

FORTRESS PHANTOM[®]

Metal Detectors



GRAVITY METAL DETECTOR OPERATOR SETUP GUIDE

GUIDE-EN-GRAVITY Version 1.0

For more detailed information, please refer to the Reference CD.

Key Technologies

Core DSP
Unparalleled Precision

UltraSense
Ultra Sensitive Detection

AutoTest
Self Diagnostics Testing

AutoCal
System Set-Up in Seconds

Fortress PHANTOM Series Metal Detectors

Simple
Operation

Outstanding
Reliability

Exceptional
Performance

INTRODUCTION

Thank you for purchasing the PHANTOM Series Gravity Metal Detector from Fortress Technology.

At Fortress we're committed to offering the most practical, functional and user-friendly metal detection solutions. Built to customer specifications PHANTOM Gravity Metal Detectors are ideally suited for inline inspection of freefalling dry, powder or granular products.

This Operator Setup Guide is intended to get you up-and-running within minutes covering the basic setup procedure in addition to the most commonly used system features.

The supplementary Reference Manual (included on CD) provides further information on all available system functions and it includes additional wiring diagrams.

ADVANCED PHANTOM FEATURES

- Core DSP - high speed Digital Signal Processor technology provides the highest processing power
- UltraSense - detection of the smallest metal contaminants with the highest sensitivity levels
- AutoTest - automated system testing reduces the high costs associated with manual testing
- AutoCal - single pass product learning and automatic calibration allow for quick set-up
- Flash RAM - Flash Memory technology prevents information loss
- Modular Design - fewer product parts render improved power-efficiency within a compact housing
- Password Protection - flexible security protection for critical parameters prevents unauthorized use
- Multiple Product Storage - quick changeover between production line runs with retained settings
- Control Options - display terminal can be made portable or mounted remotely; one terminal can operate numerous detector units
- Automated Data Logging Option - CONTACT Software enables detector communication with a PC; Wireless Ethernet connection available

For more information including product brochures and regional contact information, please visit our website:

www.fortresstechnology.com

For technical support, please call our Service team or email:

service@fortresstechnology.com

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SAFETY & CAUTIONS

Compliance with Safety Standards

The product has been designed to operate safely in accordance with the current technical and safety regulations including the provisions of the Health and Safety at Work Act, relevant EU legislation and OSHA regulations.



While every precaution has been taken to ensure the operational safety of the system it is the responsibility of the owner and / or end-user to ensure that the installation, operation and maintenance of the system complies with the requirements of the local health and safety regulation legislations and codes of practice.

Installation, Commissioning and Operation



1. The metal detector must be installed, connected, operated and maintained according to the instructions stated in this manual and other operating instructions accompanying this manual.
2. The documentation must be read, understood and all safety instruction followed by persons who are involved in the installation and use of the equipment.
3. Persons supervising, performing maintenance or installation must be suitably qualified and competent. Operators, engineers and supervisors should be given opportunity to study and discuss this manual prior to working with the system.
4. It is the responsibility of the owner and / or end-user to ensure that the equipment is operating properly and continues to operate. Routine testing and maintenance is necessary.

Electromagnetic Radiation

This device is an intentional radiator, emitting a low power radio signal designed to operate in an industrial environment. The product complies with Part 15 of FCC Rules (USA) and relevant legislation under CE.

General Safety Guidelines



1. Always isolate the system from the electrical and air services before cleaning / maintenance.
2. Keep away from the operating area of the reject device while power / air supply is applied.
3. Keep hands clear of moving parts.
4. Do not tamper with, modify or attempt to override safety switches.
5. Equipment is heavy – use lifting devices according to the Handling instructions.

Do not open when an explosive dust atmosphere may be present.

System is HAZLOC approved – Class 2, Div1 and 2 available. ATEX available for EU.

Cleaning Guidelines

The metal detector requires routine cleaning for optimal performance. Determine whether the system purchased utilizes a Stainless Steel or Painted Aluminum construction. For IP69K rated Stainless Steel units the system can be cleaned using pressure wash-down, whereas Aluminum units should be cleaned by wipe-down using a damp cloth. Ensure General Safety Guidelines are followed during cleaning and verify that all conduit entries are plugged before washing the metal detector.

For application of specific cleaning products please refer to suppliers instructions and observe advice on safety data sheets. Disinfectants typically contain Chlorine and Ammonia, the use of Chlorine on 304/304L Stainless Steel can increase risk of corrosion.

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Chapter 1: Installation

1.1 Installation - Overview

The aim of this chapter is to outline the general fundamentals of Gravity Metal Detector system installation and present the key considerations that must be taken into account to ensure trouble-free operation.

For additional resources including board maps and wiring diagrams please refer to the Reference Manual (provided on CD).

1.2 Package Contents

Your Phantom Gravity Metal Detector kit includes the following:



Phantom Gravity
Metal Detector



Test Samples
(Cards, Rods, or Spheres)



Quick-Start
Operator Manual



CD with
Reference Manual



Mounting Kit
(3 isolators and 1 washer)

CHECK YOUR PACKAGE TO CONFIRM THAT YOU HAVE RECEIVED THE COMPLETE SYSTEM, INCLUDING ALL APPLICABLE COMPONENTS SHOWN ABOVE.

1.3 Installation Tools

The installation of your Phantom Gravity detector system will only require general tools - there are no special tools required.

1.4 Installation Location

The location of the metal detector is very important, the unit must be positioned on a solid surface / frame. The metal detector must be setup in an area free from radiated electromagnetic interference and must be connected to a power supply that is free from line (mains) borne interference.

Environmental Conditions

Temperature range: -5° C to +50° C (23° F to 122° F)

1.5 Handling

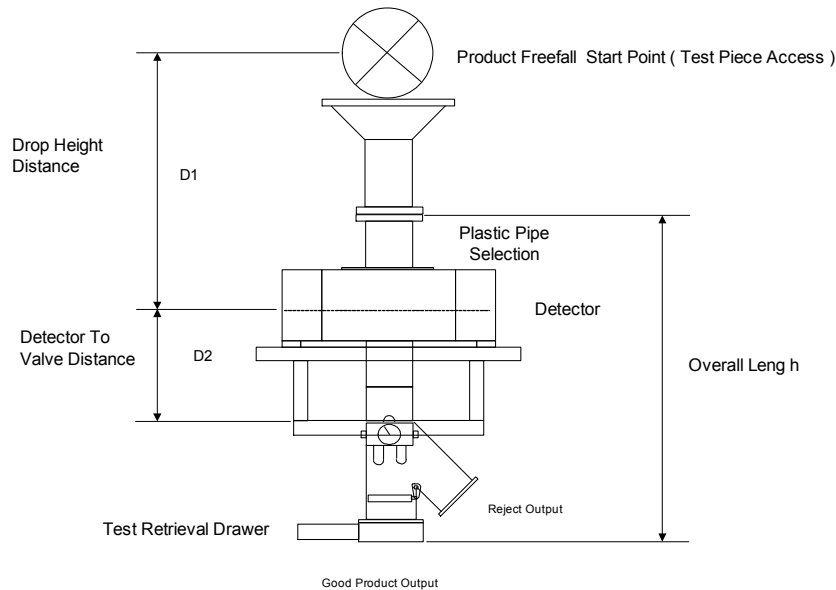
The Phantom system weight depends on application, the unit is designed to be robust and can be extremely heavy in some cases.

Where the unit has to be lifted it is strongly recommended that suitable lifting devices be used, keep the unit low to the ground in order to avoid a dangerous topple-over effect.

	WARNING! Do not use the aperture as a means of lifting the detector via forklift. Use appropriate weight capacity straps to support the unit if lifting by forklift and hook the straps securely underneath both sides of the mounting frame.
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1.6 Installation Essentials

Below are the important installation guidelines for successful Gravity application detector system results:



Note: the Gravity detector package comes in a variety of versions to suit customer application. The configuration depicted above represents a standard system setup.

1. Metal Free Area

No metal can be located in or near the detectors aperture (the opening through which product travels). The Metal Free zone required is equal to $1.5 \times$ the smaller dimension of the aperture. For large moving metal (such as rollers / covers) this zone should be at least $2 \times$ the smaller dimension.

2. Relationship of Freefall Distance and Valve Position

The maximum freefall distance is determined by the response time of the reject valve and the relative position of the reject valve. Greater freefall distance results in faster flowing product. In order to accommodate higher freefall distance, the Detector to Valve Distance (D2) must increase as the valve needs more time to reach full divert position.

Given factors such as drop height, flow rate and bulk density, Fortress Engineers can help ensure that the system is designed and constructed to suit the application.

More information on Gravity system Design Issues can be found in the Reference Manual. Contact Fortress Technology for assistance in calculating freefall height limitations of valve position.

3. Free Flowing Product

Product must be free-flowing in order for a Gravity system to work properly. Product cannot be allowed to backup or plug the valve or pipe area.

4. Pressure

There should not be any internal pressure to the pipe area. This will result in product leakage from the valve. Similarly, a vacuum presence in the pipe can affect valve operation. The pressure should not exceed the rated maximum specification for the plastic pipe and the divert valve.

5. Static

Static will be present in all applications where non-conductive materials are falling through air. Care should be taken to ground all metal components of the detector system (the valve, frame, pipe flanges, etc). Although the product pipe used already has an anti-static characteristic, use caution when touching the outside or inside of the plastic pipe section. Charges can exceed 50,000 volts and can be dangerous. Contact Fortress Technology for assistance in reducing or limiting static problems.

6. Piping

Do not load the reject valve by attaching pipe sections to either output port which may result in valve distortion and operation problems. All piping should be supported externally to avoid valve problems.

7. Maintenance

The valve and pipe section should be routinely inspected for excessive product build-up which may affect proper detection and rejection of contaminants.

8. Air Controls

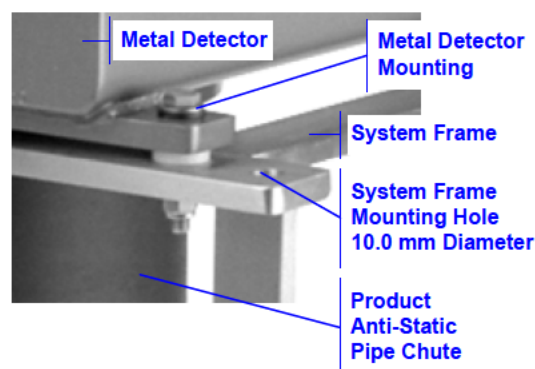
The air controls must be located close to the divert valve in order to maintain maximum response speed.

9. Foot Isolation

Mounting connections should be isolated electrically or firmly fixed with a thread lock. Loose mounting points can cause false rejections.

