2 & tm3 may be photogated, however an external photo sensor is required to sense the position of the product/pack when used in the photo-gated mode.

Photogated reject timers provide very precise and effective reject operations. For example, if an air blast reject is used to reject boxed product, photogating ensures that the air blast hits the pack in the same position every time. Without photogating the air blast operation would be dependent upon the position of the metal contaminant in the pack and hence be more variable in operation.

NOTE: At high product throughput rates the response time of the reject relay (typically 15ms),

the reject solenoid, and the reject mechanism may need to be taken into account.

RECOMMENDED APPLICATIONS

Listed below are various types of reject mechanisms encountered in detection applications with recommended timer types for fixed speed applications. For variable speed applications use tm3[G] or tm2[G].

REJECT ACTION	TIMER TYPE			
	tm1	tm2	tm2(G)	
Timed Audible Alarm				
Conveyor Stop	X	-	-	
Gravity Fall Systems	X	-	-	
Instant Reject with	X	-	-	
Timed Reject Period.				
Retracting Band		-	X	-
Air Blast		-	X	XX
Punch/P usher	-	-	X	
Drop/lift Flap	-	X	XX	
Plough action diverter	-	X	X	
Flip action diverter	-	-	XX	

XX = preferred type, X = OK, - = not applicable

Timer Selection A, B or C

The engineer may allocate different timer types and settings to position A, B or C, only three selections are allowed. In general only one timer type and setting will be required for most applications. For applications with a greater than +/- 25% variations in pack length or for those operating at different fixed speeds it may be beneficial to have different timer settings for A, B and C. The different timer settings may then be selected as required. Both timer selection and setting may be made in the engineers mode but only timer selection may be achieved from the supervisor mode.

tm1 – TIMER

The tm1 reject timer is useful for applications requiring instantaneous reject action with zero delay time. Typical applications would be gravity fall reject mechanism or simple stop alarm conveyor system.

Sample Size

Small size metal contaminants should be used to set the timer, the use of large contaminants will produce errors in the settings. Try to use the smallest metal sample that can be detected. If this is not possible use the smallest sample available and adjust the sensitivity so that the sample gives an indication of 2 to 3 red bars on the bar graph display.

Setting Timer type tm1

At this stage the user should be familiar with use of the control panel and adjusting digital values. Setting the timer can only be achieved from the Engineers Mode.

To programme the timer setting:

1) Enter the Engineer Access Code

2) Press 'ETC' key: display reads:

Select Timer ABC

3) Select type A, B or C: display reads:

Timer 'x' Update Yes / No

Note:- 'x' represents the selected timer A, B or C

4) Select YES: display reads:

Timer Type tm3(G),tm2(G),tm1.

5) Select tm1: display reads:
tm1 Reject Time ##### sec

6) Enter required value

7) Press enter twice: display reads:

Timer A,B,C

Type tm1 SET/UPDATED

for five seconds and then returns to main menu

8) Test operation of the reject device to check tm 1setting is correct.

If no further adjustment is required press Pro Exit and return to running mode.

Notes:-

a) The reject time is automatically extended in relation to the size of the metal detected, ie the smaller the piece the shorter the time. b) If two or more metal pieces pass through the detector within the set reject time, the reject time is automatically extended to ensure rejection of; pieces.

tm2[G] TIMER – NON GATED MODE

The tm2[G] timer used in the non-gated mode is an ideal delayed reject timer for use with loose product where the reject device is a reasonable distance from the detector head. It can also be used with individual products where precise reject operation is not crucial. When setting up the timer there are some basic rules that must be applied.

Sample Size

Small size metal contaminants should be used to set the timer, the use of large contaminants will produce errors in the settings. Try to use the smallest metal sample that can be detected. If this is not possible use the smallest sample available and adjust the sensitivity so that the sample gives an indication at 2 to 3 red bars on the bar graph display.

Product Presentation

Sample product or packs used to set up the timer should be passed through the detector at their normal speed without skewing or slippage.

Product Length

Where a variety of individual products with differing lengths are being inspected ensure that for a particular timer setting the variation in pack length does not exceed +/- 25% of the pack length used to set up the timer.

Three different timer settings are available, ie A, B, and C to accommodate variations in pack length.

Delay Time

Delay time is the time taken for a metal contaminant to travel from the metal detector to the reject device.

Reject Time

Reject time is the time required by the reject

device to reject contaminated product. The minimum value will be the operate time of the reject device.

Setting Up Timer Type tm2(G)

To set up the timer use the following procedure:

- 1) If inspecting individual products prepare a sample pack containing a small metal contaminant positioned at the rear/trailing edge.
- 2) Enter the Engineers access code.
- 3) If inspecting individual products pass the sample pack containing the small metal contamination through the detector and adjust the sensitivity so that the bar graph indicates 2 to 3 red bars.

If product is loose place metal sample on belt and adjust sensitivity in a similar manner.

- 4) Press 'Etc' soft key, the display reads: Select timer A /B/ C
- 5) Select timer A, 8 or C display now reads:

Timer 'x' Update Yes / No

Note:- 'x' represents the selected timer A, B or C

- 6) Select 'Yes' display now reads: Timer type tm1 / tm2(G) / tm3(G)
- 7) Select 'tm2(G)', it previously set to gated mode display will read

Gated Timer Still Required Yes / No

if not set previously to gated mode, display will be as shown in 8)

8) Select 'No', display now reads:

Signal Delay # # # #sec

Reject Time # # # #sec

tests using larger metal samples.

If product is loose test reject operation using large and small samples, also check using two metal samples spaced at different distances apart on belt.

If for any reason the settings at the timer are thought to be incorrect repeat the whole of the setting up procedure from step 1

9) If inspecting individual product place the sample pack with metal contaminant in the rear/trailing edge (must be correct size sample) on conveyor belt and allow it to pass through the detector without skewing or slippage.

Press the 'Signal Delay' soft key and adjust the Signal Delay Time so that the reject mechanism operates just as the front/leading edge of the pack reaches the reject device.

If product is loose place metal sample on belt and allow it to pass through the detector in a similar manner. However, adjust the Signal Delay Time so that the reject mechanism just begins to operate as the metal sample reaches it.

10) Now position the metal contaminant at the front/leading edge of the individual pack, pass the pack along the conveyor and through the detector as before. Press the 'Reject Time' soft key and adjust the Reject Time until the metal contaminated pack is rejected accurately and consistently.

If the product is loose adjust the Reject Time so that metal sample is consistently rejected with the minimum of wasted product.

Press the 'Enter' key to store the settings in memory.

11) Press 'Enter' key again, display now reads:

tm2(G) Gated Yes/No

12) Select No, display now reads
Timer 'A/B/C' Type tm2 Set/Updated

for five seconds and then returns to the main menu.

13) For individual products further check the operation of the reject mechanism by passing contaminated packs through the detector. Check packs with small metal samples placed first at the front and then at the rear of the pack. Repeat the

tm2[G] TIMER – GATED MODE

The tm2(G) photogated reject timer gives precise operation of the reject device where individual products, eg cartoned products, individual chocolate bars etc are transported on a conveyor. Photogating ensures that the reject operation is independent of the position of metal contamination within the product.

When setting up the timer there are some basic rules that must be applied.

Sample Size

Small size metal contaminants should be used to set the timer. The use of larger contaminants will produce errors in the settings. Try to use the smallest metal sample that can be detected. If this is not possible use the smallest sample available and adjust the sensitivity so that the sample gives an indication of 2 or 3 red bars on the bar graph display.

Product Presentation

Sample product or packs used to set up the timer should be passed through the detector at their normal speed and without skewing or slippage.

Product Length

Where a variety of individual products with different lengths are being inspected ensure that for a particular timer setting the variation in pack length does not exceed +/- 25% of the pack length used to set up the timer. Three different timer settings are available, ie A, B, or C to accommodate variations in pack length.

Window Time

Window time is the time period equal to 2 times the pack length at normal conveyor speed. This time setting is derived automatically in the set up process.

Sync Delay

Sync delay is the time taken for the pack to travel from the photo beam to the optimum reject position.

Delay Time

Delay time is the time taken for a pack with a metal contaminant in its rear/trailing edge to travel from the metal detector and have its front/leading edge line up with the centre of the reject device as it operates.

Reject Time

Reject time is the time required by the reject device to reject a pack. The minimum value will be the operate time of the reject device.

Selecting Photo-Electric Devices

Use a two part photo electric device, ie with separate transmitter and receiver or with combined transmitter and receiver and reflector. Avoid the use of photo electrics that require the pack itself to reflect the beam.

Preferred types are infra red with a maximum current demand of 30 milliamps. Other types may be used, however, if they exceed the current limitations an additional power supply will be required.

Light energised or dark energised systems may be used. The metal detector will set itself automatically and accommodate either mode during the calibration (CAL) procedure.

The output device should normally be NPN open collector, min voltage 15V, min current 10 milliamps. PNP output devices can be accommodated by changing the internal link arrangement in the detector head.

Positioning the Photo-Sensors

Position the photobeam on the conveyor at right angles to flow of product along the conveyor

such that the pack/product breaks the beam before reaching the reject device. The beam may be positioned either side of the detector. Ensure the sensors do not effect the operation of the metal detector itself by infringing the metal free zone limitations.

At line speeds of 61m/min (200ft/min) or greater the sensors must not be positioned too close to the reject device, ensure a minimum distance of 0.5m (1.5ft).

Adjust the height and alignment of the sensors so that all packs break the beam at the same leading edge position irrespective of the type or size of pack.

Electrical Connections (Photo-Sensors)

Electrical connections from the sensor should be connected to the metal detector power supply unit.

See 'Power Unit Electrical Connections' in the Installation section. Connect the sensor to the terminals labelled Pack Sensor.

Setting Up Timer Type tm2fG] in Gated Mode

To set up the timer use the following procedure:

1) Prepare a sample pack containing a small metal contaminant positioned at the rear/trailing edge

2) Enter the Engineers access code
Press the 'Enter' key to store the settings in memory.

3) Pass the sample pack containing the small metal contamination through the detector and adjust the sensitivity so that the bar graph indicates 2 to 3 red bars

4) Press 'ETC' soft key the display reads.

Select Timer A/B/C

5) Select timer A B or C, display now reads

Timer 'x' Update Yes / No

Note:- 'x' represents the selected timer A, B or C

6) Select 'Yes' display now reads

Timer type tm1/tm2(G)/tm3(G)

7) Select 'tm2(G)' if previously set to gated mode display will read

Gated Timer Still Required Yes/No

If not set previously to gated mode, display will be as shown in 8)

8) Select 'No', display now reads:

Signal Delay # # # #sec

Reject Time # # # #sec

8) Place the sample pack with metal contaminant in the rear/trailing edge (must be correct size sample) on conveyor belt and allow it to pass through the detector without skewing or slippage.

Press the 'signal delay' soft key and adjust the signal delay time so that the reject mechanism operates just as the front/leading edge of the pack reaches the centre of the reject device.

10) Pass the pack along the conveyor, and through the detector as before.

Press the 'Reject Time' soft key and adjust the reject time so the reject device responds in a way which would reject the pack if it were positioned correctly. We are not attempting to reject the pack at this stage.

11) Press 'Enter' key again, display now reads Tm2(G) Gated Yes/No

12) Select 'Yes' display now reads

Sync Delay # # # #sec

Window Time #####sec

Etc

NOTE:-

a) Always set the window time first.

b) A metal test piece is not required to set these two parameters

13) Ensure that the photo beam(s) is/are clear of obstructions and press the 'window time' soft key. The display will read 'Cal' for 5 seconds then 'Run'.

With run displayed pass a pack of the correct size and orientation along the conveyor making sure that it is square on to the conveyor or with a skew angle typical for the line. The detector will automatically set the window time based on the length of the pack.

14) Repeat step 13 two or three times to check that window time setting is repeatable,

NOTE:-

a) Ensure that during the CAL period there are no inadvertent interruptions of the photo-beam.

b) The Window Time is entered into memory automatically and a correction is applied by the microprocessor to provide a window that overlaps the pack at the front and rear by one half pack. This ensures an accurate and reliable reject action regardless of where the metal contamination is within the pack.

c) The window time is automatically extended for large pieces of metal contamination or for more than one piece of metal contamination.

15) Press the 'sync delay' soft key. All packs now passed through the detector .will operate the reject mechanism, also the detection lamp. and buzzer will operate continuously.

Repeatedly pass a sample pack along the conveyor and adjust the sync delay time so that the pack is rejected accurately and consistently. Press the 'Enter' key to store the setting in memory.

16) Press the 'Etc' soft key the display now reads

Signal Delay # # # #sec

Reject Time # # # #sec

Etc

Place the sample pack with metal contaminant in

the front or rear edge on the conveyor belt and allow it to pass through the detector without skewing or slippage.

Press the 'Reject Time' soft key and adjust the reject time until the metal contaminated pack is cleanly rejected.

Press the 'Enter' key to store the setting in memory.

17) Press the 'Enter' key the display will now read

Timer 'A/B/C' Type tm2(G) Set/Updated

for five seconds and then returns to the main menu.

18) Further check the operation and settings of the reject mechanism by passing contaminated packs through the detector.

Check packs with small metal samples placed in turn at the front and rear of the pack then repeat the tests using larger metal samples.

Note: Under normal running conditions with packs continuously passing along the conveyor if the gap between a metal contaminated pack and the adjacent pack is less than half the pack length both packs may be rejected.

If for any reason the settings of the timer is thought to be incorrect repeat the whole of the setting up procedure from step 1.

tm3[G] TIMER

The tm3[G] is a variable speed version of the tm2[G] timer,

The tm2[G] timer has four time clock controlled functions that will provide an accurate reject action on a fixed speed conveyor.

The tm3[G] timer has three of these functions controlled by a speed sensor attached to the conveyor, which enables an accurate "reject action to be maintained over a wide range of speeds.

The speed sensor provides a number of digital pulses in relation to the distance moved by the conveyor. The incremental distance moved between pulses is known as the SHIFT distance.

Customers fitting/producing their own speed sensor should refer to Appendix A.

Setting Up Timer

Before making any adjustments the following points a) through to c) should be noted, and to ensure accurate rejection of all sizes of metal contamination in any position within the pack these procedures must be rigorously applied.

a) The same small metal test piece should be used to make the following settings.

For loose product it can be placed on the belt, for packaged products it is convenient to position the metal test piece always on top of the pack at the front or rear edge and pass it down the centre line of the conveyor.

b) The sensitivity should be adjusted such that the metal test piece is only just detected, i.e. 2 or 3 red bars illuminated on the bar graph display.

c) The metal test piece has to pass through the aperture along the same axis for every test, i.e. the same distance from the top of the aperture or nearest surface of the detectors aperture.