1.7 Mechanical Installation

The Gravity metal detector's framing typically has four 10.0 mm diameter mounting holes. Each one must be securely bolted and properly grounded to connecting frames, thus eliminating possible system vibration. Below is an illustration of one of the mounting points:



1.8 Air Service

The Gravity system comes with a pre-installed Filter Regulator Lubricator – air service unit. All pneumatic components such as the solenoid valve and cylinder actuator are connected and ready for use. A recommended air pressure of 60 PSI is required for proper operation of pneumatic components.

Note: air pressure dictates the response time of the reject mechanism.



1.9 Electrical Installation

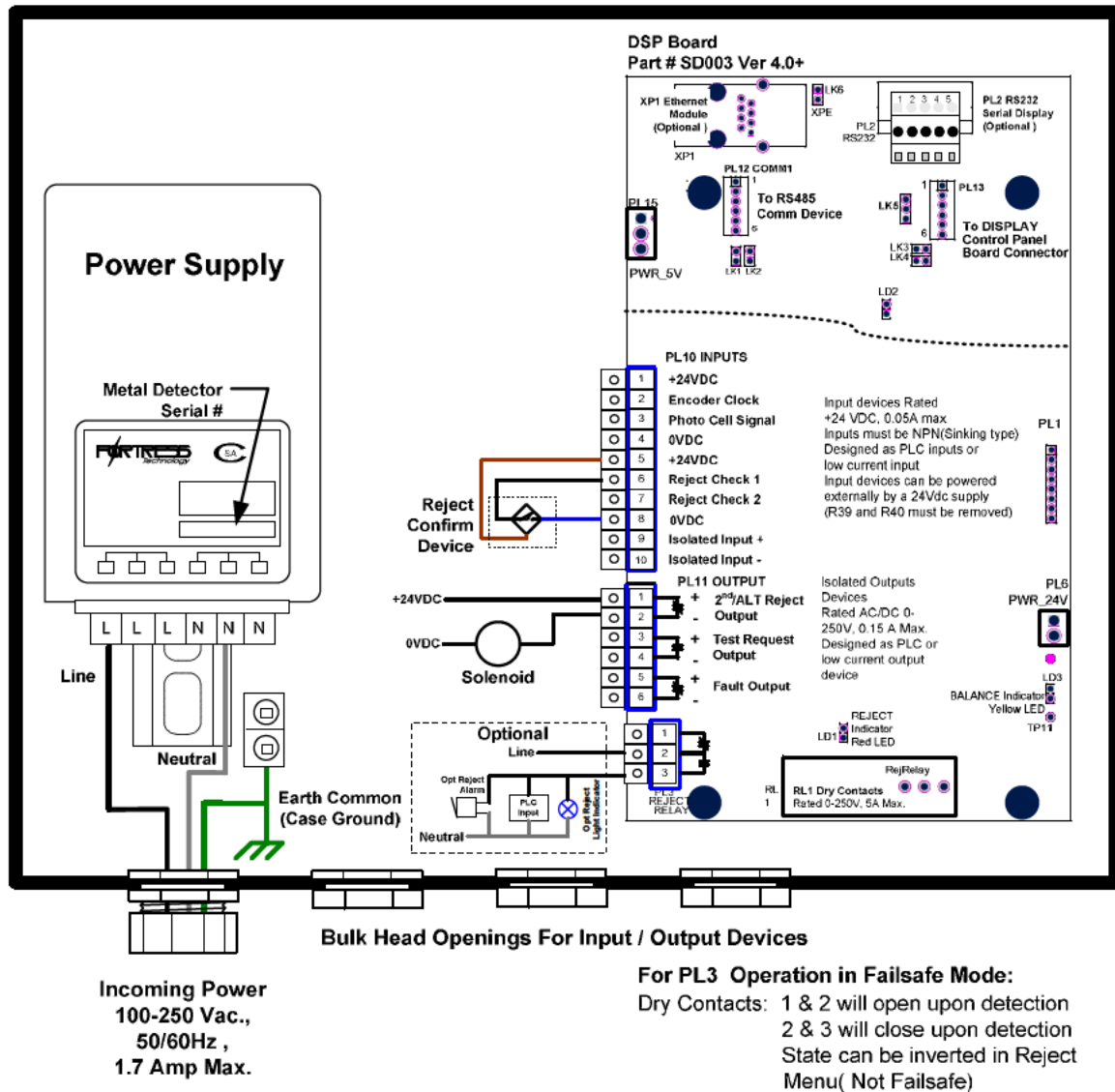
Power Supply

The metal detector power supply is incorporated within the systems electronic enclosure, the detector internal power supply is universal (working voltage 95-260V AC, 47-63Hz). The power cable should be wired to a suitable plug or device with a circuit protection of 3 amps.

	WARNING! Only a suitably qualified electrical technician should wire the Power supply mains cable.
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The following is a typical system installation diagram showing the connection of the Power Supply, Reject Device, and Reject Confirm. For a more detailed diagram, refer to Appendix #1.

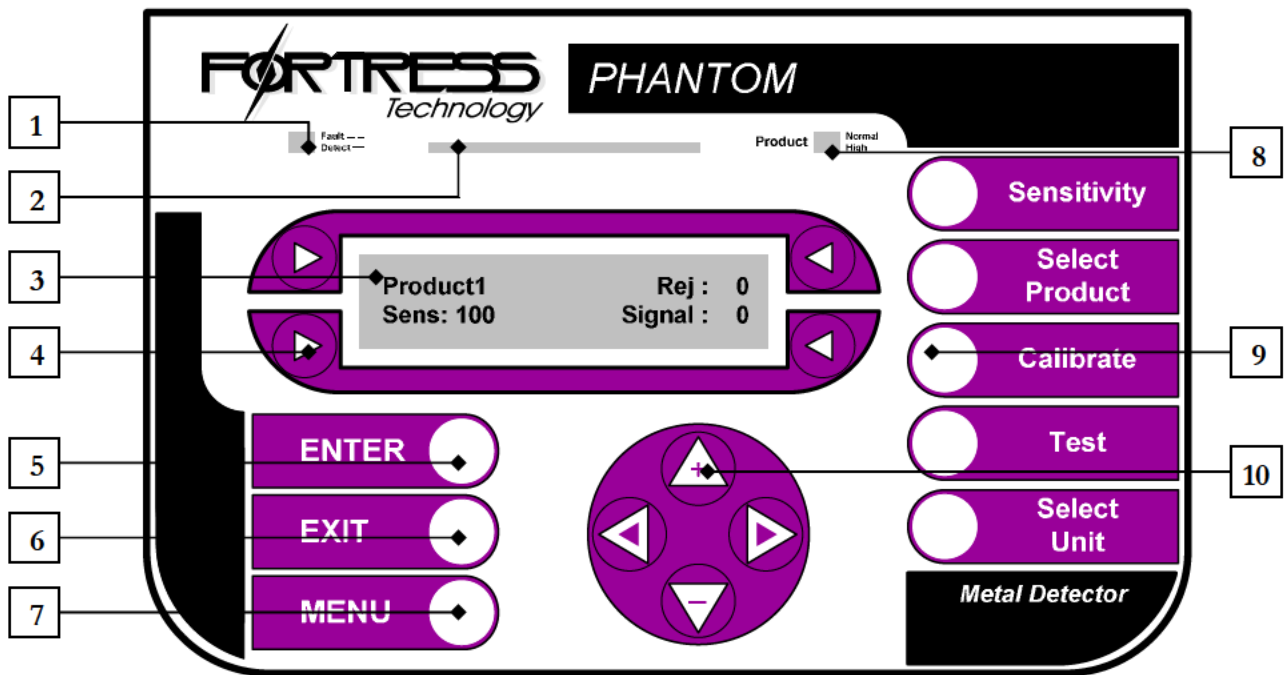
Typical Wiring Diagram



Chapter 2: Getting Oriented

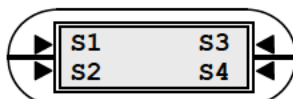
2.1 Phantom Interface - Introduction

Regardless of the detector model the same user-friendly Phantom control interface is utilized, the aim of this chapter is to become familiarized with the terminology and basic operation of the control panel.



The buttons, LED indicators, and display can be categorized as follows:

1. **Detect / Fault** – illuminates with a red LED upon Detection and flashes upon system Fault.
2. **LED Bar Graph** – center-reading meter contains a green and red zone to visually quantify the Signal of product, metal or background noise. The larger the signal the more significant the effect / contamination being detected.
3. **LCD Display** – digital screen shows system status and enables programming via menus.
4. **Soft Keys** – used to edit menu options, refer to Section 2.2 for further details.
5. **ENTER** – used to confirm changes to menu options.
6. **EXIT** – cancels any changes and returns to the previous menu.
7. **MENU** – navigates through submenus, refer to Section 2.3 for further details.
8. **PRODUCT** – indicates with a green LED whether a product is running through the detector, a red LED represents a High product effect reading.
9. **Hard Keys** – dedicated shortcut keys provide quick access to the most commonly used features, refer to Section 2.2 for further details.
10. **Arrow Keys** – used to navigate within menu options, and increase / decrease values when editing. Refer to Section 2.4 for further details.



2.2 Hard vs Soft Keys

The keypad has a series of 'Hard' and 'Soft' Keys which can be defined as follows:

Hard Keys:

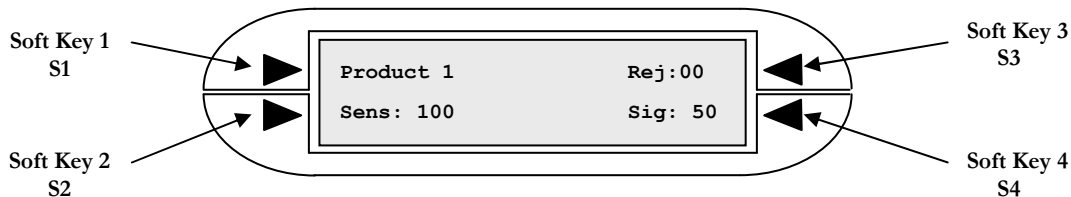
The Hard Keys perform the same function irrespective of where you are within the menu structure, these convenient "shortcut" keys (arranged on the right of the keypad) represent the most commonly used functions including: SENSITIVITY, SELECT PRODUCT, CALIBRATE, TEST, and SELECT UNIT.

Less common functions are accessed through the MENU key.

Soft Keys:

The Soft Keys change their function according to the menu display, these four keys arranged around the LCD display are used to edit the function being displayed on the LCD next to that soft key.

For example the display below shows the reject count displayed next to the top right soft key, to reset the reject counter simply press Soft Key 3 (S3).



Convention:

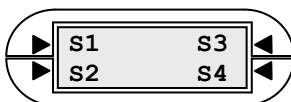
For the purposes of this manual the Soft Keys will be abbreviated as S1, S2, S3, and S4 as per the above illustration (also found in the page footer below).

2.3 Menu Navigation

To move from one menu screen to the next, simply press the MENU key, alternatively, while no entry field is being edited (i.e. no flashing cursor is visible) the DOWN arrow key can be pressed to move to the next menu screen and the UP arrow key to navigate backwards.

2.4 Editing Menu Options

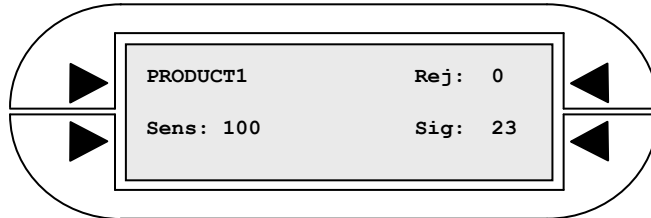
General Rules: After pressing the soft key associated with an option field, a flashing cursor will appear. To cycle through or edit the value of the option press the same soft key again or use the UP and DOWN arrow keys located in the circle keypad. The LEFT and RIGHT arrows are used to move the cursor across the entry field. To accept the new selection press the ENTER key; to cancel the new selection and revert to the old one press the EXIT key.



Note: for a few submenu options (such as Polarity) pressing the associated soft key will actually change the setting without the need to confirm via the ENTER button, however this is not the typical process.

2.5 Main Menu

Upon powering up your Phantom metal detector, you will see the following Main Menu:



The four menu items can be defined as follows:

PRODUCT1: the default Product Name.

This field shows the name of the currently selected product, multiple products can be entered into the system, product information can be edited and products can be deleted via the Select Product Menu (see sections 4.3 - 4.5 for more information).

REJ: the Reject Count.

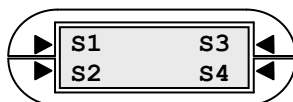
The Reject Count increments with every reject occurrence (a Signal reading of over 100), press S3 to reset the Reject Count.

SENS: Sensitivity numerical setting. – *see Section 3.6 for more information.*

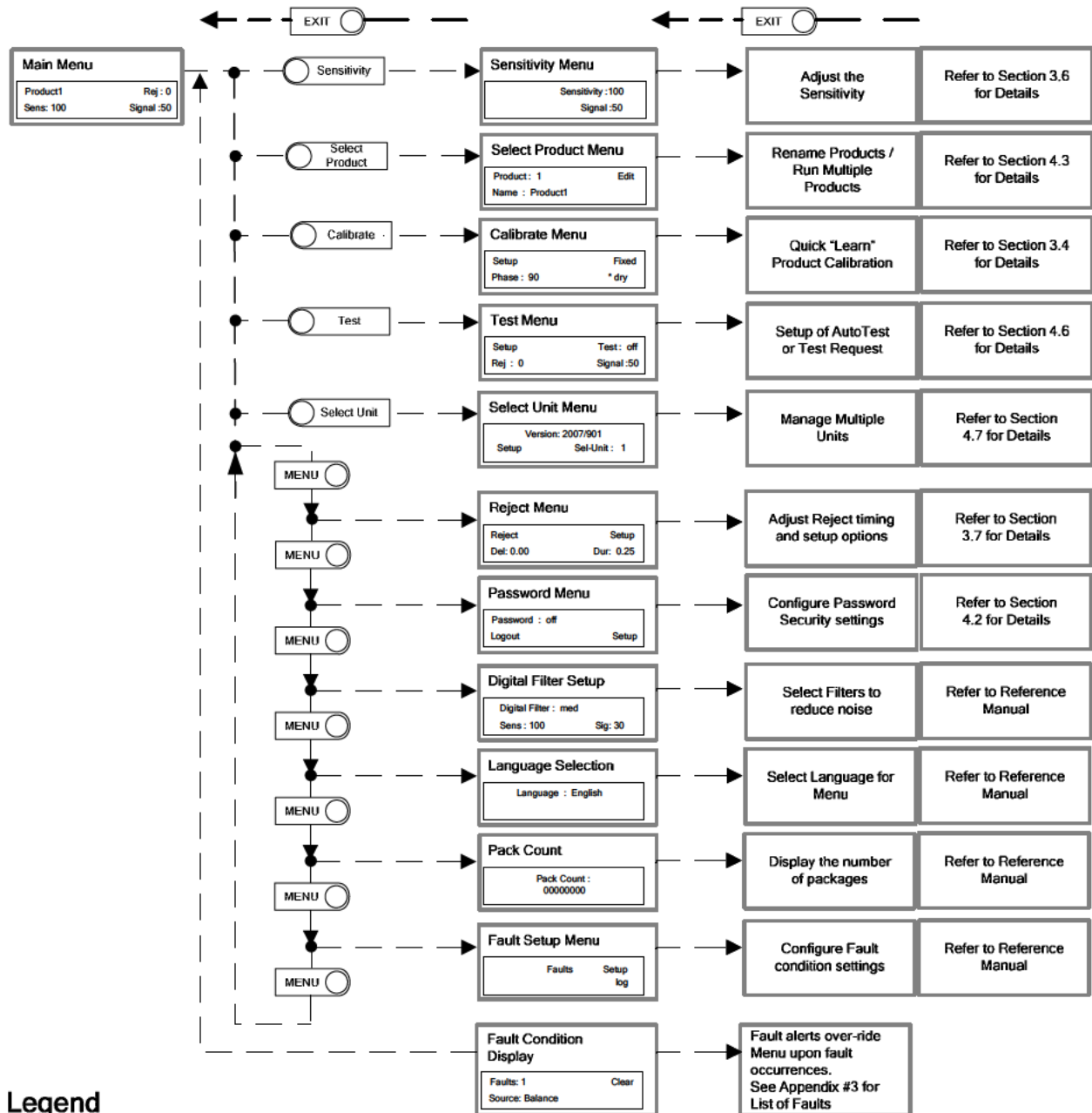
The sensitivity number ranges from 0 to 999 and determines the size of metal that can be detected, smaller pieces of metal can be detected with a higher sensitivity setting. Typically, the sensitivity is optimized between 30 and 200. Press S2 to change the sensitivity or press the SENSITIVITY hard key to access the Sensitivity Menu.

SIG: Signal reading. . – *see Section 3.3 for more information.*

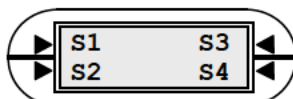
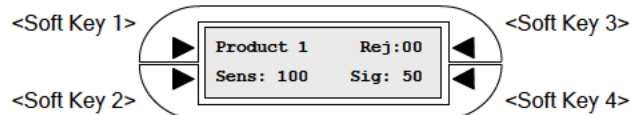
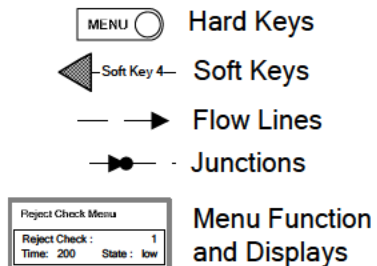
The signal number displayed represents the relative size of the detection signal, to become a detection a signal must exceed 100. The signal number can be reset by pressing S4.



2.6 Menu Flowchart



Legend



Chapter 3: Quick Setup Tutorial

3.1 Start Up Tests - Overview

With the detector assembled and installed it is now ready for action, the aim of this chapter is to outline the initial tests that must be carried out before introducing the Phantom detector into production. These preliminary tests ensure system functionality and configure the Phantom detector for usage with your unique product.

☺ This simple set-up procedure only takes minutes to complete!

	INFO: It is strongly recommended that you complete an entire setup of one product before introducing additional products.
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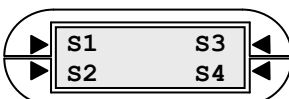
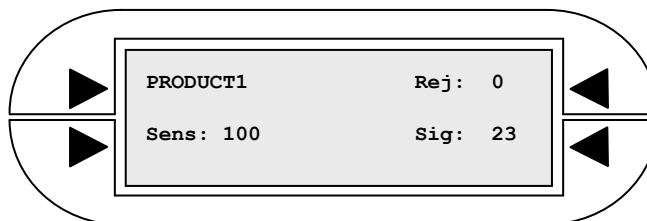
3.2 Power Up Sequence

Upon applying power to the detector the unit will Power Up and go through the following start-up process:

1. The LED bar graph will go full scale left and right and then return to the normal operating mode of the centre LED in the Green Zone.
2. The display will indicate the default menu window.
3. The reject device may operate and then return to the normal operating position depending on the settings of your system.

	WARNING! Keep away from the operating area of the reject device upon powering up the unit.
---	---

The power up sequence will take approximately 5 seconds and once complete the detector will be ready for the initial tests, at this stage you will see the Main Menu screen as depicted below.



3.3 Test #1: Initial Signal Check

Before moving forward it is important to ensure that the detector has a quiet and stable starting point. After the Power Up Sequence is complete the LED bar graph should appear settled in the centre position.

The detector will always pick up a small signal reading from its surrounding environment, however in the absence of product passing through the aperture the Signal should not show a value higher than 30.

	INFO: The Signal reading will display the highest detection value registered and maintain this value on screen until another detection occurs or until the Signal is reset manually.
---	--

To test the initial signal follow these steps:

1. Make sure that the area is clean, verify that no metal is located near or within the aperture;
2. Turn ON the surrounding machines for a simulation of the true operating environment;
3. Reset the Signal by pressing S4;
4. Check to see if the detector is in a stable position with no detections falsely triggering and a steady Signal under 30.

If the starting point Signal is under 30 you're ok to proceed.

If the detector is showing a Signal of over 30 without any product running it is advised that you stop and examine the cause before proceeding further. Refer to the Troubleshooting Guide (FAQ's) for possible causes and corrective solutions.

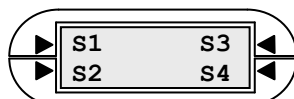
3.4 Test #2: Product Calibration

Every product has unique characteristics, the purpose of Product Calibration is to “teach” the metal detector these product attributes known as “**Product Effect**”. The detector then “learns” the product in order to ignore or “**Phase Out**” the inherent product effect at a particular “Phase Point” and “Mode” (wet or dry).



Quick Tutorial: Product Effect

Metal detectors detect metal based on measuring electrical conductivity and magnetic permeability. Many products inspected inherently have one or both of these characteristics within their makeup, for example, any product that is iron enriched, such as cereals, create a large magnetic signal which the detector must compensate for in order to detect small pieces of metal. Products with high moisture such as bread, meat, and cheese are electrically conductive and produce a large conductive signal – these are referred to as “wet” products. During a fast learn process the Phantom detector automatically sets its phase point to ignore the product effect signal, the following table shows typical product effect signals and categorizes them as wet or dry.