Setting Up Timer Type tm3[G] – Non Gated Mode

To set up the timer use the following procedure:

1) If inspecting individual products prepare a sample pack containing a small metal contaminant positioned at the rear/trailing edge.

If product is loose use smallest detectable metal test sample available.

2) Enter the Engineers access code

3) If inspecting individual products pass the sample pack containing the small metal contamination through the detector and adjust the sensitivity so that the bar graph indicates 2 to 3 red bars.

If product is loose place metal sample on belt and adjust sensitivity in a similar manner.

4) Press 'ETC' soft key and display reads Select Timer A/B/C

5) Select timer A B or C, display now reads Timer 'x' Update Yes/No Note: 'x' represents the selected timer A B or C

6) Select 'Yes' display now reads Timer Type tm1/tm2(G)/tm3(G)

7) Select 'tm3(G)' if previously set to gated mode display will read

Gated Timer Still Required Yes/No

If not set previously, display will be as shown in 8)

8) Select 'No' display now reads

Signal Shift ###

Reject Shift ##

9) To set signal shift set the conveyor to its mid-range speed.

For loose product use the smallest metal test piece positioned on the belt, for packaged products use the smallest metal test piece positioned at the rear/trailing edge of the pack.

Press the key adjacent to Signal Shift and adjust the shift setting using the up/down and cursor keys such that the reject operates just before

On loose product the metal reaches the reject device.

On Packaged product – the front/leading edge of the pack reaches the reject device.

When set - press ENTER once

10) To set reject shift, for loose product use the smallest metal test piece positioned on the belt, for packaged products use the smallest metal test piece positioned at the front/leading edge of the pack.

Press the key adjacent to Reject Shift and using the up/down and cursor keys adjust the reject time until the metal test piece is accurately rejected.

When set – press ENTER key once

If no further adjustments are required press ENTER again. The display will change showing the type of timer and asking the question

tm3 Gated? Yes /No

No – completes the programming and will display the type of timer – 'Set/Updated' for a period of five seconds after which it returns to the main menu.

Setting Up Timer Type tm3[G] – Gated Mode

To set up the timer use the following procedure:

- 1) Prepare a sample pack containing a small metal contaminant positioned at the rear/trailing edge.
 - 2) Enter the Engineers access code
 - 3) Pass the sample pack containing the small metal contamination through the detector and adjust the sensitivity so that the bar graph indicates 2 to 3 red bars.
 - 4) Press 'ETC' soft key and display reads Select Timer A/B/C
 - 5) Select timer A B or C, display now reads Timer 'x' Update Yes/No Note: 'x' represents the selected timer A B or C
 - 6) Select 'Yes' display now reads Timer Type tm1/tm2(G)/tm3(G)
 - 7) Select 'tm3(G)' if previously set to gated mode display will read
- Gated Timer Still Required Yes/No If not set previously, display will be as shown in 8)
- 8) Select 'No' display now reads Signal Shift ### Reject Shift ###
 - 9) To set signal shift set the conveyor to its mid-range speed.

Place the sample pack with the smallest metal test piece positioned at the rear/trailing edge of the pack on the conveyor belt and allow it to pass through the detector without skewing or slippage.

Press the key adjacent to Signal Shift and adjust the shift setting using the up/down and cursor

keys such that the reject mechanism operates just as the front/leading edge of the pack reaches the centre of the reject device.

When set – press ENTER once

10) The reject shift will be adjusted as the last operation so do not worry at this stage about the reject mechanism operation.

If no further adjustment is required press ENTER again. The display will change showing the type of timer and asking the question

tm3 Gated? Yes /No

10) Select 'Yes' displays reads

tm3G Sync Shift ###

ETC Window Shift ##4

NOTE:–

a) Always set the window shift first.

b) A metal test piece is not required to set these two parameters.

c) The position on the conveyor of the photogate sensor should always precede the reject mechanism. Ensure the sensors do not effect the operation of the metal detector itself by infringing the metalfree zone limitations.

At line speeds of 61m/min (200ft/min) or greater, the sensors must not be positioned too close to the reject device, ensure a minimum distance of 0.5m (1.5ft).

Adjust the height and alignment of the sensors so that all packs break the beam at the same leading edge position irrespective of the type or size of pack.

d) When the Gated option is selected the Reject Shift is changed from being controlled by the speed sensor to being controlled by the internal time clock with units in seconds. A pre-set time setting of 100ms is the initial setting of the Reject Time and this should be sufficient to allow the Window Shift and the Sync Shift to be set first, before trimming the 'Reject Time'.

12) To set 'Window Shift'

Press key adjacent to 'Window Shift'.Display

Shows CAL for 5 seconds after which 'RUN' Appears.

With run displayed pass a pack of the correct size and orientation along the conveyor making sure that it is square on to the conveyor or with a skew angle typical for the line. The detector will automatically set the window shift based on the length of the pack.

The window shift can be measured several times to assess the effects of skewing of the pack simply by repeating the above procedure.

NOTE:–

a) CAL is calibrating the photo sensor so that either a light energised or a dark energised sensor can be used.

b) Ensure that during the CAL period there are no inadvertent interruptions of the photo-beam.

c) The detector head is always pre-set to operate with a NPN photo-sensor but it can be switched (internally) to operate from a PNP photo-sensor.

Both photo-sensor and speed sensor must be the same output type, NPN or PNP.

d) The Window Shift is entered into memory automatically and a correction is applied by the microprocessor to provide a window that overlaps the pack at the front and rear by one half pack. This ensures an accurate and reliable reject action regardless of where the metal contamination is within the pack.

e) The window shift is automatically extended for large pieces of metal contamination or for more than one piece of metal contamination.

13) To set Sync Shift

Sync Shift is the distance measured in shift pulses from the front edge of the pack interrupting the photo-beam to the pack being in its optimum reject position.

Press the key adjacent to 'Sync Shift'.

Pass the correct size of pack along the conveyor.

Both the detection light and the buzzer are operated continuously during this procedure, and all packs will now operate the reject mechanism even without having a metal test piece.

Adjust the Sync Shift setting until the pack is accurately rejected.

When a satisfactory setting has been achieved. Press ENTER once.

The Reject Time should now be adjusted.

14) Press the 'Etc' soft key the display now reads Signal

Shift 4## Reject Time #####sec
Etc

Place the sample pack with metal contaminant in the front or rear edge on the conveyor belt and allow it to pass through the detector without skewing or slippage.

Press the 'Reject Shift' soft key and adjust the reject time until the metal contaminated pack is cleanly rejected.

When accurate reject action has been achieved

Press ENTER once.

Using the ETC key will toggle the display between the two pages to allow for any trimming to be done before finally entering the data into memory.

When satisfactory settings have been achieved

Press ENTER once again.

The display will show the type of timer Set/ Updated for a period of five seconds after which it returns to the main menu.

15) Further check the operation and settings of the reject mechanism by passing contaminated packs through the detector.

Check packs with small metal samples placed in turn at the front and rear of the pack then repeat the tests using larger metal samples.

Note: Under normal running conditions with packs continuously passing along the conveyor if the gap between a metal contaminated pack and the adjacent pack is less than half the pack length both packs may be rejected.

If for any reason the settings of the timer are thought to be incorrect repeat the whole of the setting up procedure from step 1.

PROGRAMING THE DETECTOR

GENERAL

At this stage the metal detector should have been installed and configured and the user be familiar with the basic operation of the control panel as described in previous sections.

The Safeline detector has the ability to store settings for 21 different product numbers. Each product number represents a group of settings, the appropriate setting of sensitivity, phase, timer type and inverse detection may be allocated to each product number.

Sensitivity and phase when set correctly will optimise the detection sensitivity while selection of timer type will optimise reject operation, for different pack lengths or speeds. Inverse detection will allow the action of the reject timer, in the selected product number, to be reversed.

For most products the optimum setting of the detector will be with phase 0000. With products exhibiting a product effect improved detection sensitivity may be achieved by aligning the phase discriminator to the product signal.

To decide which of the two set up conditions give the best sensitivity it will be necessary to set up the detector first with phase 0000, and then, with phase aligned to the product effect. Comparison should be made between the two results and the most favourable setting selected.

Before making an adjustment to the detector ensure that product is continually moving through the detector aperture in its usual manner.

NB:– The detector will not operate correctly with product stationary in the aperture.

Worst case, product effect condition, ie. greatest disturbance of the coil system/largest product signal is experienced when the coil system condition changes from no product to maximum product. This is because the detector senses the changes in the amount of product in the detector.

If the product is in a continuous strip a large product signal may be experienced from the leading face followed by a much reduced signal as the product fills the detector.

With boxed/cartoned product the worst case

condition occurs as the box enters and leaves the detector. The gaps between the boxes will create the worst case product effect condition. If the boxes are touching a reduced product signal will result.

NON PRODUCT EFFECT APPLICATIONS

If when set at phase 0000 and sensitivity at maximum there is no product signal visible on the LED bar graph, as will be the case with most dry products. Adjustment of the detector is simply a case of adjusting the sensitivity to give the required detection standard, ie 1.0, 1.5, 2 Fe etc. To do this use the following procedure:–

- 1) Ensure product is flowing thorough detector in normal manner.
- 2) Enter Supervisor/Engineer Access Code.
- 3) Select appropriate product number.
- 4) Manually set phase to 0000.
- 5) Adjust sensitivity and check detection level with metal sample passing through detector.
- 6) Press 'Enter' to enter new values in memory.

PRODUCT EFFECT APPLICATIONS

Wet/moist product, ie meat, cheese, soups etc generate product signals when passed through the detector. At setting Phase 0000 the signal will be clearly visible on the LED Bar graph display.

With this type of product there are two alternative settings for the detector. Without phase discrimination (ie phase 0000) and with phase discrimination, ie phase aligned to the product.

The most favourable condition is ascertained by setting the detector to both conditions and comparing the results.

Before adjusting the detector ensure that the product is passing through the detector in its normal manner. Note:— the product should be continually moving, the detector will not operate with standing/stationary product in the aperture.

If the product is a continuous length/strip, the worst case product effect is given from the leading edge/face of the product. Product fully spanning the detector head gives a much reduced signal.

For the purpose of setting up the detector it is usual to use the worst case product effect conditions. This will necessitate setting up to the leading edge/face signal. Similar circumstances exist with individual or cartoned products. The worst case product effect occurs when the detection senses the change from full product to no product, ie the gap between products.

It is recommended that the detector is set up initially to worst case product effect conditions. With experience it may prove possible to increase the sensitivity setting without having to re-adjust the phase setting.

Minimising Product Effect Signal without the Use of Phase Discrimination

- 1) Ensure product is flowing through the detector, creating worst case product effect condition".
- 2) Enter the access code.
- 3) Select appropriate product number (00 to 20).
- 4) Manually set phase to 0000, (NB product No 00 is preset to phase 0000 and cannot be altered).
- 5) Observe the bar graph display and adjust the sensitivity such that the product gives a maximum

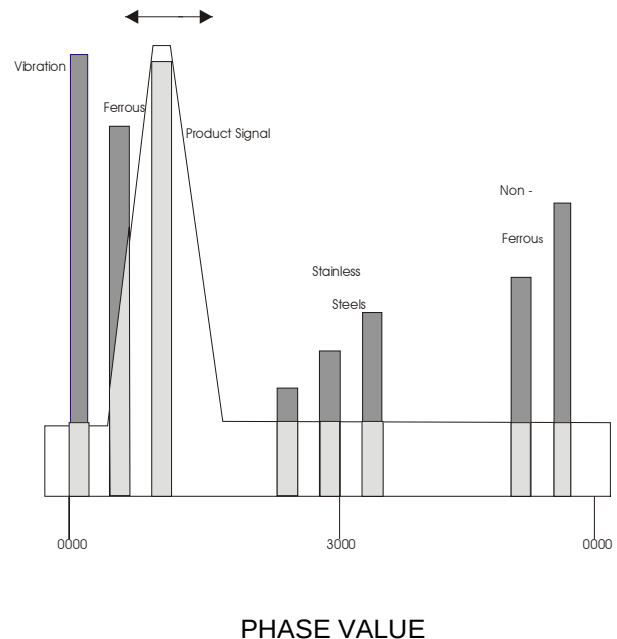
signal of 2 to 3 green segments on the bar graph display.

- 6) Test the detection sensitivity with metal samples.

Minimising Product Effect Signal By Manually Adjusting The Phase Discriminator.

The objective of the following procedure is to ascertain the setting of phase which will align the phase discriminator with the product signal. The correct setting will give minimum signal from the product on the bar graph display.

There will be one value of phase which will give minimum signal, 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.

it is much easier to find the correct phase setting by starting at a low sensitivity setting then repeating the process in stages at increased sensitivity.

When using phase discrimination to minimise product signals the detector will become more susceptible to vibration. The final setting of sensitivity may be limited by vibration effects rather than product effect.

- 1) Ensure product is flowing through the detector creating worst case product effect conditions.

2) Enter access code.

3) Select lowest available product number (01 to 20).

4) Manually set phase to 0000.

5) Adjust sensitivity so that the peak signal from the product gives just less than full scale indication on the LED bar graph display. If the signal is very large, such that zero sensitivity does not reduce the product signal to less than full scale indication on the LED bar graph, it may be necessary to reduce the power level (see Power Drive in 'Programmable Settings').

6) To find the null point, change the phase setting to 0500 and observe if amplitude of product signal indicated on the bar graph display reduces. Repeat the process increasing the phase setting in steps of 0500, ie 1000, 1500, 2000, 2500, 3000 etc, until the null point is located.

Lets say for example as we increased the setting there is a clear reduction in signal as we change from 2500 to 3000, then from 3000 to 3500 the signal starts to increase again. This indicates that the null point is between 2500 and 3500.

7) Now reduce phase setting in steps of hundreds ie 3500, 3400, 3300, 3200, etc. the product signal indicated on the bargraph display should now reduce in amplitude. Decrease the phase setting in steps of hundreds until the product effect signal is reduced to a minimum and then just starts to increase again.

8) At this stage the product effect signal indicated on the bar graph display should be quite small. To obtain a more precise phase setting increase the sensitivity setting to give a larger signal indication on the bar graph display.

9) Now use the 'tenth digit' and increase the setting, ie. 3010, 3020, 3030, 3040, 3050, etc. until the product effect signal is reduced to a minimum and then just starts to increase again. Using the tenths digit adjust the phase setting up and down until minimum signal ie. the null point is found.

10) Although not always necessary an even more precise null point will (be found by now using the 'units digit' in a similar manner to the tenths digit as described in 9). Using the units digit adjust the

phase setting up and down until minimum signal ie. the null point is found.

11) The phase discriminator is now aligned to the product signal, next adjust the sensitivity so that the product signal gives a maximum signal of 2 to 3 green bars on the bar graph display.