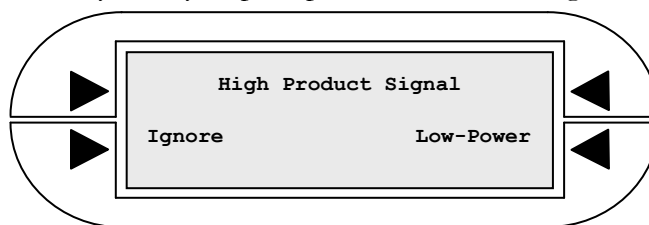
Typical 'Wet' Products	Typical 'Dry' Products
<u>Food</u> : Meat, Cheese, Bread & Bakery Products, Fish, Dairy Products, Salads <u>Packaging</u> : Metallic Films <u>Other</u> : Plastic and Rubber products with high carbon black content	<u>Food</u> : Cereal, Crackers, Cookies, Frozen Food Products (< 20°F, -7°C), Peanut Butter and Margarine (Vegetable oil is not conductive) <u>Other</u> : Wood Products, Plastics and Rubber (Products with high carbon black content may be considered 'wet'), Textiles, Paper Products

The detector will be set with factory settings which may not necessarily match those needed to run your product (although Fortress strives to preset the detector settings to meet the product application).

Note: in most Gravity applications the product is Dry and/or will have little or no Product Effect. It may not be necessary to perform a Calibration procedure.

To determine if factory settings correspond to your product application try the following:

1. Reset the Signal by pressing S4;
2. Pass a typical product through the detector aperture while checking the Signal reading and Product LED illumination;
3. If the detector does not "see" the product (Signal below 60) then the product effect may not affect detection, or the factory settings already match the product. Normally the Product LED will appear Green upon passing the product through however, sometimes it may not illuminate at all due to minimal product effect. In either event you are OK to proceed to the next subsection of Quick Product Calibration;
4. If the product generates a detection signal you are likely to have a product effect that needs to be phased out and should proceed with the Quick Product Calibration procedure provided that the Product LED is not Red;
5. If the Product LED is Red you may be prompted with the following screen:



A red Product LED indicates that product effect is excessive which may result in an erroneous Phase number when calibrating. The software will provide you with the option to switch to "Low Power" or "Ignore". Switching to "Low Power" will lower signal strength to account for the high product effect. Press soft key (S4) to automatically switch to Low-Power mode. You may then proceed with the next step of Calibration.

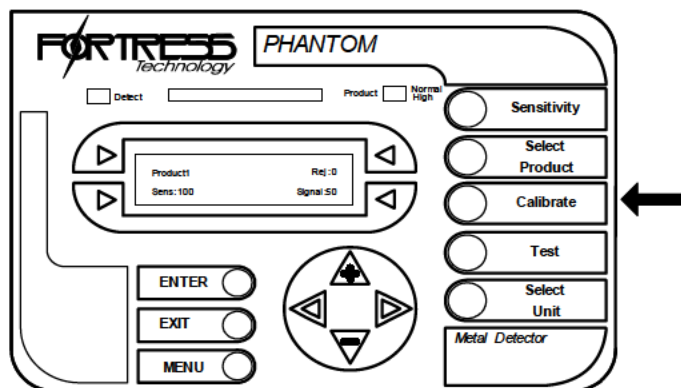
However, if your system was already preset to "Low-Power" mode, lowering the power is not an option. You will need to call Fortress Technology to troubleshoot.



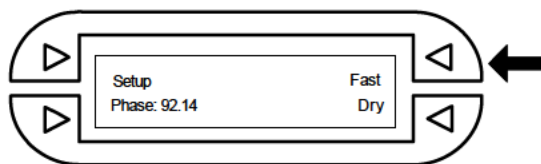
Quick Product Calibration Procedure:

To “learn” a new product or re-calibrate at any time simply press the Calibrate key **twice** and let good product pass through the detector, the detector will automatically learn the correct phase number of the product and determine whether it is Wet or Dry. Below is a step-by-step breakdown:

1. Press the CALIBRATE hard key on the right side of the Phantom control panel;



2. Press the CALIBRATE hard key again and the display will show a “fast” learn mode;



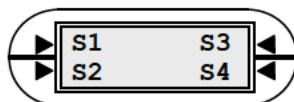
3. Run a typical product through the detector at normal speed and orientation;
4. The menu display will change “Fast” to “Fixed” and the Phase number should change to a new value;
5. The detector is now setup for the product.

Confirm Proper Product Calibration:

To ensure that Calibration was successful try the following:

1. Return to the Main Menu by pressing the EXIT key;
2. Press S4 to reset signal;
3. Pass a typical product through detector;
4. If “Calibrated” correctly the signal should be under ‘60’ (20-30 typical).

Note: the Sensitivity may need to be adjusted in order to reduce the effect of difficult product. Please refer to section 3.6 for more information.



3.5 Test #3: Establish Sample Detection

Now that the detector is set and calibrated for the product to be run, a manual test is highly recommended (to see how well the system is working). The detector's response in the event of metal contamination can be simulated using the supplied Test Spheres. The testing procedure is intended to confirm the detector's performance as well as the operation of the Reject device thus ensuring that contaminated product will be correctly handled.

Testing a Gravity system can be very difficult if testing access and recovery are not designed into the system. However, testing is a simple process when using a convenient access port for introducing the sample plus a safety catch gate for retrieving the sample.

Test Access Point

It is imperative that the test sample be inserted as close as possible to the point where the product begins its freefall. An access point to introduce a test sample (plastic ball with metal sample imbedded) must be provided upstream of the detector system. The entry point can be a threaded pipe or a miniature retractable gate situated above the anti-static pipe of the detector with a diameter of over 1" to accommodate the size of the sphere. The test port location should allow the sample to travel at normal speed through the detector.

Test Sample Safety Retrieval Gate

A safety catch gate should be inserted into the normal product flow after the valve. It is typically used on the "good product" output so that the test sample can be safely recovered if the detector fails to detect the sample, or the valve fails to react properly. It is also recommended that a similar catch gate be used on the reject output to ease the recovery of the test sample when it is rejected. Test gates can be quickly inserted into the product flow during a test, and removed from the flow afterwards.



Test Ball Retrieval Drawer allows for ease of manual testing

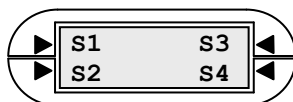
Testing Procedure:

For the next steps you'll need to utilize the Test Spheres included with your Gravity metal detector, follow these steps to test the detector and reject device:

1. Drop the Test Sphere through the detector via the Test Access Port;
2. Check to see if the Signal reading exceeds 100 indicating a correct detection;
3. Monitor the operation and accuracy of the Reject valve in removing the contaminated product from the production flow. For more information on Reject adjustment refer to section 3.7

Note: the Sensitivity will need to be adjusted given the following Signal reading scenarios.

1. If the Signal shows a very high result (over 1000) it's advisable to lower the Sensitivity;



2. In the unlikely event of the detector not detecting the test sample try increasing the Sensitivity to the point where background Signal for good product is approximately 60.

For more information on utilizing the Sensitivity setting refer to the next section.

3.6 Test #4: Set Sensitivity Level

The detector's sensitivity level determines the size of metal that can be detected, smaller fragments of metal are detectable at higher sensitivity levels. However, the trade-off is that higher sensitivity levels also make the metal detector more susceptible to outside interference and product effect.

The goal is to optimize the Sensitivity so that it is maximized at a safe level without compromising overall system performance.

The factory default for Sensitivity is 100.

The Sensitivity number value can range from 0 ~ 999.

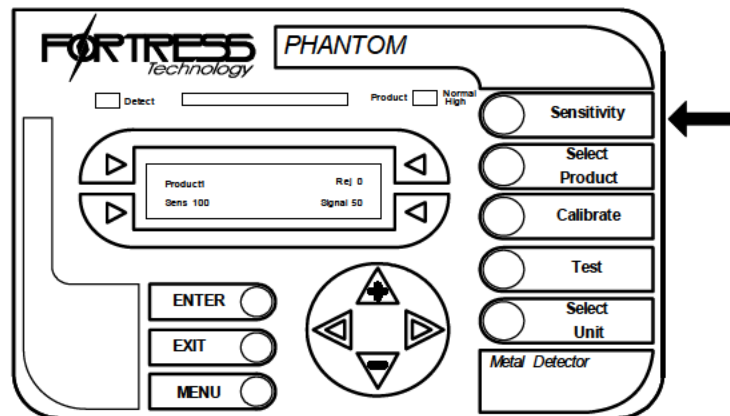
The typical Sensitivity setting used ranges between 30 ~ 200.

General Rule: Sensitivity may be increased as long as Signal from product is under "60".

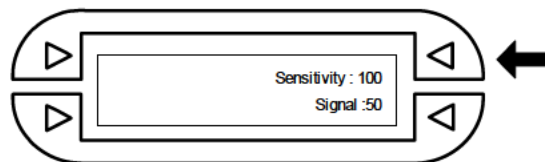
Sensitivity Adjustment Procedure:

To adjust the Sensitivity follow these steps:

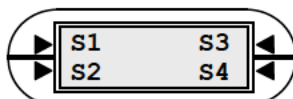
1. Press the SENSITIVITY hard key on the right side of the Phantom control panel;



2. Press S3 and a flashing cursor will appear;



3. Press the UP / DOWN arrow keys (+/-) to increase or decrease the Sensitivity, the LEFT / RIGHT arrow keys can be used to scroll the cursor between digits.



4. Press ENTER to confirm.

Confirm Sensitivity Level

To ensure that a proper Sensitivity level was successfully applied try the following:

1. Return to the Main Menu by pressing the EXIT key;
2. Press S4 to reset Signal;
3. Pass a typical product through detector;
4. Check the Signal reading, if it's below 60 you may increase the Sensitivity further (a Signal between 40 ~ 60 is acceptable). If the Signal reading is above 60 then you should try lowering the Sensitivity.

3.7 Test #5: Reject Adjustment

If you're finding that the reject device is not successfully removing the test samples from the production line in the testing scenarios described, an adjustment to the Reject Delay and / or Duration is required.

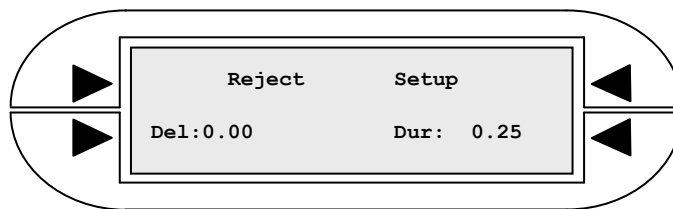
Reject Delay is the number of seconds from the moment of detection before the reject device activates.
Reject Duration is the number of seconds that the reject device will be activated for.

Note: in most Gravity applications the Delay should be set to zero to ensure a fast reject response time.