12) Check the susceptibility of the detector to vibration if unacceptable reduce the sensitivity until acceptable.

13) Press the 'Enter' key to store the new settings in memory.

14) Test the sensitivity of the detector by passing metal samples through the aperture of the detector (preferably on or in the product) and note the results.

Minimising Product Effect Signal By Using The Automatic Setup Facility

Using the auto-setup feature the system will automatically setup the phase and sensitivity to a product passed through the detector.

The product will need to be passed through the detector at least two times during auto-setup and at worst (under large product signal applications) up to five times.

The system cannot be used to setup automatically on a continually running product line.

The auto-setup will work successfully with any packaged or loose product which exhibits a product signal.

For example minimum product effect signal may have occurred at 3100 and starts to increase again at 3000.

For product effect applications where the product flow is continuous, such as that found on pipe line systems, manual phase adjustment must be used. See 'Minimising Product Effect Signal By Manually Adjusting The Phase Discriminator'

1) Ensure no product is passing through the detector.

2) Select a sample product which will create a worst case product effect condition.

3) Enter access code.

4) 4) Select lowest available product number (01 to 20).

5) Select phase.

6) Select automatic – from this point the auto-setup routine will guide you through each step. Simply follow the displayed instructions.

7) When asked to pass product through aperture ensure the product is passed in the same orientation and position each time.

8) When the auto-setup routine has finished it will display the message "Product adjustment completed". The phase and sensitivity have now been set passing the product through the aperture should now give 2 to 3 segments on the bar graph display.

NOTE – If the message 'WARNING the phase setting may be in error appears it may be necessary to trim the phase and possibly the sensitivity manually (see 'Minimising Product Effect Signal By Manually Adjusting The Phase Discriminator').

9) Test the sensitivity of the detector by passing metal samples through the aperture of the detector (preferably on or in the product) and note the results.

SELECTING TIMER A B or C

The timer setting A B or C controls the operation of the reject device. There are three different timer settings available however for most applications only one timer setting will be required.

Possible circumstances which may necessitate different timer settings are as follows.-

- 1) Photogated punch/push reject device with a wide variation in pack length. Adjusting the timing will ensure the pusher hits the pack in the most effective position.
- 2) Applications running at different conveyor speed that necessitate different reject timer setting.

The settings of timers A B and C are set by the Engineer when the detector is configured.

At this stage the objective is to allocate a previously set timer to a particular product number as advised by the Engineer.

- 1) Enter the supervisor or Engineers Access code
- 2) Press 'ETC' key
- 3) The display asks for a selection A B or C. Select the appropriate timer setting as advised by engineer.
- 4) Press 'Prog/Exit' key and exit programme.

SELECTING INVERSE DETECTION

The action of the reject timer can be reversed such that product containing no metal contamination is rejected whilst metal contaminated product is not rejected.

This feature is often used to verify that a product contains a metallic premium.

This option is only selectable in the engineers mode.

To select inverse detection:

- 1) Enter the Engineers Access code
- 2) Press 'ETC' key until the inverse detection page is displayed
- 3) Press the soft key adjacent to YES 4) Press 'Prog/Exit' key and exit programme.

NOTE:-

- a) This option can only be selected if the current timer is gated (i.e. a tm2G or tm3G).
- b) A gated timer can not have its parameters changed **if** this option is selected. Inverse detection must be deselected prior to adjustments.

If the user attempts either a) or b) above, the system prevents its implementation and displays the required action on the LCD display, i.e. in the case **of** note a) – "Timer must be gated for this option".

PERFORMANCE VALIDATION ROUTINE

General

The performance validation routine (PVR) helps users comply with ISO 9000 and BS5750 by ensuring that the metal detector system is tested and operating to the users specified quality assurance (QA) standards of performance.

The quality standards of many user companies require the metal detector and its reject system to be manually tested at specified intervals by authorised QA personnel to validate compliance.

QA personnel may 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 may be allocated a private access code to the metal detector ensuring that the individual charged with testing the metal detector does so at the specified time.

Local Printer Unit (Optional)

Although effective as a stand alone function the PVR is most effective when used in conjunction with a local printer unit (LPU), the printer will provide a date and time stamped hard copy print out showing when the metal detector was tested and by whom.

The hard copy print out can be used to demonstrate authorised personnel's compliance with company standards and hence the user companies compliance with the agreed quality standard. This may prove invaluable to companies wishing to demonstrate compliance with the ISO 9000, BS5750, the UK Food Act, and for users supplying the major retail organisations with strict metal detector standards.

The LPU also records general information relating to the metal detector performance, it will date and time stamp events such as rejections and changes made to the metal detector settings. The LPU is a very useful management tool for recording events that effect detector performance.

The customer may use their own LPU (providing the module firmware is 2.10 or greater) or purchase a Safeline LPU.

See Appendix D for illustrations of typical printouts.

Accessing The PVR

All Safeline metal detectors are shipped from the factory with the following PVR access codes

Code 0004 = QA Inspector Access

Code 1000 = QA Operator 1 Access

Code 2000 = QA Operator 2 Access

Code 3000 = QA Operator 3 Access

– ETC through to –

Code 9000 = QA Operator 9 Access

CONFIGURING THE PVR

Various operating characteristics of the PVR are programmable and may be altered or configured to suit the particular requirements of the application. The configuration process should be performed by the QA Inspector when first installing the metal detector or making changes to the setup characteristics.

On entering the QA inspector mode select **QA SETUP** to gain access and allow alteration of the following settings:

Set **Date** - Firmware 2.22 or greater

Allows the setting of YEAR, MONTH and DAY. I Refer to 'Changing Digital Values' for adjustment.

Set **Time** - Firmware 2.22 or greater

Allows the setting of HOUR and MINUTE. The clock uses the 24 hour format. Refer to 'Changing Digital Values' for adjustment.

Line Identification (Line ID. # # # #)

A line identification number can be entered.

For example the upper two digits may be the line number and the lower two digits may be the metal I detector number.

Printer (Printer - YES/NO)

Select YES if a printer is installed.

No should always be selected when a printer is not installed.

**Test Samples (FERROUS – #.#mm / NONE
FERROUS – #.#mm / STAINLESS STEEL 0.#mm)**
This allows the user to setup test sample materials and sizes which will be prompted for during the performance check. There are three independent settings for each of the twenty one product numbers.

Selecting the soft key adjacent to the material will allow selection of ferrous (Fe.), none ferrous (N-Fe.), or stainless steel S/S).

Having selected the material select the soft key adjacent to #.0mm and enter the test sample size. Press ENTER to store the selected material and test sample size in memory.

Shift Report Options

The following options, if selected 'IN', will be recorded and printed out as part of the shift report.

Reject Relay Operations (Reject Rly Oper'ns – IN/OUT)

If 'IN' is selected the shift report will include the date and time of all reject delay operations since the last shift report.

Modified Settings (Modified Settings – IN OUT)

If 'IN' is selected the shift report will include certain settings which have been changed since the last shift report. The shift report will include the settings new value / condition and the date and time when it was changed.

The settings which are recorded are;

Prod No, Sens, Phase, Timer Type, Reference Phase, Pack and Reject Count Resets and Reject Inhibit

Shift Report Interval (Shift Report Int. – H. / M.M)

The shift report can be automatically printed on a timed basis.

The 'H' stands for hours and can be adjusted to a maximum of 8.

The 'M' stands for minutes and can be adjusted to a maximum of 59.

This will allow a time interval of up to 8:59 between shift reports.

Setting the time to 0 00 disables timed shift reports.

Shift Report Start Time (Shift Report Start H.## / M W) – Firmware 2.10 or greater

The start time of the shift report can be set to allow automatically printed shift reports to be started from a specified time.

The 'H' stands for hours and can be adjusted to a maximum of 23.

The 'M' stands for minutes and can be adjusted to a maximum of 59.

Test Interval (Test interval - H #/ M.##)

The test interval is the time period between which the metal detector system requests the QA personnel to carry out a performance check.

The message 'REQUEST FOR PERFORMANCE CHECK' appears on the control module display when a test is due.

With Module firmware version 2.10 (or greater) an optional output is available which could be used to drive an external indicator to attract the attention of the QA operator.

The test interval time is restarted when a performance check is carried out.

The 'H' stands for hours and can be adjusted to a maximum of 8.

The 'M' stands for minutes and can be adjusted to a maximum of 59.

This will allow a time interval of up to 8.59 between performance checks.

Setting the time to 0.00 disables requests for timed performance checks.

Overdue Period (Overdue Period - H. # /M.##)

This is the time period allowed, following a performance check request, before the test is classed as being overdue.

If the overdue period is reached the 'REQUEST FOR PERFORMANCE CHECK' message is changed to 'OVERDUE FOR PERFORMANCE CHECK' and the bar graph display and buzzer are sequenced on and off to attract attention. An alarm output is also available, see 'Alarm if overdue'.

The maximum overdue period is restricted to half of the test interval time.

Alarm If Overdue (Alarm If Overdue – YES/NQ)

If Reject Confirmation hardware is fitted this option can be selected to operate the system fault relay (See 'Power Unit Electrical Connections' in the Installation section) when a performance check becomes overdue.

Note on module firmware version 2.02 and less the RCU must be selected in the Engineers mode for this facility to operate.

Change QA Operator Code (Change Cod" QA # #####)

Allows the setting of the nine QA operator codes.

Select the soft key adjacent to the arrowed line (^ – -) to select the QA operator number (i.e 1 to 9).

Select the soft key adjacent to # # # # and enter the required code Press ENTER to store the new code in memory.

PERFORMANCE VALIDATION PROCEDURE

A performance check may be carried out at any time.

The PVR may have been configured to automatically prompt the user (normally authorised QA personnel) to carry out a performance check. This will occur at regular intervals, determined by the pre-programmed test interval.

If the test interval has been set the time of the next performance check can be checked by pressing ETC twice from the normal running display. the display will show the 'Current Time" and the Next QA Test time .

NOTES

- 1) If the PVR has been configured for timed performance checks then the test interval time will be restarted when-ever a performance check is carried out
- 2) If the operator wishes to check the operation of the reject mechanism to its highest level, to ensure correct operation at the worst case extremes it will be necessary to follow instruction 13) on Page 22 when passing through the sample or contaminated pack Also refer to 'Sample Size' on Page 21 to ensure that the correct size sample is used.

Carrying out a performance check;

The test sample(s) should be passed though the metal detector with the product.

If inspecting individual products prepare a sample pack (one for each> test sample) containing the test sample.

Position the test sample at the rear/trailing edge of the product and in a position which places it as close as possible to the centre at the aperture metal detector aperture when the product is passed through the detector.

1) Enter the QA access code (QA inspector or QA Operator).

2) It accessed by QA inspector code press 'TEST', the display reads

FERROUS NONE FERRQUS

EXIT STAINLESS STEEL

3) Select the material to be tested, the display reads -

Pass . #.#mm i Fe. / N-Fe. / S/S sample

PASSED

FAILED

4) The display prompts the operator to pass the' selected test sample through the metal detector.

If inspecting individual product place the sample pack prepared earlier on the conveyor belt and allow it to pass through the detector.

if the product is loose place the test sample on the conveyor belt (or into the product flow) and allow it to pass through the detector.

Ensure that the test sample is detected and (if applicable) that the sample pack / test sample i-; successfully rejected.

If note 2) is being followed it may be necessary at this point to pass the contaminated product or test sample through again.

Enter the result of the test by pressing the 'PASSED' or 'FAILED' soft key, the display reads as shown in 2). If a LPU is installed, the result will be printed for confirmation of the test.

If there are more test samples to be checked continue from step 3),

If the performance check has been completed press the 'EXIT' soft key or the 'PRQG/EXIT' key.

PRINT-OUTS / DATA COLLECTION

Information (or data) being transmitted by the metal detector may be transferred directly to paper by using a local printer unit (LPU). Alternatively it may be collected by other types of 'intelligent' equipment.

The following description assumes that a LPU is being used to obtain a 'hard copy' print out of information available from the metal detector.

For this facility to work the 'Printer – YES/NO' option in the QA Inspector setup mode must be selected.

See Appendix D for 'Sample Printed Reports Showing Format And Contents'.

Connection of the LPU is to COM1 on the metal detector power supply unit. See Appendix C for 'Setting 'Up And Connecting A Printer To The Metal Detector'.

Shift Report printout

Depending on how the QA Inspector has setup the PVR the shift report printout may include all reject relay operations and/or modified settings or no shift information at all.

Once a shift report has been printed the metal detector starts to accumulate information for the next shift and the previous shift report is abandoned.

The shift report is printed under any one of the following three condition;

- 1) On a timed basis – see under 'Configuring The PVR' the 'Shift Report Interval',
- 2) When selected in the QA Inspector mode.
 - a) Enter QA Inspector access code.
 - b) Press 'PRINT' soft key the display reads.

PRINT ALL SETTINGS

PRINT SHIFT REPORT

- c) Select PRINT SHIFT REPORT.
 - c) If nothing further is required press the PROG/ EXIT key to return to the running mode.

3) If the accumulated shift report information exceeds the available storage space. This is not likely to happen under normal operating conditions.

Settings printout

This printout contains all the Engineer and QA settings.

- 1) Enter QA Inspector access code.
- 2) Press 'PRINT' soft key the display reads.

PRINT ALL SETTINGS PRINT SHIFT REPORT
- 3) Select PRINT ALL SETTINGS.
 - 3) If nothing further is required press the PROG/ EXIT key to return to the running mode.

Performance Check printout

As detailed in The Performance Validation Routine section above, printouts are immediate when a performance check is carried out.

Printer Error Messages

There are currently two error messages associated with the printer / data collection unit, these are:-

1) DATA COLLECTION UNIT NOT READY

This occurs if the module can not communicate with the printer,

Check –

- a) is the printer powered up?
- b) is the printer set up correctly (see Appendix C for 'Requirements Of Your Serial Printer') ?
- c) is the wiring and connections from the metal detector to the printer correct '?
- d) has the printer paper run out or the paper jammed?
- e) is the printer 'on line'?

2) DATA COLLECTION UNIT NOT CONFIGURED

This occurs if the printer is not configured in, either by the supplier, or by the customer from within the QA Inspector mode.

This will only occur following an attempt to drive the printer from the QA Inspector mode.

APPENDIX A

A Rotary Encoder Used As A Speed Sensor

For The tm3[G] Timer

Speed Sensor Requirements

The speed sensor may be:

- a) a purpose bought item, known as a Rotary Encoder, or
- b) 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 have the following electrical specification:

Operating Voltage- +15 V D.C.

Quiescent Current - 60 mA maximum.

Output Type - NPN open collector.

PNP output devices can be accommodated by changing the internal link arrangement in the detector head.