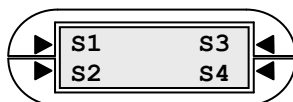
Reject Adjustment Procedure:

Follow these steps in order to correct the reject accuracy:

1. From the Main Menu press the MENU key once to navigate to the Reject Menu;



2. Press S2 to adjust the Reject Delay time. Increase/decrease the value using the arrow keys followed by ENTER to confirm the adjustment;
3. Press S4 to adjust the Reject Duration time, Increase/decrease the value using the Arrow keys followed by ENTER to confirm the adjustment;
4. Press EXIT to return to the Main Menu;
5. Run the Test Procedure again to ensure that you get the right reject timing.



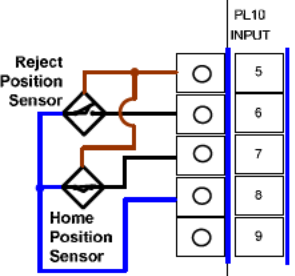
3.8 Reject Confirm Option

The Phantom metal detector will record a Reject when the Signal reading exceeds 100 but without Reject Confirm it can't determine whether the reject device actually functioned. The Reject Confirm option provides a means of verifying that the reject device worked properly.

By connecting a position sensor on the reject mechanism the full movement of the reject can be accurately confirmed. Examples of sensors used include a reed sensor, inductive sensor or proximity switch.

The Phantom detector allows for up to two reject confirmation inputs to be monitored – normally one at the reject position and the other one at the home position. Refer to the wiring diagram below for setup instructions:

Setup and Wiring for Reject Confirmation

Terminal Wiring	Location of sensor	Settings (Normal Operation)
 PL10 INPUTS 5 +24VDC (Common +) 6 Reject Check 1 7 Reject Check 2 8 0VDC (Common -) 9 Isolated Input +	Reject Position	Reject Polarity: Failsafe Reject Check : 1 R1 Polarity : Low
	Both Positions (Home position and Reject Position/Bin Full)	Reject Polarity: Failsafe Reject Check : 2 R1 Polarity : Low R2 Polarity : Low Note: Reject Check 2 can also function as the reject bin full sensor.

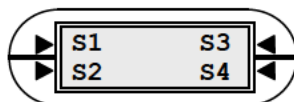
Upon reject, any failure in the movement of the reject mechanism will be identified by the sensor and it will trigger a fault. There are two faults related to the reject confirmation option which include:

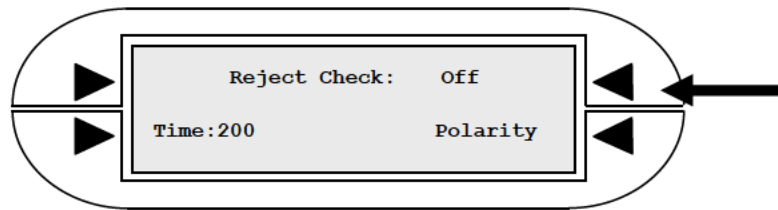
1. Reject Check Fault – occurs when the reject mechanism cannot / didn't move from the home position to the reject position within a specified amount of time, or when product was not seen entering the reject bin;
2. Reject Position Fault – occurs when the system could not confirm if the reject mechanism returned to the home position, this error may also be caused by incorrect polarity settings in the software.

Configuring the Reject Confirmation System

To enable the Reject Confirmation option in the software follow these steps:

1. From the Main Menu press the MENU key once to navigate to the Reject Menu;
2. Press S3 to enter Reject Setup;
3. Press the MENU key three times to arrive at the Reject Check menu;
4. Press S3 to select how many reject confirmation sensors are being used (options are: 1 sensor / 2 sensors / Off - meaning no sensors);



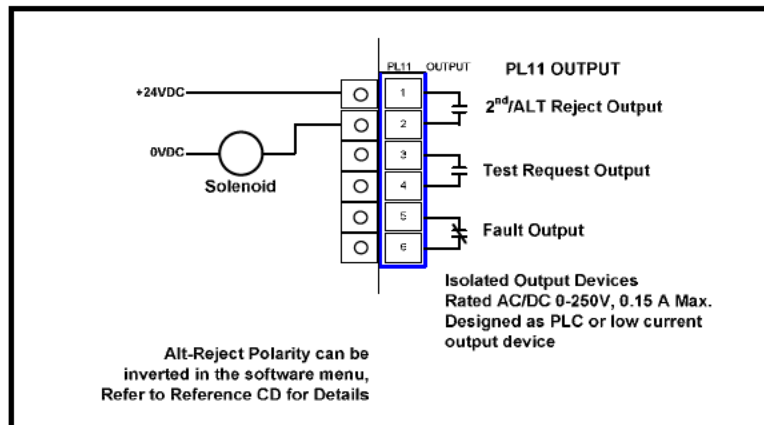


5. Press S2 to select and edit the reject confirmation time (measured using an internal clock which has 231 pulses per second). The number represents the amount of time it takes for the reject device to extend and retract, exceeding this threshold will result in a fault;
6. Press S4 to enter the Reject Confirmation Device Polarity Menu where you can toggle the polarity of the reject confirm sensors.

3.9 Alternate Reject Option

The Alternate Reject option allows you to connect a second reject device with separate reject timing settings. When configured the secondary ALT Reject output of PL11 will function independently of the main PL3 reject relay, refer to the wiring diagram below for setup instructions:

Typical Wiring Diagram



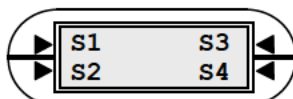
For typical Gravity systems, the optically isolated Alternate Reject Output is used to activate a 24VDC solenoid valve. It is defaulted to have the same reject timing as the main PL3 reject relay, however, it can also be configured to function independently.

Setting the "Alt-Reject" Delay or Duration to a number greater than the default setting of zero will automatically enable the Alternate Reject timing as an independent reject output. This option for example, will enable a secondary reject device connected to PL3 such as a Reject Alarm or a Beacon Light to be activated for a longer period of time than the solenoid valve.

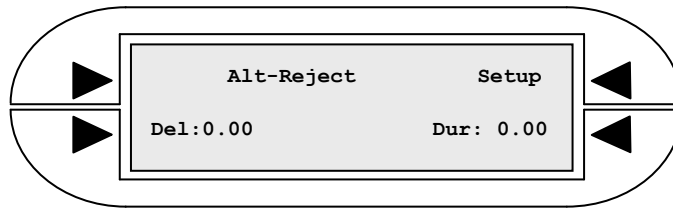
Configuring the Alternate Reject:

To enable the Alternate Reject option in the software, follow these steps:

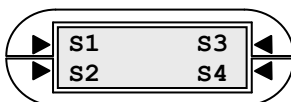
1. From the Main Menu, press the MENU key once to navigate to the Reject Menu;
2. Press S3 to enter Reject Setup;



3. Press the UP arrow key to find the Alternate Reject Menu;



4. Once you adjust either the Delay or Duration to a number above the default setting of zero, the system will automatically enable the Alternate Reject as an independent reject output.



Chapter 4: Auxiliary Functions

4.1 Auxiliary Functions - Overview

Now that your Phantom metal detector has been calibrated and tested successfully you're ready to integrate the system into production. The aim of this chapter is to highlight and explain the features most commonly used in day-to-day operation, the functionality of these features is further elaborated upon in the Reference Manual along with other features that aren't covered in this guide.

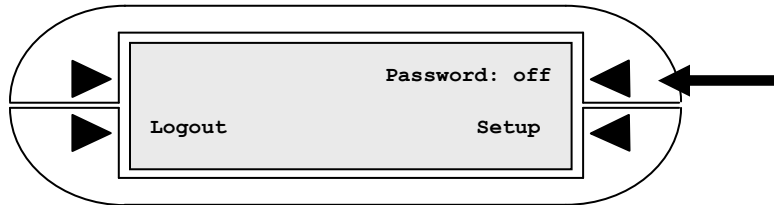
4.2 Password Security

Password protection prevents an unauthorized user from tampering with the metal detector, the Phantom allows you to configure password protection selectively allowing operator access only to a select number of functions.

Activating Password Protection:

To enable or disable password security and create a new password, follow these steps:

1. From the Main Menu press the MENU key twice to access the Password menu;
2. To turn Password protection ON/OFF press S3;

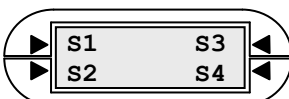


3. A flashing cursor will appear - press S3 again to toggle between ON/OFF followed by ENTER to confirm.

When password protection is ON you will be prompted for the password upon any key press and the display shown below will appear.



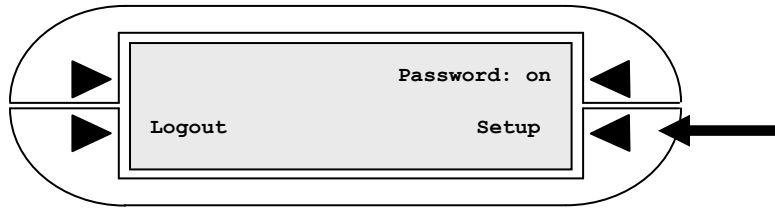
	INFO: The Default Password is "AAAA"
---	--



Change Password:

To Change your Password follow these steps:

1. From the Password menu press S4 to enter the Password Setup;



2. Press one of the lower soft keys (S2 or S4) to modify the password, a password can be made up of any four alphabetical, numerical or underscore (_) characters;
3. Press the UP / DOWN arrow keys (+/-) to change each character, the LEFT / RIGHT arrow keys are used to scroll the cursor between characters;
4. Press ENTER to confirm the new password and EXIT to return to the password menu.

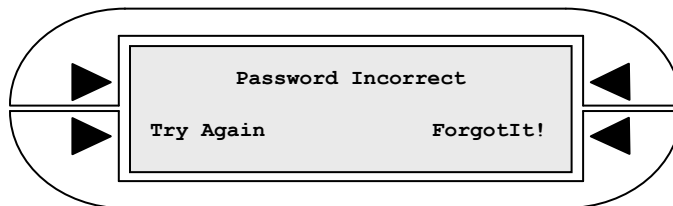
	INFO: Record the new password in a safe place.
---	---

Logout:

The Logout function found in the S2 position of the Password menu reinstates password protection after you have completed adjustments to the metal detector settings. Password protection will be reinstated automatically if no key press has occurred for 5 minutes.

Wrong / Forgotten Password:

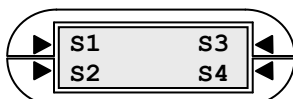
If you enter an incorrect password the following menu screen will appear:



Press S2 to 'Try Again'. If you have forgotten your password press S4 and the detector will display a seed number which Fortress engineers can decode for you. Please be prepared to offer proof of your authority when calling in to obtain the correct code.

Advanced Password Configuration:

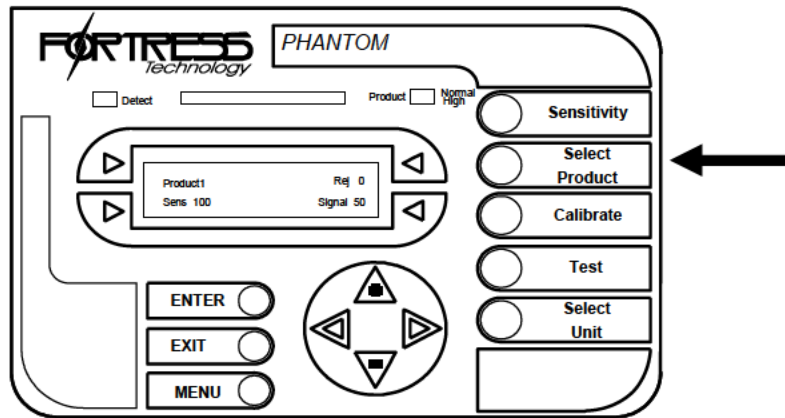
For a more detailed explanation of the advanced Password security settings (including selectable Hard Key / Soft Key operator access) please refer to the Password submenu section of the Reference Manual.



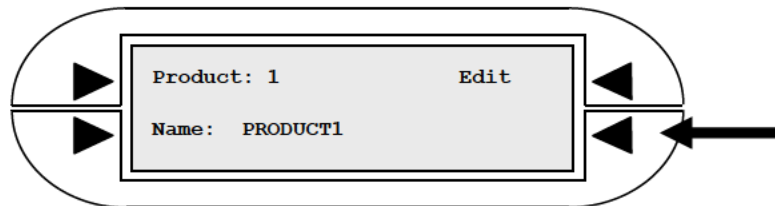
4.3 Renaming Products

The Main Menu displays the name of the product currently being run, by default the Product Name is set to PRODUCT1 and no additional products are setup. To change the default product name to a more suitable descriptive one follow these steps:

1. Press the SELECT PRODUCT key on the right side of the Phantom control panel;



2. Press one of the lower soft keys (S2 or S4) alongside the product name to edit the name;



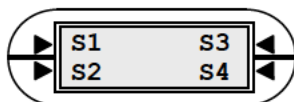
3. A flashing cursor will appear on the first letter, press the UP / DOWN arrow keys (+/-) to increase or decrease the alpha and numeric characters. The LEFT / RIGHT arrow keys are used to scroll the cursor between characters.
4. Press ENTER to confirm.

4.4 Saving a Master Product

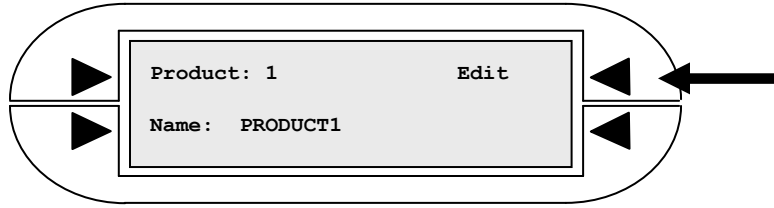
After you've followed all the Quick Start procedures and renamed your product it's strongly recommended that you save the settings. With your saved Factory Settings you can easily restore the saved product setup configuration at any time, this capability proves to be valuable in cases where operator changes have a negative effect on the system's performance as it's easy to revert back to the stored settings.

To Save a Master product record follow these steps:

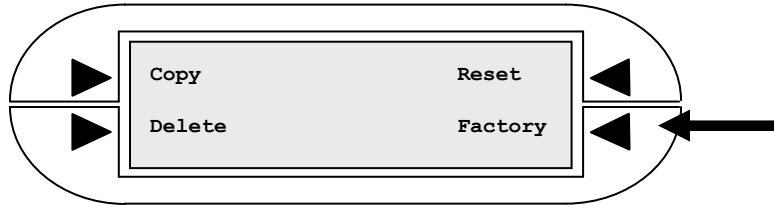
1. Press the SELECT PRODUCT key on the right side of the Phantom panel;



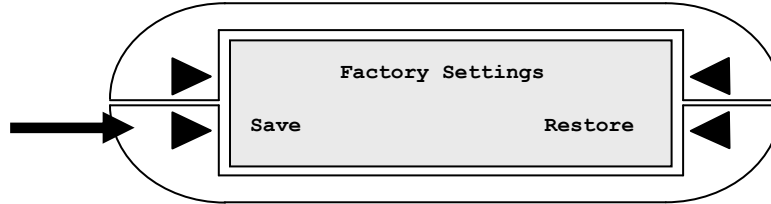
2. Press S3 to enter the Product Edit submenu;



3. Press S4 to enter the Factory Settings submenu;



4. Press S2 to save the current product settings as the Master settings also known as the Factory Settings.



To restore the saved Factory Settings at any time simply press S4 in the menu shown above.

Note: Reset and Restore should not be confused, the Reset function changes the current product settings back to the standard default settings whereas Restore returns the settings to your saved Master configuration.

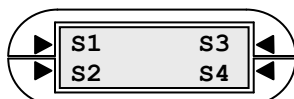
4.5 Running Multiple Products

The Phantom allows you to store settings for up to 99 different products in its memory, Product settings (including sensitivity and calibrated phase point) are instantly retrieved upon changing from one product to another.

Create a New Product:

To Create a New Product you are in actual fact “copying and pasting” an existing product already stored in your Phantom’s memory into a new product slot. The first time that you create a new product you are copying the information from the Master product that’s setup. When creating subsequent new products you may copy from any product record, adjustments to new products do not affect the settings of the product that was initially copied. Follow these steps to setup a new product:

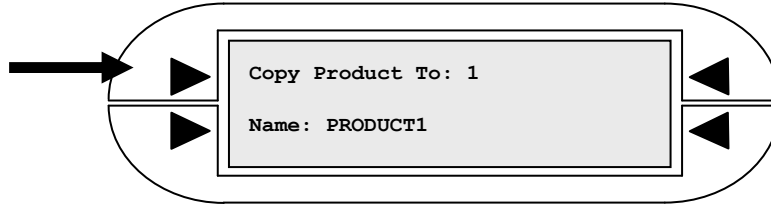
1. Press the SELECT PRODUCT key on the right side of the Phantom panel;
2. Press S3 to enter the Product Edit submenu;



- Press S1 to enter the Copy Product submenu;



- To create a new product press either of the upper soft keys (S1 or S3) to select the “slot” number of the new product. A flashing cursor will appear press the UP / DOWN arrow keys (+/-) to increase or decrease the slot number. Press ENTER to confirm;



- You can quickly edit the product name for your newly created product by pressing one of the lower soft keys (S2 or S4).

After Exiting the newly created product will appear as the currently selected product in the Main Menu.

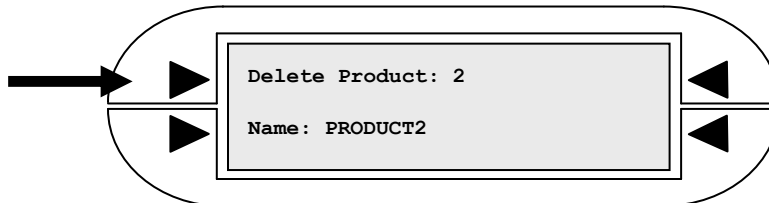
Select a Product:

To switch from one product to another follow these steps:

- Press the SELECT PRODUCT key on the right side of the Phantom panel;
- From the Select Product menu press the SELECT PRODUCT hard key again to scroll through the list of products and press ENTER to confirm a selection.

Delete a Product:

To erase a stored product record select the Delete option from the Edit submenu of Select Product.



Press one of the upper soft keys (S1 or S3) to edit the Delete entry field and select the number of the product you want to delete. After pressing the ENTER key the name of the product will change to UNDEFINED to confirm that the product has been deleted.

Note: you cannot delete a product that is in use and you can never delete Product #1.

4.6 AutoTest / Test Request

It is highly recommended that the sensitivity of the detector is checked routinely via testing as part of the quality control procedure. The Phantom offers two distinct methods of automated testing to confirm the detector's performance as well as the response of the reject mechanism:

AutoTest: performs short interval testing of the detector's sensitivity and valve reaction without any operator involvement, thus reducing the high cost of frequent manual testing. AutoTest works by injecting a simulated metal signal (identical to a test metal sphere sample) that acts as a rejection. You can set the simulation to occur at either the touch of a button (Manual option) or at regularly scheduled time periods of your choice (Auto option).

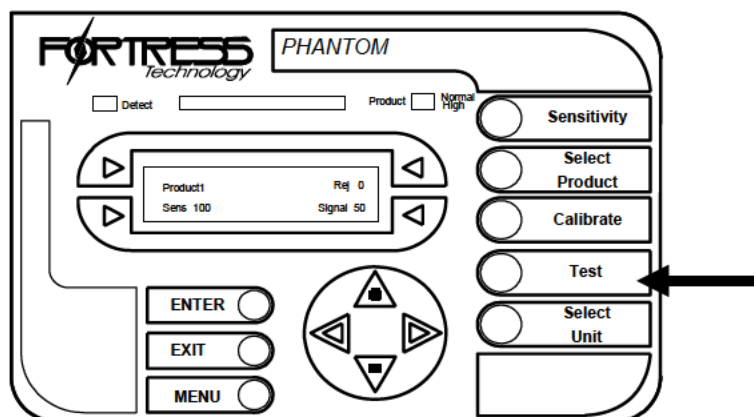
Test Request: you may set the detector to automatically request a test procedure utilizing the test samples supplied at regular intervals (Request option).

Note: AutoTest is an optional setup.