Note

If a pack sensor is also being used, both the pack sensor and the speed sensor must be the same output type, NPN or PNP.

Output Voltage:- 15 V minimum.

Output Current:- 10 mA minimum.

Output Waveform:- Pulse output

Pulse width:- 10 ms minimum.

Frequency:- 50 Hz maximum

Speed Sensor Electrical Connections

Refer to the Installation section.

Connect the sensor to the terminals labelled Speed Sensor.

Producing A Rotary Encoder Using A Proximity or Photo-electric Sensor

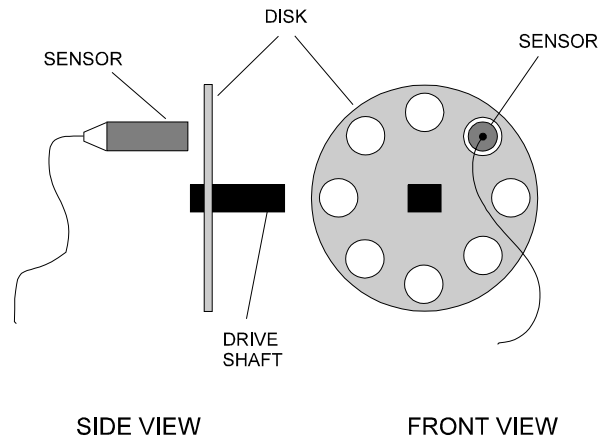


Figure A-1

Figure A-1 above shows a possible technique for producing a rotary encoder using a proximity or photo-electric sensor.

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.

Disc Construction

The disk diameter and number of holes/slots can be determined when the required shift distance of the speed sensor is known (see following section). If the required shift distance is 25mm/shift then the hole/slot pitch of the disk should be designed so the sensor gives one pulse cycle out for 25mm moved by the conveyor, see Figure A-2 below.

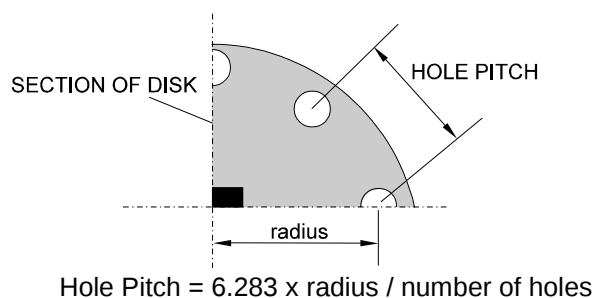


Figure A-2

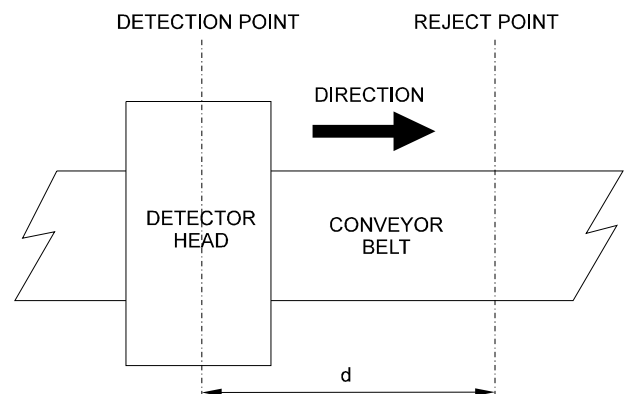
In building the disk, make sure that the solid and gap width are such as to keep the pulse width and frequency within the specified limits.

Determining The Required 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 SHIFT distance and is the smallest interval measurable by the detector (i.e. its resolution).

Table A-1 can be used to determine the shift distance for your system. Using distance, d, between the detection and rejection points

(see Figure A-3 below), follow these steps.



- 1) Find the point on the table where d lies between the minimum and maximum limits. If this value lies at more than one point in the table select the point that corresponds to the smallest shift distance,

Example.

For, d = 1000 mm (39 inch)

This value lies at four points in the table, which corresponds to shift distances of 13 mm, 19 mm, 25.5 mm and 32 mm.

Select the smallest value, 13 mm (0.5 inch).

- 2) Next check that your maximum conveyor speed does not exceed the limit specified in the table.

Example.

For, d = 1000 mm (39 inch) and,
Shift Distance = 13 mm (0.5 inch)

The maximum conveyor speed is 38 m/min (125 ft/min).

Shift Distance		6.5 mm (0.25 inch)	13 mm (0.5 inch)	19 mm (0.75 inch)	25.5 mm (1.0 inch)	32 mm (1.25 inch)
Detection to Rejection. Distance, d	Minimum	191 mm (7.5 inch)	381 mm (15 inch)	572 mm (22.5 inch)	762 mm (30 inch)	953 mm (37.5 inch)
	Maximum	635 mm (25 inch)	1270 mm (50 inch)	1905 mm (75 inch)	2540 mm (100 inch)	3175 mm (125 inch)
Maximum conveyor speed		19 m/min (62.5 ft/min)	38 m/min (125 ft/min)	57 m/min (187.5 ft/min)	76 m/min (250 ft/min)	95 m/min (312.5 ft/min)

If your maximum conveyor speed exceeds this limit then choose the next point up, where in our example the shift distance is 19 mm. At this point distance d still lies within limits, and we have an improved maximum conveyor speed at the expense of a larger shift distance.

If your maximum conveyor speed still exceeds the tabulated limit then choose the next point up, providing, as in our example, distance d still lies within limits.

APPENDIX B

Hardware Failure Numbers, Variable Error Numbers Circuit Fault Numbers And Warning Numbers.

GENERAL

The metal detector carries out various test functions to ensure that it is operating correctly. Some of these tests are carried out during power-up and others are done on a continuous basis.

Any test which fails is displayed on the LCD display as an error number. The type of errors are categorised as:

Hardware Failure No's.

Variable Error No's.

Circuit Fault No's.

Warning No's.

HARDWARE FAILURE NO'S

During power-up the firmware runs basic tests on the CPU Board hardware, any error is displayed as a Hardware Failure Number.

Any of the above Hardware Failure numbers prevents the metal detector from operating.

Action

Replace the Module or contact the supplier.

VARIABLE ERROR NO'S

During power-up 'SELF TEST' the firmware runs test on all the user programmable variables, such as the SENSitivity, PHASE and Timer settings.

Any corrupted variable is replaced with its default value and the 21st to 25th segment of the bar graph display is flashed to warn the user.

The metal detector is not prevented from operating.

The flashing segments of the bar graph are cleared by powering down and back up again with no Variable Errors.

Action

Check all your programmed settings and the operation of the system and contact the supplier.

CIRCUIT FAULT NO'S

During power-up and normal running of the system the firmware carries out various monitoring tasks to ensure circuit functionality, any error is displayed as a Circuit Fault Number.

Circuits Fault 1, 2 and 3 prevent the metal detector from operating and forces a reject condition.

If a Reject Confirmation Unit (RCU) is fitted and operating the 'system fault relay' contacts will be activated.

Action

Replace the module or contact the supplier.

Circuit Fault 4 and 5 do not prevent system operation but action must be taken.

Action

Contact the supplier.

Circuit Fault 6 does not prevent system operation.

Action

Repeat auto-setup and when the LCD message reads "Ensure no product is passing through aperture" please make sure that this instruction is followed. If the problem still exists contact the supplier.

WARNING NO'S

During power-up the firmware checks the module memory and the detector head memory for validity, any errors are displayed as Warning Numbers.

If Warning 1 occurs it will be followed by the question:

Maintain Module YES>

settings ?? NO>

Select the 'YES' soft key option - be patient it will take several seconds to transfer the module settings to the head.

Action

Ensure that the metal detector is not powered down for 30 seconds, following a change to any of the settings.

If the problem still persists contact the supplier.

Note: If it is the first time the metal detector has been switched on with a new interconnection board then there is nothing to worry about.

Warning 2, 3 and 4 are displayed continually and prevent the system from running. Pressing any key will put the metal detector into its normal running mode.

The metal detector may still be used if the message was a Warning 4.

Action

Check all your programmed settings and the operation of the system and contact the supplier.

OTHER FAULT MESSAGES

BALANCE FAULT CONTACT SUPPLIER

This message on the LCD prevents the metal detector from operating and forces a reject condition.

If a Reject Confirmation Unit (RCU) is fitted and operating the 'system fault relay' contacts will be activated.

Action

Contact the supplier.

WARNING - No communications hardware.

This message appears on the LCD during power-up 'SELF TEST' if communications is configured in and the module does not have the correct hardware.

The display remains for approximately 10 seconds and then self clears.

Action

If RS232 communications is required contact the supplier.

BAD ROM CHECKSUM FOUND: MACHINE FAULT XXXX.

This message appears on the LCD during power-up 'SELF TEST' if a fault is found with the firmware.

This condition prevents the metal detector from operating and forces a reject condition.

Action

Contact the supplier.

WARNING DATE/TIME NOT SET UP

The message will normally follow a WARNING 4 condition and is displayed continually preventing the system from running. Pressing any key will put the metal detector into its normal running mode.

Action

Set the date and time and check all your programmed settings and the operation of the system and contact the supplier.

APPENDIX C

Setting Up And Connecting A Printer To The Metal Detector

GENERAL

Information (or data) being transmitted by the metal detector may be transferred directly to paper by using a printer.

Alternatively it may be collected by other types of 'intelligent' equipment such as a terminal or computer.

This appendix is intended for users who wish to use their own printer or data collection device, and although all references throughout this text assume it is a printer that is being used, it applies just as equally to a data collection device.

Requirements Of Your Serial Printer

Currently the printer driver supplied as standard with the metal detector is designed to drive any serial dot-matrix printer.

The format of the information being output by the metal detector is in columns of up to 42 characters. This means that for optimum appearance and clarity your printer should be 42 columns or greater.

The serial communication parameters of your printer must be setup as follows:

Baud rate : 9600

Data bits : 7

Start bits : 1

Stop bits : 1

Parity bits : 1 Odd

The printer must operate with RS232 voltage levels (i.e. typically +9V) and not TTL voltage levels.

The printer ideally will use hardware handshaking although X-ON and X-OFF software handshaking is supported but must be selected from the engineers mode.

Connecting Your Printer

The metal detector has two serial communication ports COM1 and COM2 both accessible from the P/S Connection PCB within the Power Unit Enclosure. See 'Power Unit Electrical Connections' in the installation section.

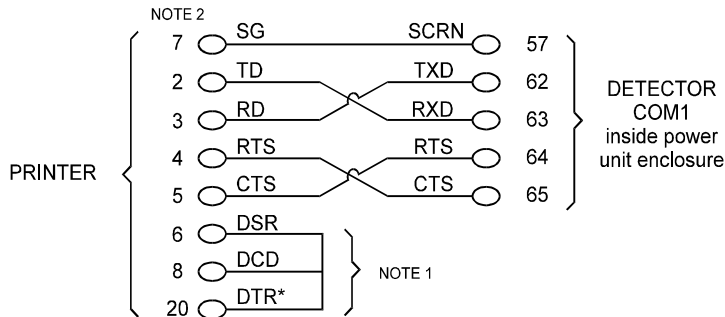
The printer connects to COM1.

See 'Connection Of Printer To Metal Detector' over leaf for details.

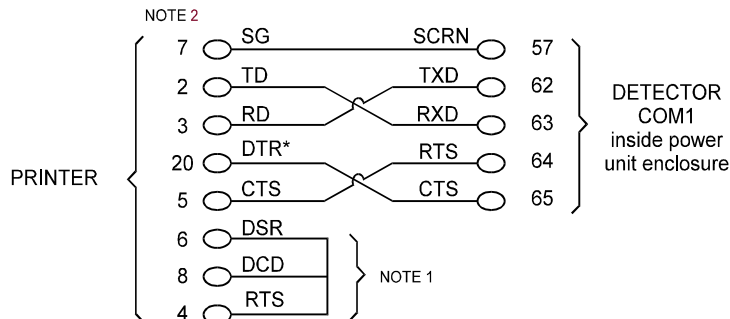
COM2 is not used for the printer.

CONNECTION OF PRINTER TO DETECTOR

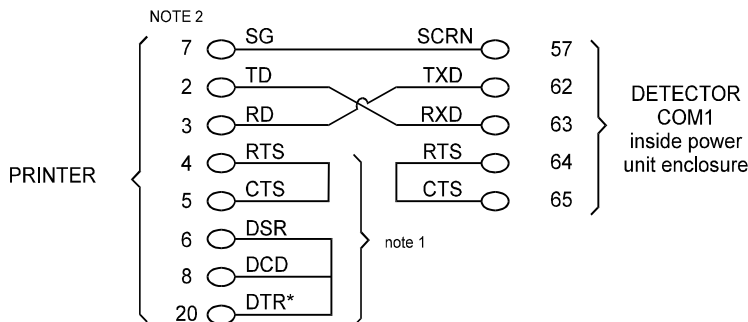
1) Hardware handshake connection (recommended)



2) Hardware handshake connection (printer does not use RTS line)



3) Software handshake connection for X-ON/X-OFF control



* Certain printers use SSD (pin 11) as an alternative printer-ready line.

NOTES

- 1) Many printers do not require CTS, DSR or DCD to be at active levels. However it is accepted good practice to connect these signals together as shown.
- 2) The printer pin numbers shown are for an RS232 25-way D-type connector - if your printer uses a 9 way D-type connector consult the printer manual for the correct pin numbers.
- 3) These are the terminal numbers of the COM1 connectors on the P/S Connection PCB within the Power Unit Enclosure.

Sample Printed Reports Showing Format And Contents

Note: Individual printouts will vary according to the settings stored in the detector

Current
Prod No ; 00

QA Settings Printout

* QA Settings *

Line ID ; 0205
 Printer ; YES
 Relay Rpt ; YES
 Settings Rpt ; YES
 Report Int ; 8:00
 Test Int ; 2:00
 Overdue Int ; 0:30
 Alarm ; NO

Prod No	Fe	N/Fe	S/S
00	1.2	1.5	1.5
01	1.5	1.8	1.8
02	0.0	0.0	0.0
03	0.0	0.0	0.0
04	0.0	0.0	0.0
05	0.0	0.0	0.0
06	0.0	0.0	0.0
07	0.0	0.0	0.0
08	0.0	0.0	0.0
09	0.0	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	0.0
13	0.0	0.0	0.0
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	0.0	0.0	0.0

Shift Report Printout

** SHIFT REPORT START **

Date	Time
01 Jan 1998	10:30:15

Reject Relay Operated

Date	Time
01 Jan 1998	09:00:45
01 Jan 1998	09:00:45
01 Jan 1998	09:00:46
01 Jan 1998	09:00:47
01 Jan 1998	09:00:48
01 Jan 1998	09:31:03
01 Jan 1998	10:05:59
01 Jan 1998	10:06:00

Modified Settings

Date	Time
01 Jan 1998	09:01:15

Prod No ; 01
 Sens ; 156
 Phase ; 3100
 Timer ; B
 Rej Count ; RESET
 Pack Count ; RESET
 Current
 Prod No ; 00

Shift Report Printout - continued

Date	Time
01 Jan 1998	09:01:15
Prod No	; 02
Sens	; 185
Timer	; A
Ref Phase	; 2850
Reject Inh	; YES
Current	
Prod No	; 01
Date	Time
01 Jan 1998	09:01:15
Reject Inh	; NO
Current	
Prod No	; 01
SHIFT REPORT END	

Performance Check

* Performance Check *	
Date	Time
01 Jan 1998	10:45:00
Line ID	; 0205
Operator	; QA INSPECTOR
Prod No	; 01
Sens	; 156
Phase	; 3100
Timer	; B
Material	; FERROUS
Size	; 1.5mm
Dtection	; YES
Reject Rly	; YES
Result	; PASSED
Material	; STAINLESS STEEL
Size	; 1.8mm
Dtection	; YES
Reject Rly	; YES
Result	; PASSED

APPENDIX E

Firmware Versions 2.13, 2.15 and Higher

Product Signal Cancellation

Phasing out a product effect signal whether manually or automatically very often does not eliminate the product signal entirely. The remaining signal normally means that the metal detectors sensitivity must be reduced to eliminate the product signal entirely, and this in turn leads to reduced performance.

Product Signal Cancellation (PSC or Product cancellation) aims to eliminate any remaining product effect signal without the need for running at reduced sensitivity.

System /Product Requirements

- Fixed speed photogated conveyor system. The pack sensor must be mounted before and as close to the head as possible.
- Minimum belt speed of approximately 10 m/min.
- Maximum pack length 1 m.
- The product effect must be consistent.
- There must be sufficient space between consecutive packs for the pack sensor to register them as discrete products.
- Presentation of the product must be consistent, product guides may be needed.
- Up to 5 correctly presented products may be in the aperture at any one time.

If any one of the above requirements are not met, consult with your supplier.

PSC Limitations

There are certain applications where PSC will not work:

- loose or variable product
- pipe line systems
- gravity fall systems
- variable speed systems (unless PSC is setup each time the speed is changed)

PSC Setup

1) Pack sensor calibration

If the reject timer used is a tm2(G), the following setup is not required.

- Select tm2(G) from a different timer group.
- Select Window Time. When RUN is displayed, pass the product. After a Window Time value is displayed, press Enter.
- Reselect the original timer group.

Note - this only needs to be done ONCE.

2) Cancellation Setup

- Set the following display to YES (Firmware Version 2.15 or greater).

Prod. cancellation YES ►
◀ETC NO ►

- PSC is available in Prod. No. 1 to 5. Select the appropriate Prod. No.

- Select PHASE and carry out AUTOMATIC Product adjustment.

- At the end of Product adjustment, it should display:

Prod. cancellation YES ►
NO ►

If not, it will mean the sensitivity setting can not be improved upon and cancellation will be ineffective.

v) Select YES

vi) The product will require three further passes, after the first

Obtaining product
information 1...

Will be displayed. After the second

Obtaining product
information 2...

will be displayed. After the third

Adjusting
sensitivity

will be displayed. The final message will be

Product adjustment
completed

vii) If at any stage an error has occurred or the PROG/EXIT key has been pressed, the following will be displayed

Product cancellation
NOT operating

and the settings from the first part of Product adjustment will be used with PSC not working.

viii) The letter 'P' in 'PHASE' will flash (Firmware Version 2.15 or greater) indicating PSC is working.

IMPORTANT

To achieve optimum performance and prevent false detections, the conveyor belt MUST be free from contamination.

The position of the pack sensor MUST detect the pack at a regular point. If the pack has a tag or joint on the leading edge, the pack sensor detection point could be inconsistent and lead to impaired operation.

Once PSC is setup and working, if required SENS can be manually adjusted but PHASE cannot. If PHASE is adjusted PSC will stop working and the 'P' in PHASE will stop flashing (Firmware Version 2.15 or greater).

VIEWING Mode

The VIEWING mode is a new access level. The user may view all settings that are normally set in the ENGINEERS mode but cannot change them. The default code is 0005.

This may be changed in the ENGINEERS access mode.

Japanese Language

Japanese has been added to the list of languages available to the metal detector. As with the other language options, all displays have been translated. Printouts however, have not, they will remain in English (2.21 and above have Japanese printouts).

Due/Overdue Alarm Output

There has been a change to a Performance Validation Routine setting. In QA SETUP,

Alarm if Overdue - YES/NO

has changed to,

Alarm if - - DUE/OVERDUE

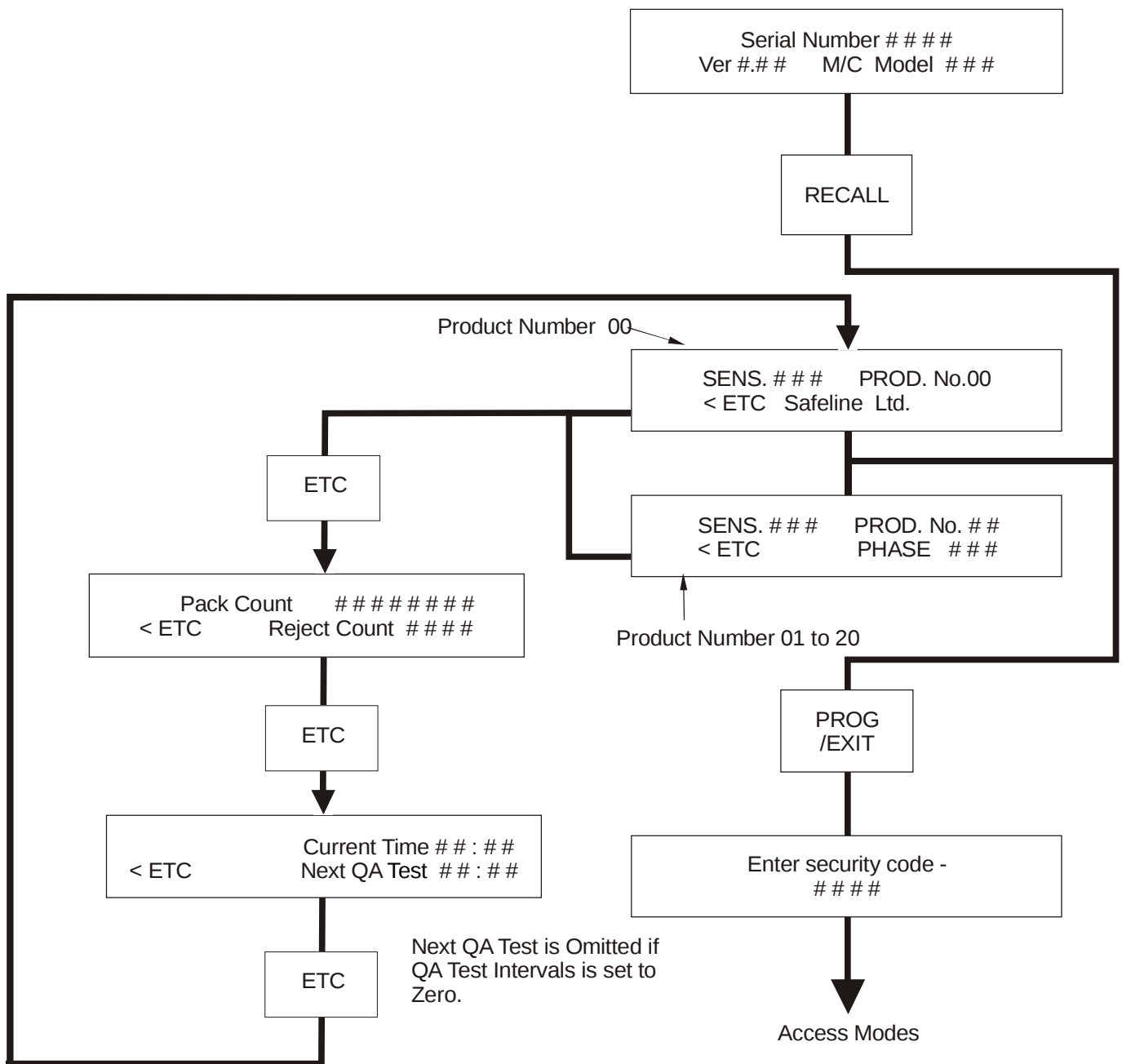
An independent alarm output is available if a Performance Check becomes either due or overdue.

This is an open collector output, capable of sinking a maximum current of 100 mA, at a maximum voltage of 30 V.

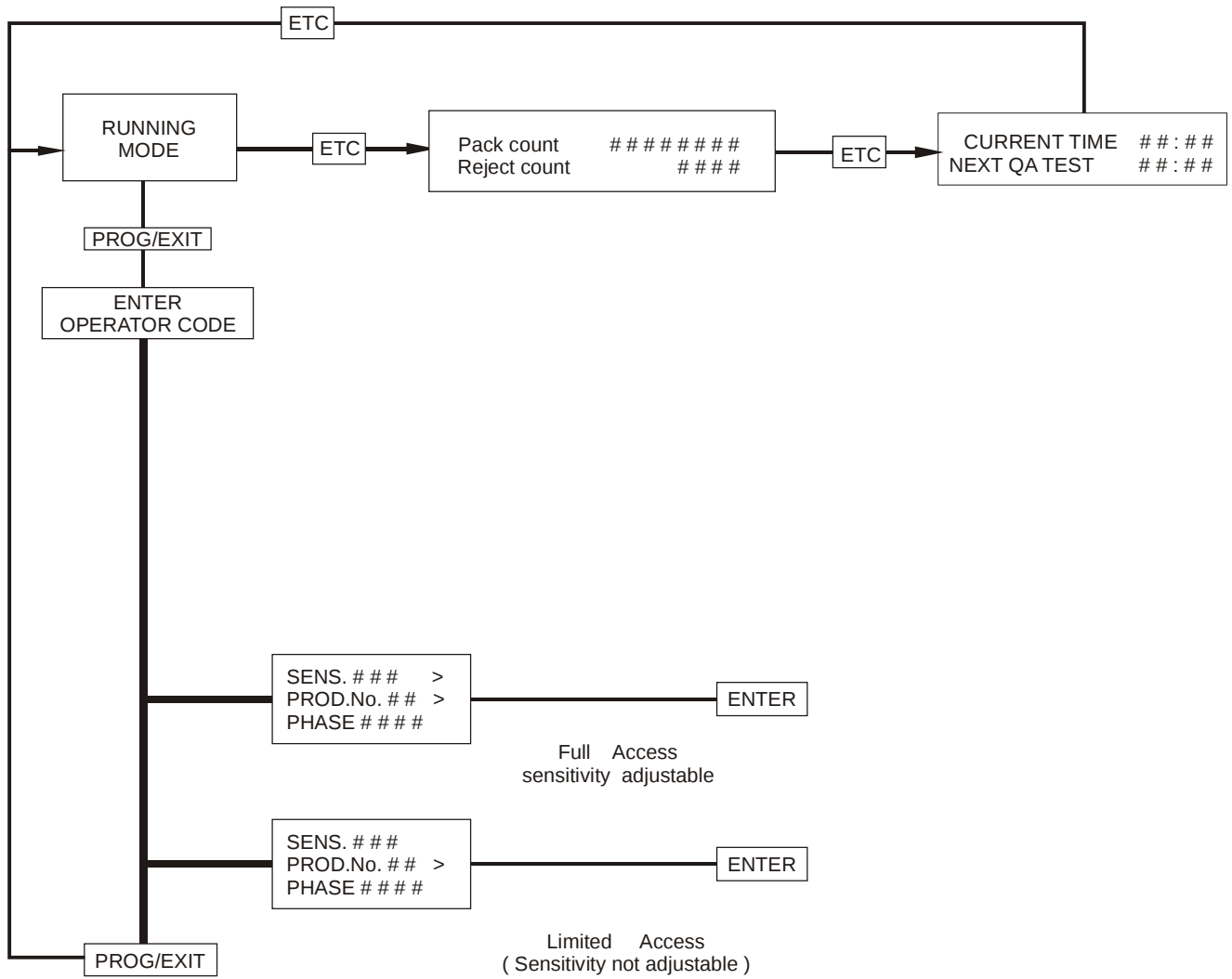
(Note - reject confirmation does not have to be selected).

DRAWING LIST

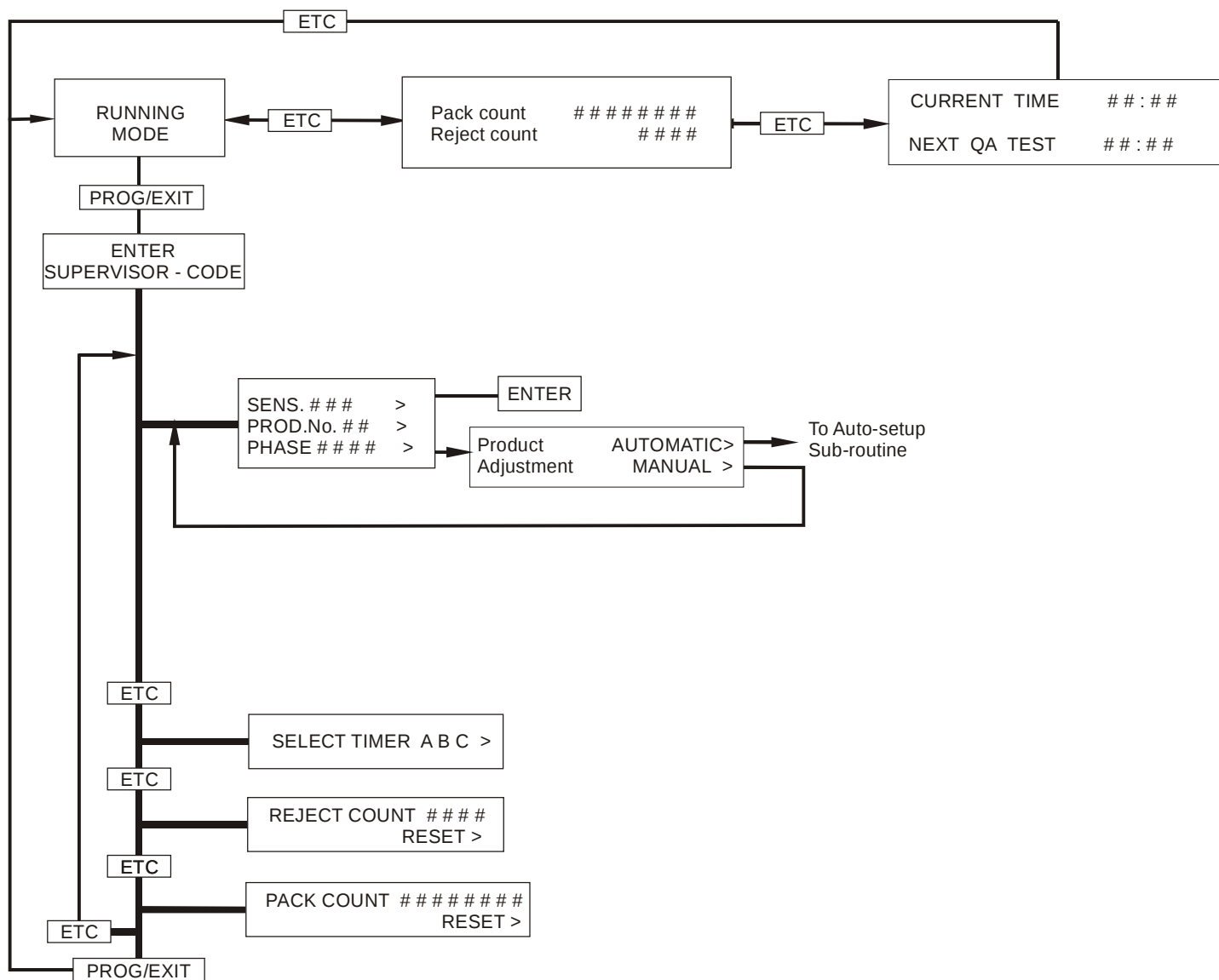
Flow Chart – Running Mode	Page 49
Flow Chart – Operator Mode	Page 50
Flow Chart - Supervisors Mode	Page 51
Flow Chart – Engineers Mode	Page 52
Flow Chart – QA Operator Mode	Page 54
Flow Chart – QA Inspector Mode	Page 55
Flow Chart - Auto-setup Routine	Page 56
Flow Chart – tm1 Timer	Page 57
Flow Chart – tm2[G]	Page 58
Flow Chart – tm3[G]	Page 59
Typical Metal Detector Conveyor System	Page 60