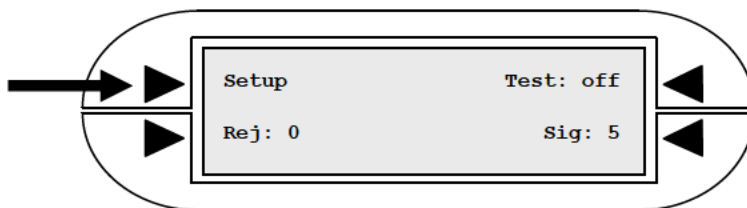
Configuring AutoTest / Test Request:

To setup the AutoTest / Test Request function follow these steps:

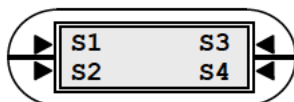
1. Press the TEST hard key on the right side of the Phantom control panel;

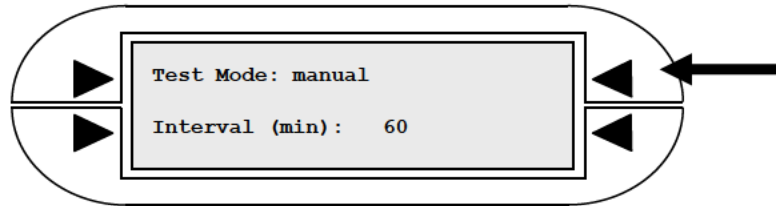


2. From the Test menu press S1;



3. From the Test Setup submenu press S3 repeatedly to select between AutoTest modes: Manual / Auto / Request.



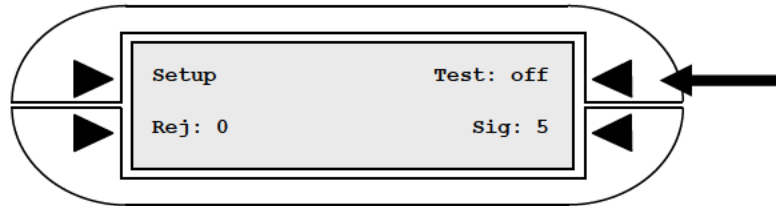


4. Press the ENTER key to confirm the selection.
5. If you selected Manual mode Test setup is complete and you may Exit.
If you selected Auto / Request press the S4 key to adjust the setting of the Interval either increasing / decreasing the test timing via the Arrow Keys, then pressing ENTER to confirm.

AutoTest Operation – Manual / Auto Modes

To execute AutoTest under Manual mode, follow these steps:

1. Press the TEST hard key on the right side of the Phantom control panel;
2. From the Test menu press S3;



3. A simulated metal signal is instantly injected, check to confirm that a detection Signal and Reject increment occurred and that the reject device was properly triggered.

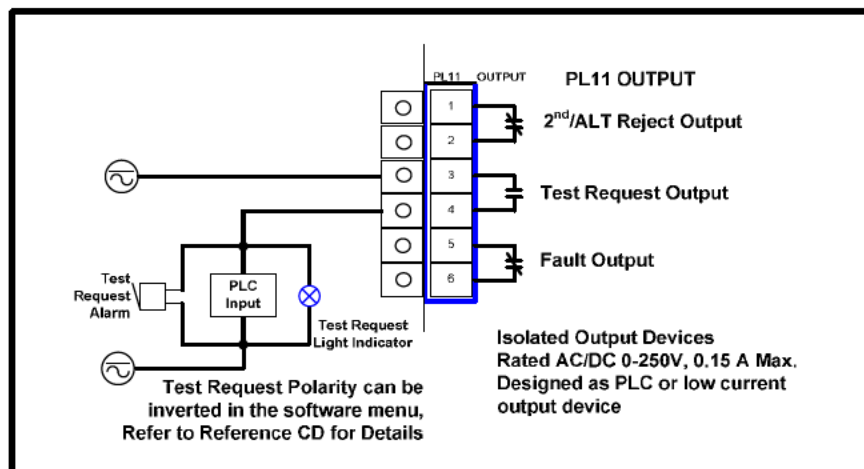
To execute AutoTest under Auto mode no action is required as the test will be run at the prescribed interval.

Note: If an AutoTest execution does not cause a detection a Fault is generated.

Test Request Setup & Operation

Test Request prompts the user to conduct testing using the supplied test samples at specified time intervals.

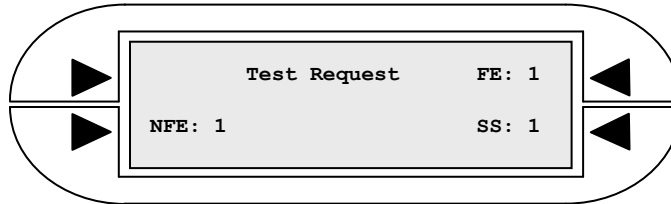
Setup and Wiring for Test Request



AUXILIARY FUNCTIONS

You can change the number of test passes that are required per test sample (Ferrous / Non-Ferrous / Stainless Steel). To setup the test request passes follow these steps:

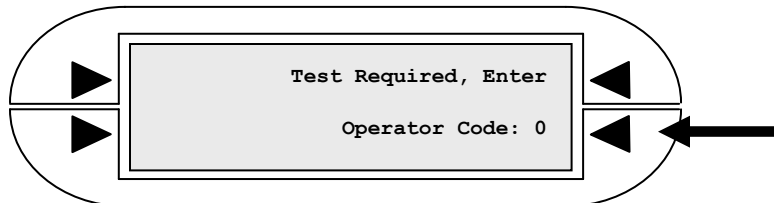
1. From the Test menu press S1;
2. From the Test Setup menu press the MENU key once;
3. The Required Passes submenu will appear as shown;



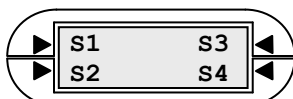
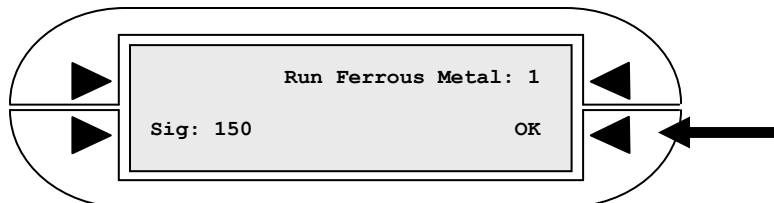
4. Use the corresponding soft keys to edit the values of Ferrous (FE), Non-Ferrous (NFE) and Stainless Steel (SS) test sample passes.

To operate Test Request follow this procedure:

1. For the purposes of this tutorial set the Test Request time interval to a low value of 1 minute via the Test Setup menu, this modification will allow you to quickly access the Test Request features (you can later change the interval to a more appropriate value);
2. When the Test Request time interval comes up the Test Required screen will automatically appear;
3. Press S4 to enter the Operator Code – a value between 0-99 that represents the identity of the test operator;



4. Press ENTER after editing the Operator Code;
5. You will be presented with a series of three Test Pass screens starting with Run Ferrous. Run the Ferrous test sample through the aperture per the number passes selected in Required Passes;
6. After each test sample run press S4 to move on to the next phase;



- At the end of the three test passes you will see a Test Complete screen showing the result.

A “Pass” indicates that all required passes generated a detection Signal above 100.

A “Fail” occurs when at least one of the test passes did not render a detection Signal above 100 and a Test Signal fault will subsequently appear.

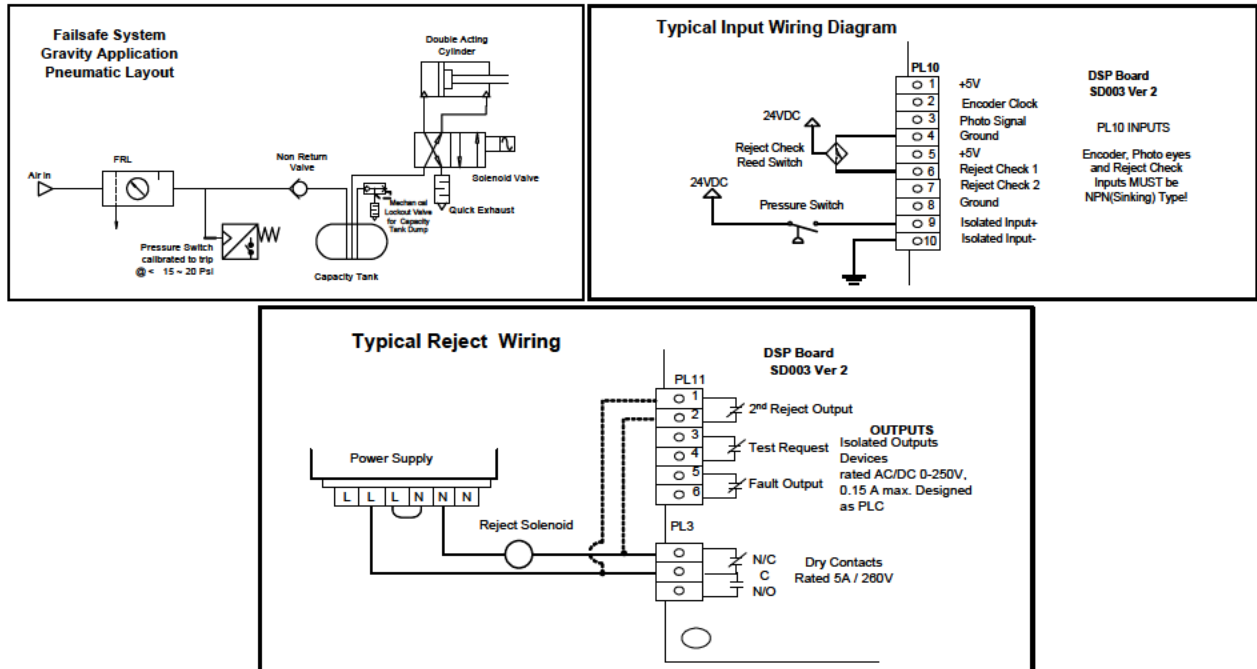
4.7 Select Unit

With Phantom models, multiple detectors can be controlled by a single control interface - this option offers convenience when detectors are installed in difficult to access locations. For more in-depth instructions on managing Multiple Units please refer to the Select Unit section of the Reference Manual.

4.8 Failsafe System

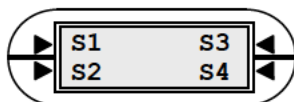
A Failsafe System can be incorporated into the Gravity system for the purpose of putting the detector in reject state upon any electrical failure or pneumatic pressure drop. It includes an air pressure switch that senses the air pressure and generates a Fault when pressure drops below 20 psi. The air pressure fault diverts the system to reject. If an electrical failure occurs, the reject solenoid will lose power which in turn causes the flap gate to switch to reject state.