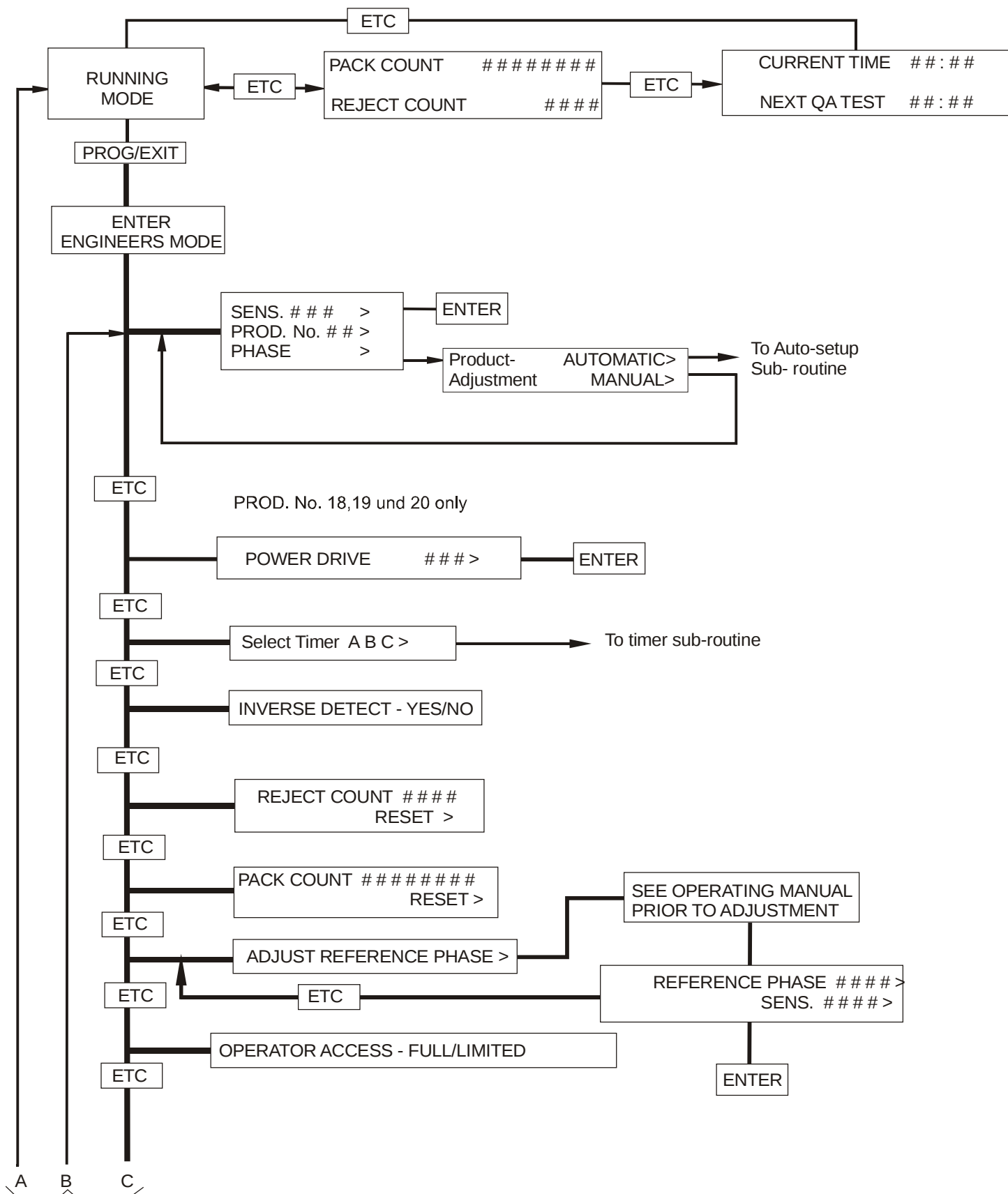
RUNNING MODE
FLOW CHART - VERSION 2.01 to 2.49



OPERATOR MODE
FLOW CHART - VERSION 2.01 to 2.49

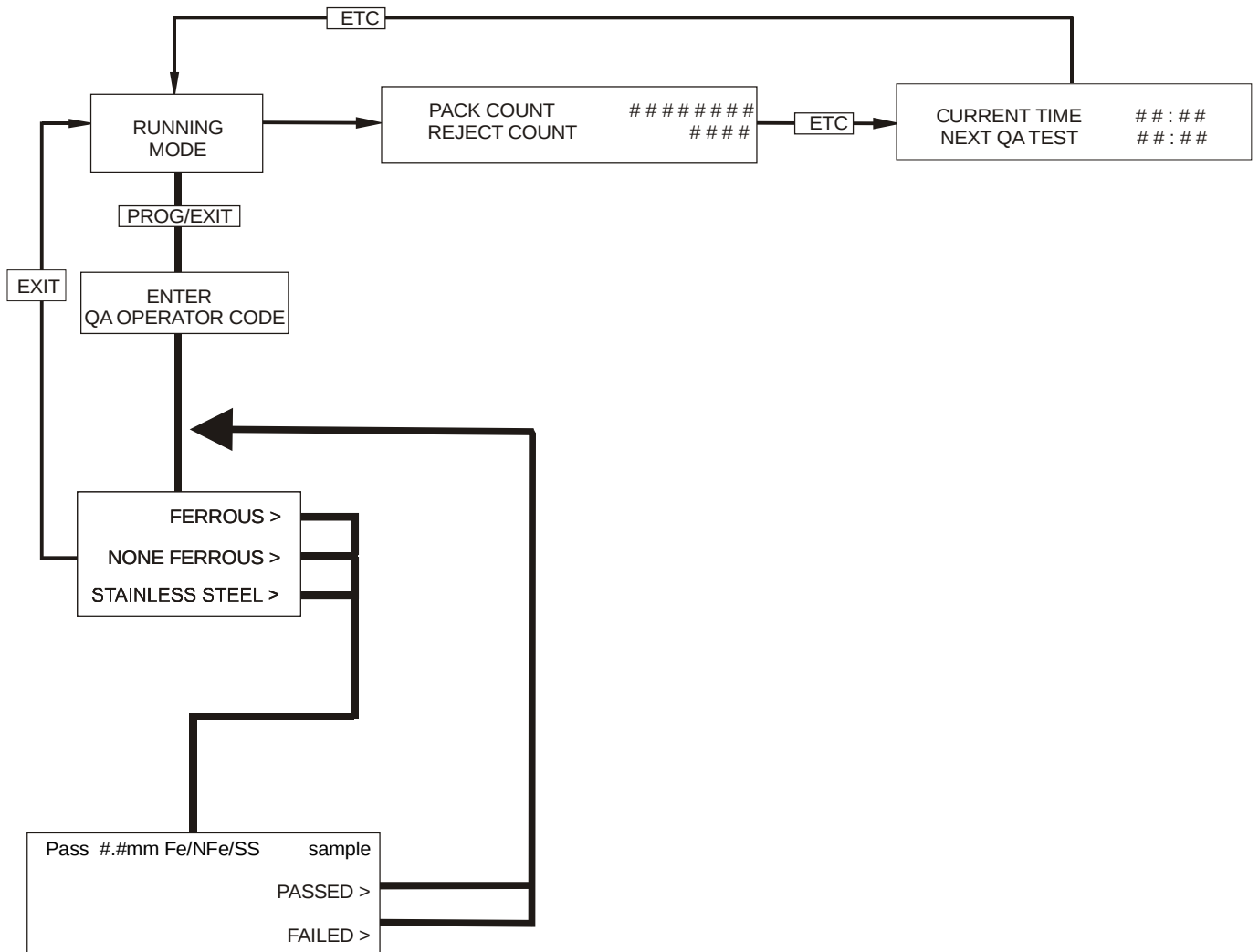


SUPERVISOR MODE
FLOW CHART - VERSION 2.01 to 2.49

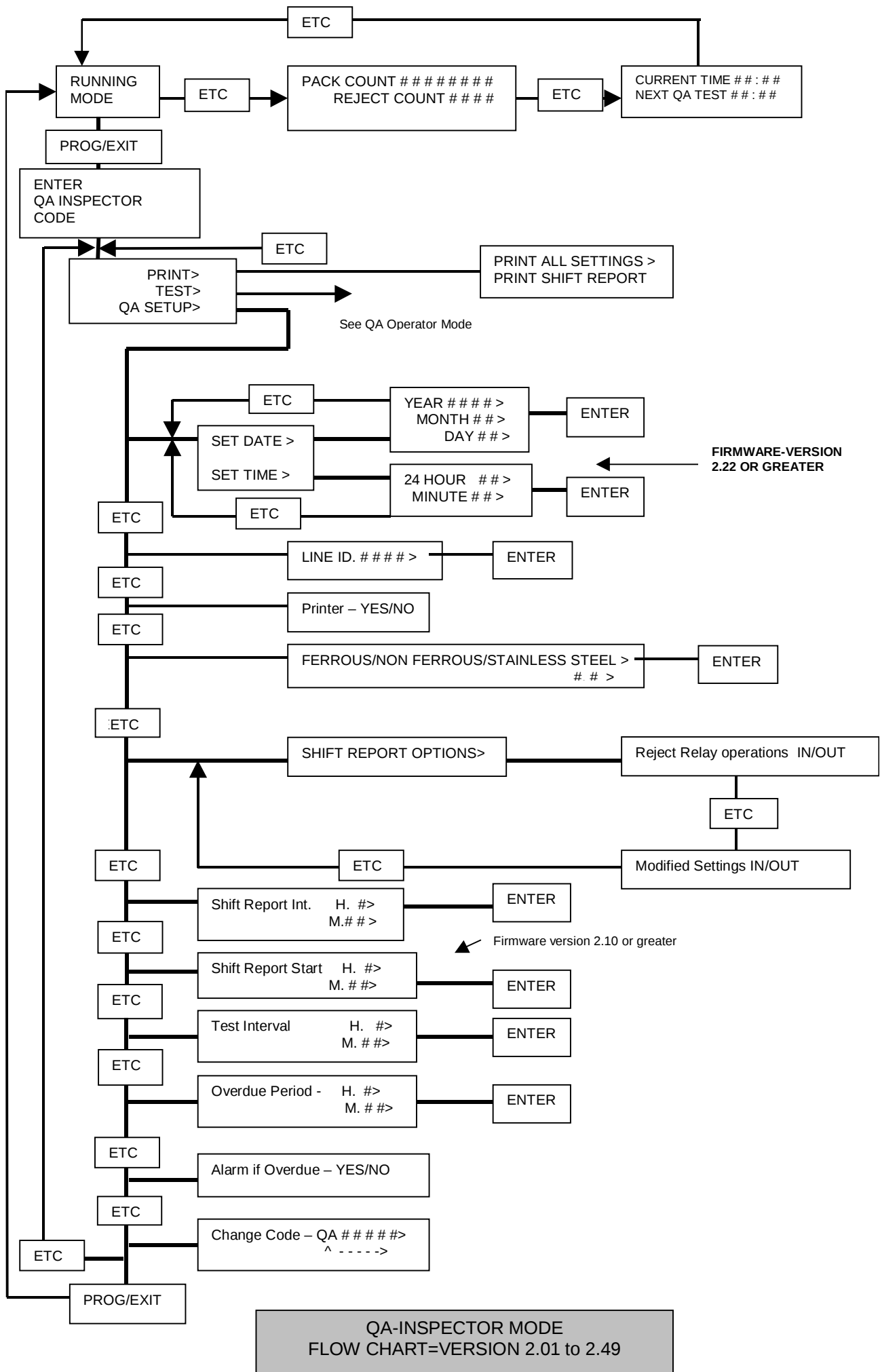


CONTINUED ON
NEXT PAGE

ENGINEERS MODE
FLOW CHART - VERSION 2.01 to 2.49

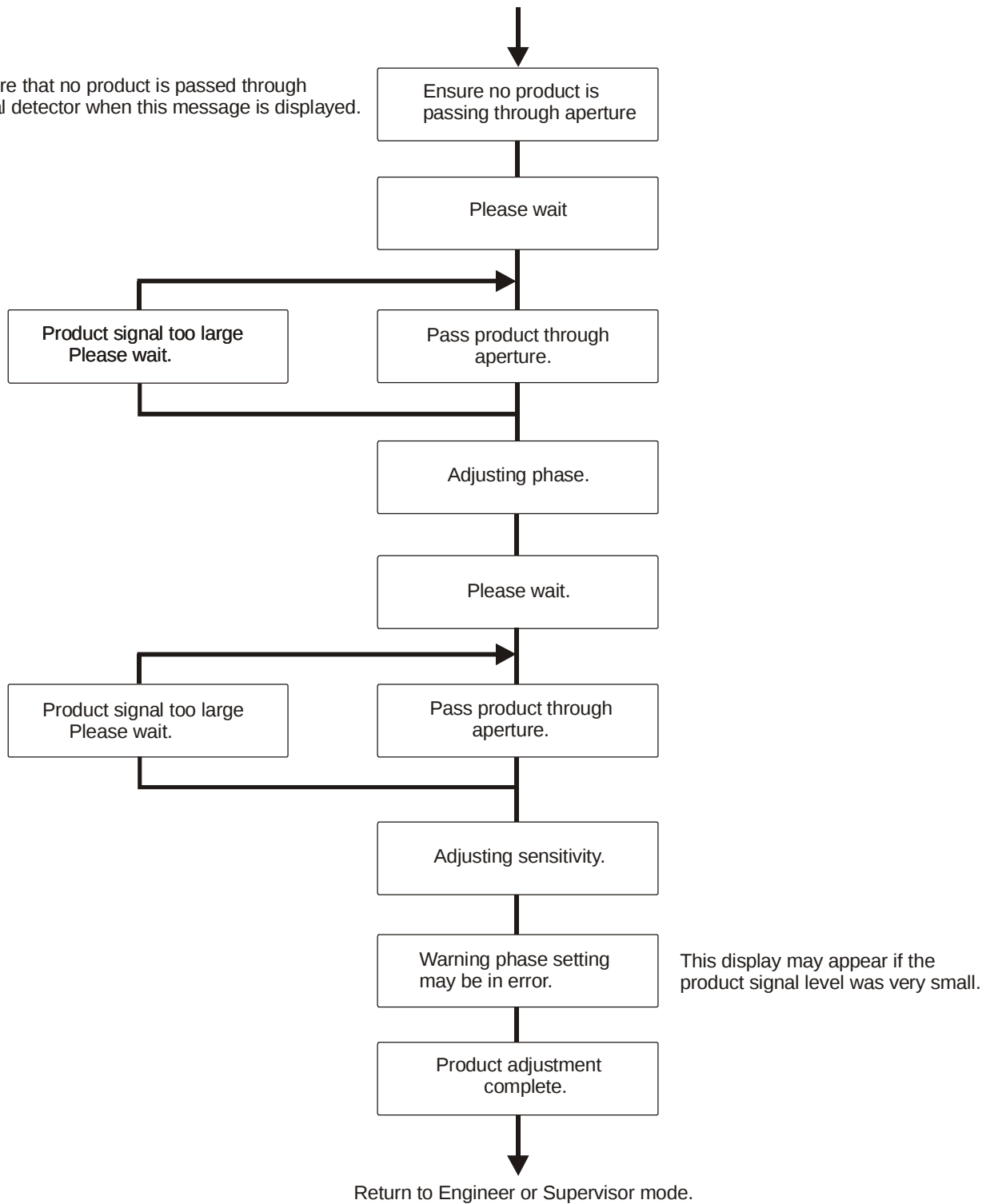


QA-OPERATOR MODE
FLOW CHART - VERSION 2.01 to 2.49



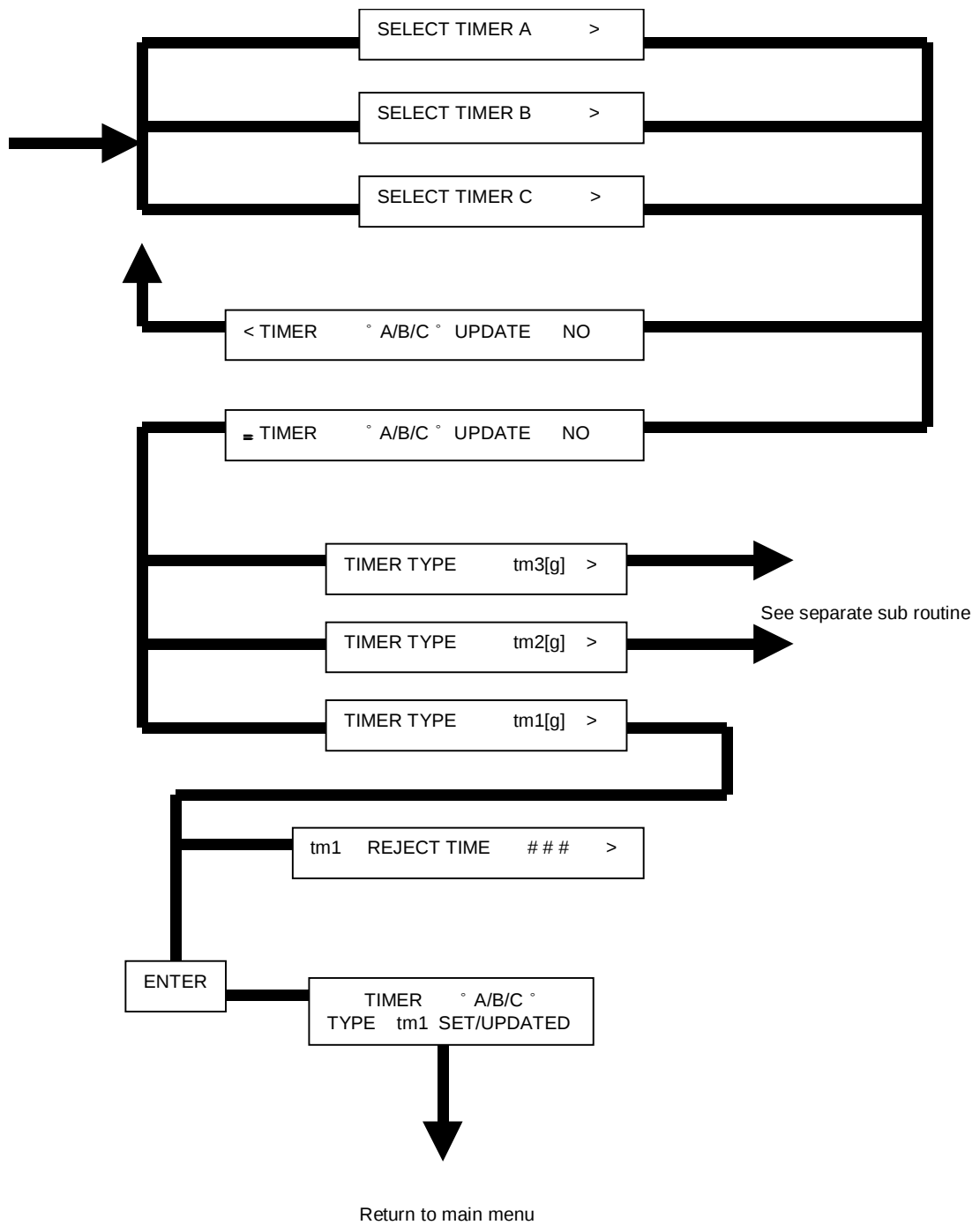
Entered from Engineer or Supervisor mode.

Make sure that no product is passed through the metal detector when this message is displayed.



PROG/EXIT Key will terminate the routine at any point.

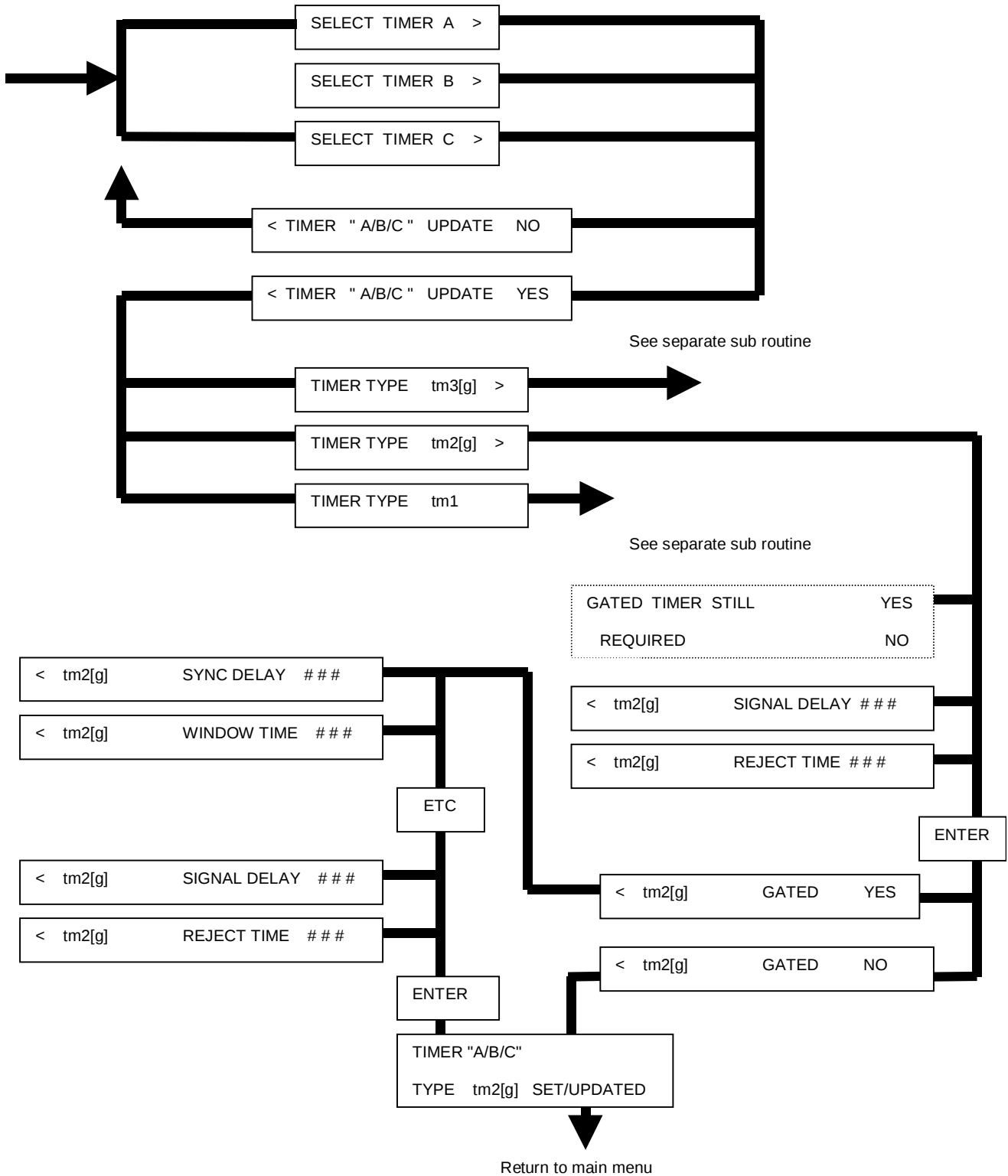
AUTO SETUP SUB -ROUTINE
FLOW CHART - VERSION 2.01 to 2.49



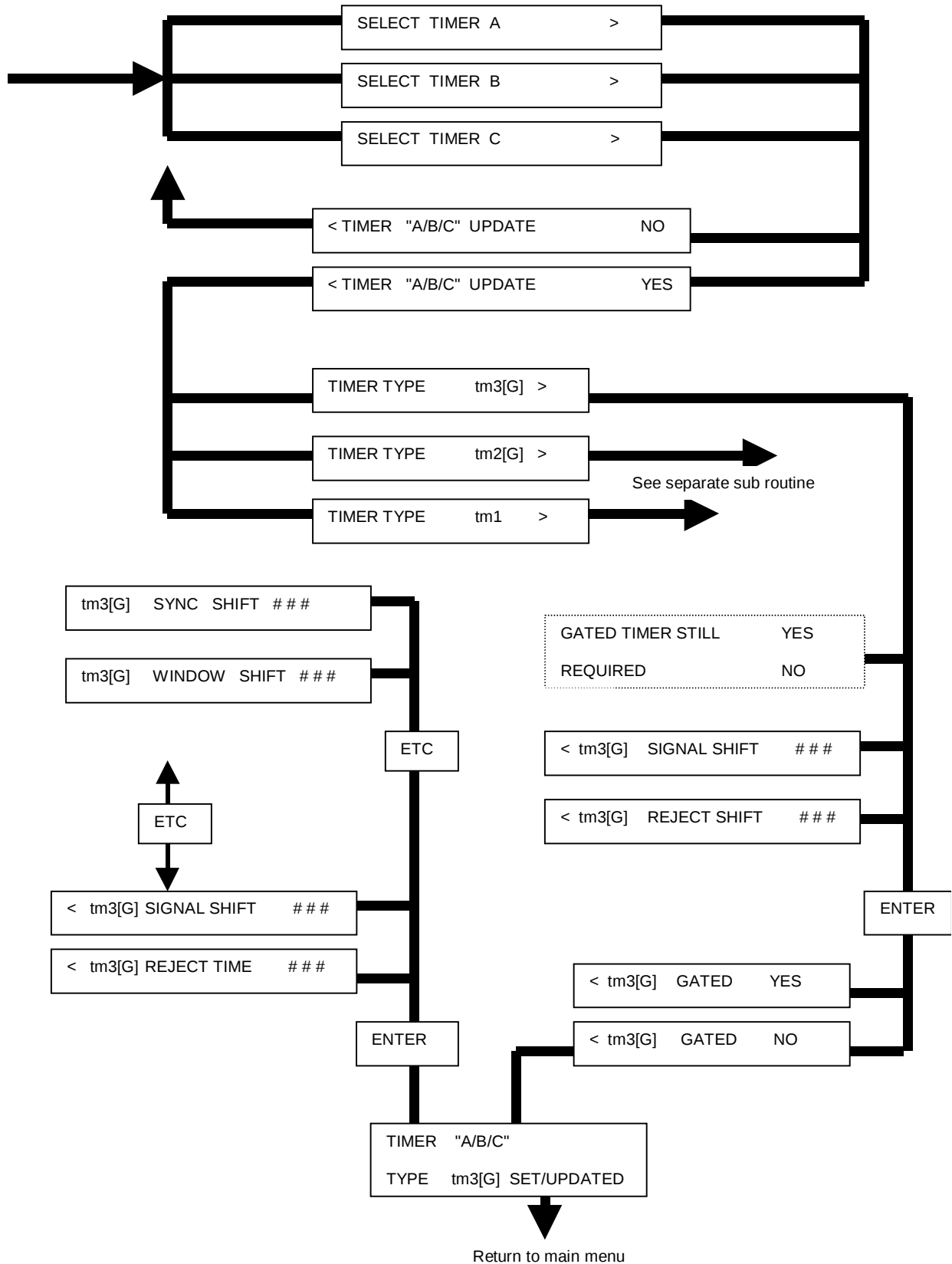
tm 1 TIMER SUB-ROUTINE
 Engineer Mode – Version 2.01 to 2.49

Tm2[G] TIMER SUB-ROUTINE

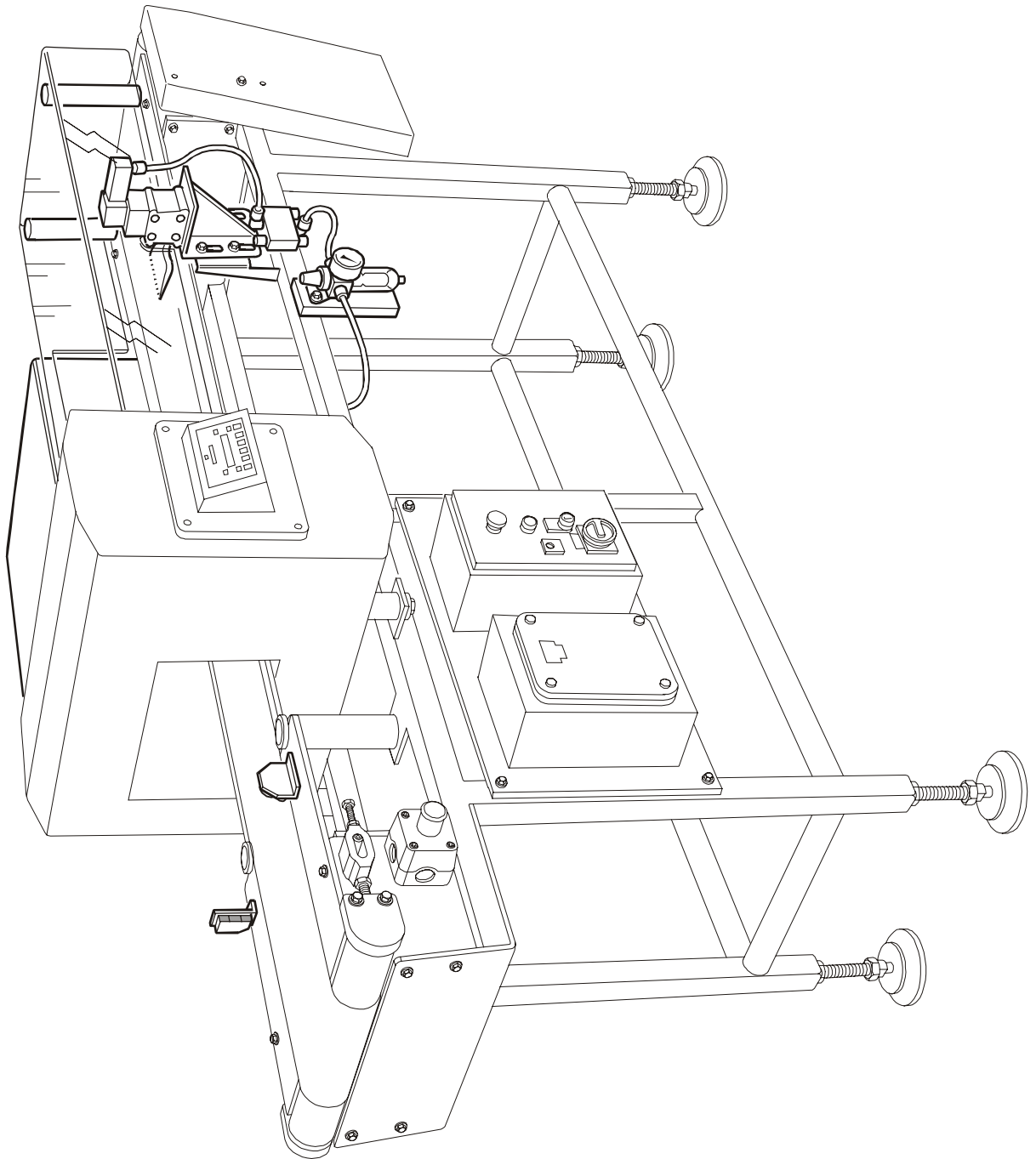
ENGINEER MODE – VERSION 2.01 to 2.49



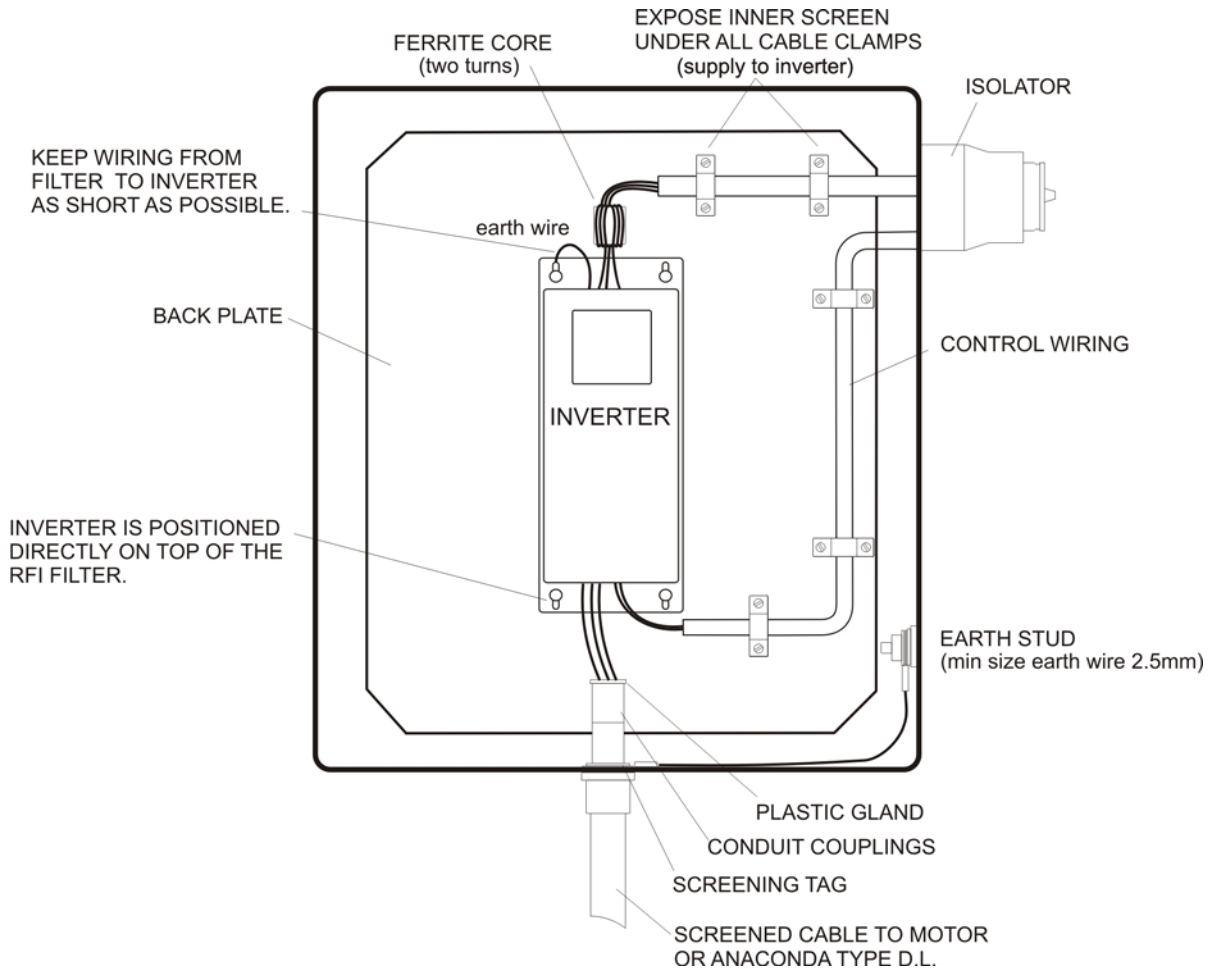
tm3[G] TIMER SUB-ROUTINE
ENGINEER MODE – VERSION 2.01 to 2.49



TYPICAL METAL DETECTOR CONVEYOR



RECOMMENDATIONS FOR THE USE OF INVERTERS



This is a typical layout of the inverter supplied by safeline.

Do 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.

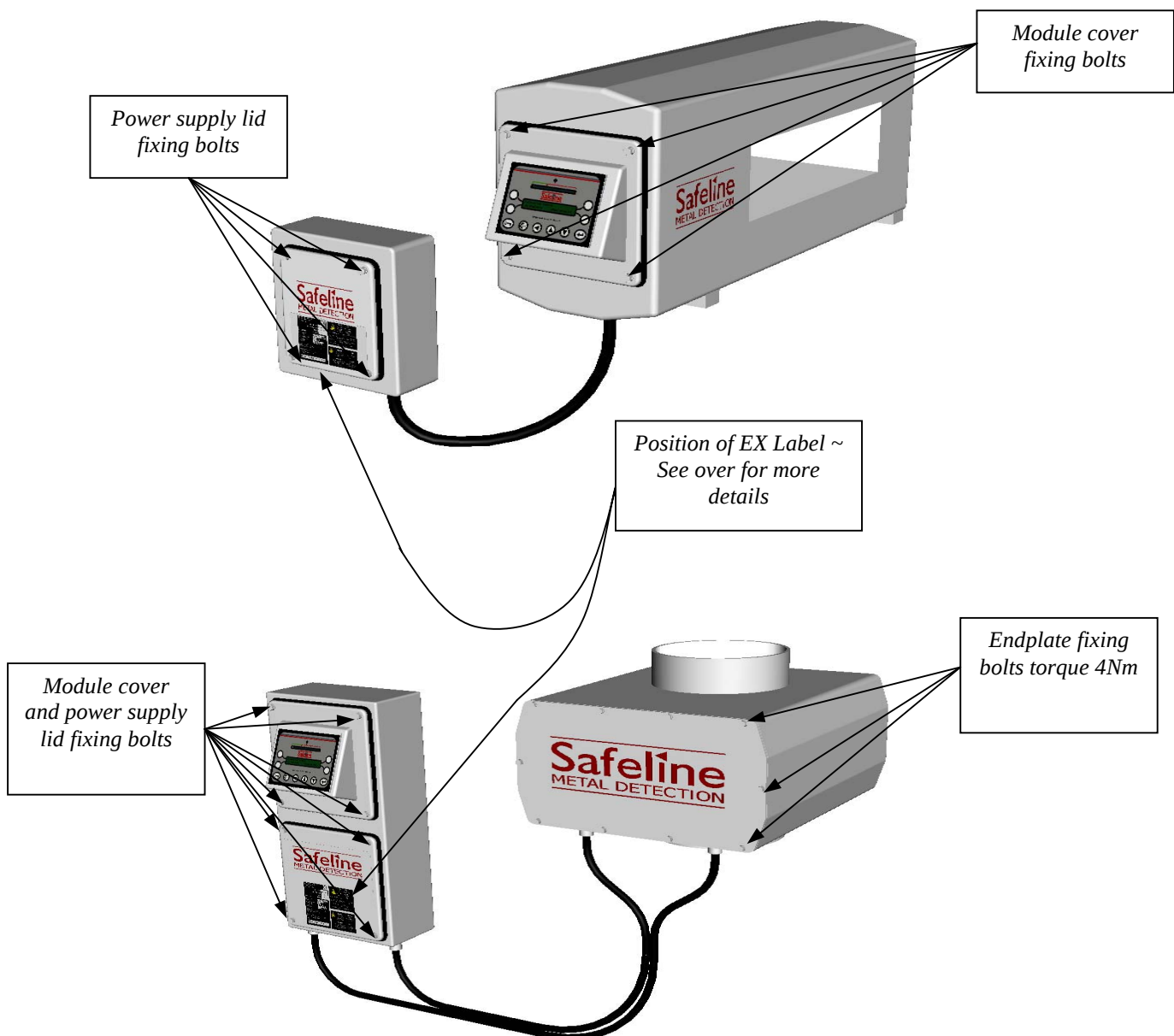
General counter measures.

1. Keep wiring inside control box as far away from inverter as possible.
2. Motor cables should be run separate from any other cables and as far from the metal detector as possible.
3. External screened cables should be grounded at suitable intervals where possible.
4. Remove insulation only where screening clamps are shown to provide good earth continuity at that point.
5. 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.
6. Use twisted shield cables for the detector connecting and the control signals.
7. Ground inverter, motor, etc. at one point.
8. 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, earth leakage relay to operate unnecessarily.
To prevent this. take appropriate measures, e.g. set the carrier frequency to a lower value, use earth leakage circuit breaker designed for suppression of harmonics and surges, and use the electronic overcurrent protection built in the inverter.

(Applicable only if ATEX option is ordered)

ATEX DIRECTIVE

- This product complies with the ATEX Category as stated on the ATEX system label shown below.
- A static hazard may exist – Do not clean non-metallic parts with a dry cloth.
- Ensure torque setting on fixings highlighted below conform to the values stated on page 5 “Technical Specification”.
- Do not open any electrical enclosures when 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 damage 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).



(Applicable only if ATEX option is ordered)

ATEX system label

Safeline METAL DETECTION		Montford St. Salford England					
System Identifier							
Year of Manufacture							
Model							
System Rating		IP Rating					
Voltage/Spannung/ Tension/Voltaje		100	110	120	220	230	240
Phase/Phase/Phase/ Fase		1Ø	3Ø				
Frequency/Frequenz Fréquence/Frecuencia		50	60	Hz			
Power/Leistung/ Puissance/Poder/		100	300	600	1K	3K	
		5K	10K	Watts (Max.)			
Max surface temp/ Maximale oberflächentemperatur/ Température maximum de surface/ Temp. superficial max.						79 °C	
Ambient temperature range/ Umgebungstemperaturbereich von/ Gamme de température ambiante/ Límites de temperatura						-10°C to +40°C	
0539 II 2 D c DEMKO 02ATEX134042							

ATEX Static warning label

	CAUTION Refer to manual for connection details	ACHTUNG Vor inbetriebnahme bedienanleitung beachten
	ATTENTION Voir le manuel avant tout cablage	CAUTION Le refiere a manuel por conecion detalla

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

Es gibt gegebenenfalls Probleme mit statischen Aufladungen - Bitte nicht-metallische Teile nicht mit trockenen Tüchern o.ä. reinigen

Un risque d'électricité statique peut exister - Ne pas nettoyer les parties non méalliques avec un chiffon sec

Pueden generarse cargas estáticas. No limpiar las partes no metálicas con un paño seco

ATEX Enclosure warning label

	Warning Do not open when energised or when an explosive dust atmosphere is present	Achtung Nicht öffnen bei eingeschalteter anlage oder in explosiver atmosphäre
	Precaucion No abrir bajo tensión eléctrica conectada, o cuando una atmosfera de polvo deflagrante esté presente	Attention Ne pas ouvrir sous tension ou en présence d'une atmosphère explosive