Failsafe System Air and Electrical Layout



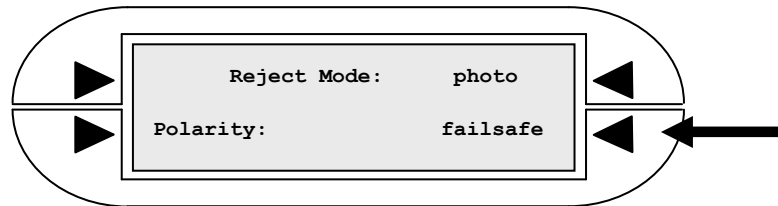
In order for the Failsafe System to work, the reject on fault mode and the air pressure fault must be enabled in the software as follows:

- From the Main Menu press the MENU button to display the Reject Setup menu;

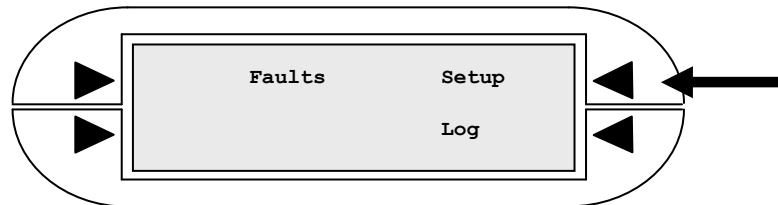


AUXILIARY FUNCTIONS

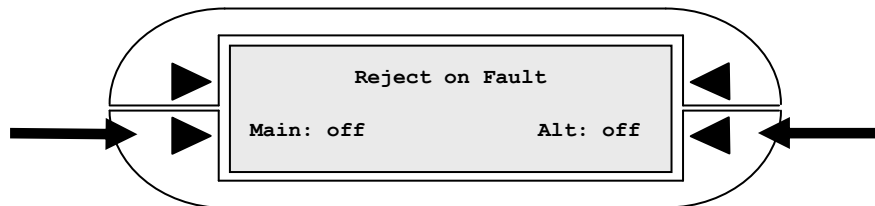
2. Press S3 to display the Reject Mode menu;
3. Make sure the polarity indicates “failsafe”, press S4 if necessary to change the setting;



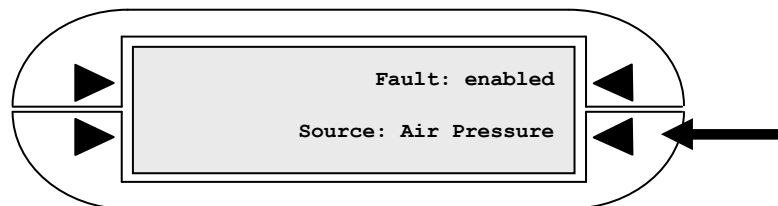
4. Press EXIT once, then press the MENU button five more times to display the Fault source menu and press S3 to enter the setup;



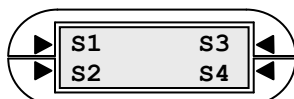
5. In the Fault source setup, change the Reject on Fault option to ON for the reject output associated with the Gravity system's Reject Valve – whether it's Main or Alt, press S2 or S4;



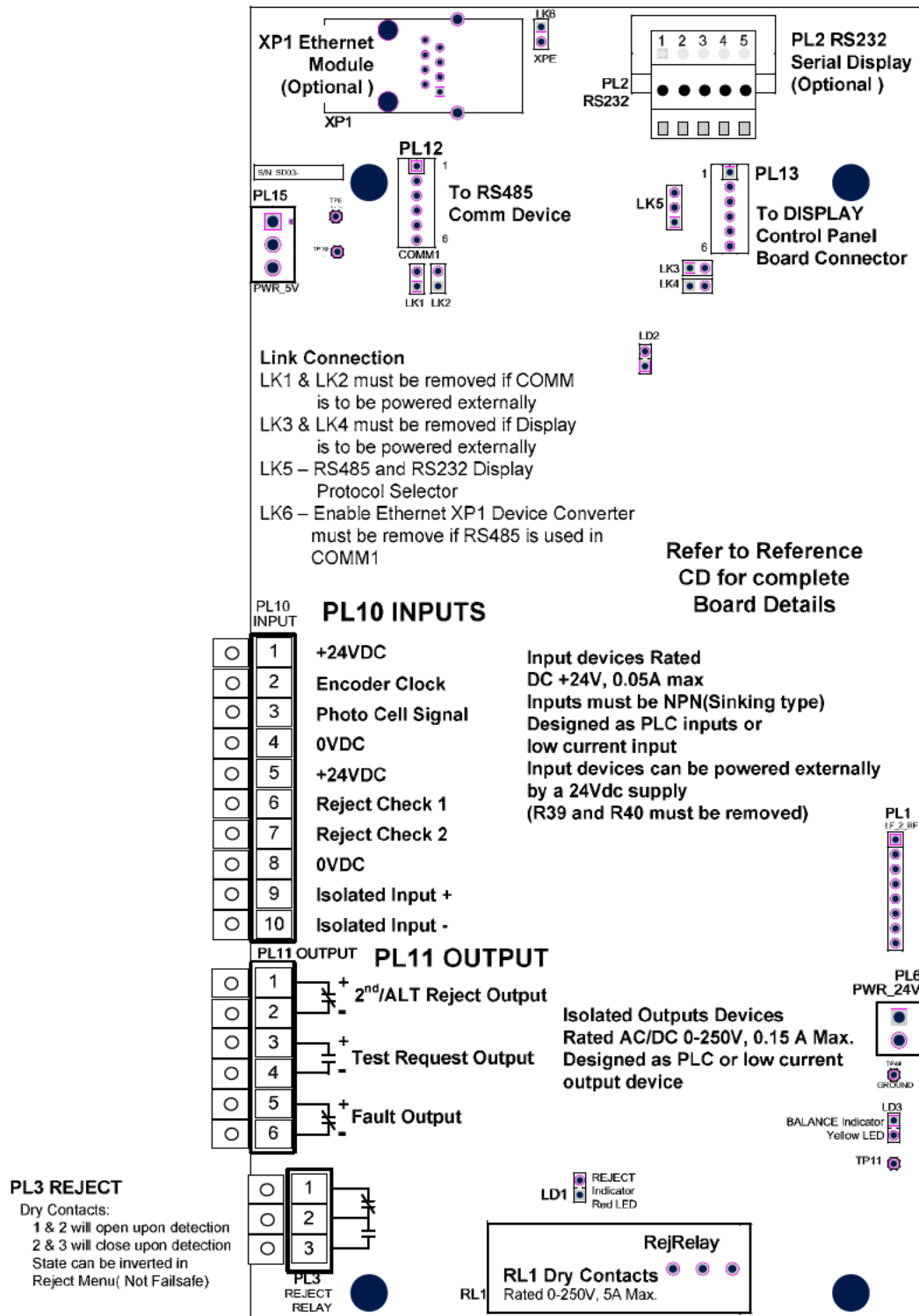
6. Press the MENU button three more times to setup the specific Fault Source. Press S4 repeatedly to navigate between the different Faults until finding “Air Pressure”, and then press ENTER.



7. Press S3 to set the Air Pressure fault from “masked” to “enabled”.



Appendix #1: DSP BOARD MAP



Appendix #2: FAQ's

Troubleshooting Guide

When a malfunction occurs it may not be serious and can be corrected easily. The following describes the most common problems and solutions, please refer to the following before calling Technical Support:

	WARNING! Shock Hazard Only qualified service personnel should open the detector cover.
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Problem:

Upon initial power-up the display does not light up, remove the display cover off and follow the check list below.

Check:

- Make sure there is power going to the detector per the Power Supply connection instructions in Section 1.7;
- Fasten any loose cable connections;
- Confirm that the Display Cable connector is plugged into [PL13 – Display] of Digital Board. Refer to Appendix 1 for orientation of wires and the Reference Manual for additional wiring diagrams;
- The Green LED (LD2) on the top center of Digital Board should be flashing, if the green LED (LD2) is not flashing, check for loose cable connection on PL15 (Blue & Green wire) of the Digital Board. 5Volts DC can be measured on TP10 (in front of PL5) with a voltmeter.

Problem:

The detector is falsely triggering.

Check:

- Investigate various symptoms of false triggers to determine the source. Perform the Initial Signal Check described in Section 3.3 to determine whether false triggering is coming from the surrounding outside environment / product;
- Make sure all moving cross members or metal transfer plates are electrically isolated;
- Look for any large pieces of metal around the aperture opening such as metal guides, covers, wire cables, etc. that may move when the system is on. Refer to the installation section for more information.
- The detector may be detecting **outside interference** from the surrounding area. Possible sources of such interference are:
 1. Airborne electrical interference – static, radio (RF), earth loops, variable frequency drives
 2. Vibration – moving metal
 3. Temperature fluctuation – ovens, freezing tunnels

The detector may be capable of filtering any one of these types of interference through the digital filter settings but if at all possible it is recommended to identify and fix the source of interference to achieve optimal performance from the metal detector.

- If the **Product is the source of false triggering**, try re-calibrating the system as described in Section 3.4 and then adjust the Sensitivity (per Section 3.6). Note: if you change the Sensitivity level, always ensure that your test samples can still be detected.

Problem:

The reject device is malfunctioning.

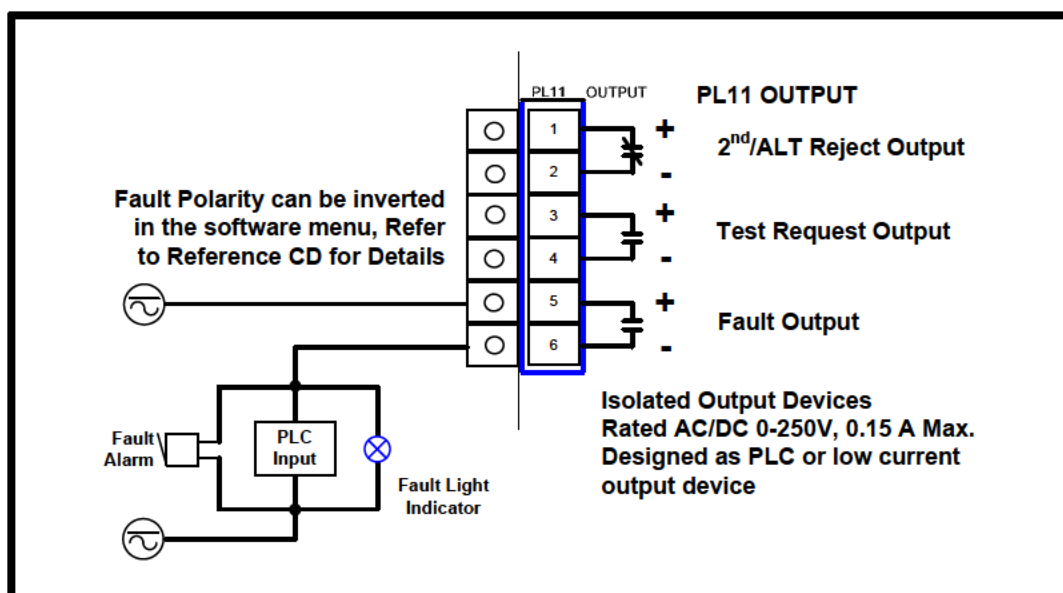
Check:

- On the Display Panel confirm that the Signal level is exceeding 100 and the red detection light is ON in the event of a reject activation;
- Check if the actuator/cylinder valve is changing state upon a Signal of 100 or greater. If not check whether the reject cable is properly wired to the Digital Board reject output (refer Wiring Diagrams in Section 1.7 and Reference Manual);
- If actuator/cylinder valve is changing state, confirm there's adequate air pressure to the device (typically 60 psi / 4 bar).

If problems still persist contact Fortress Technology's technical support for assistance.

Appendix #3: Faults

Fault Wiring Diagram



List of Faults and Corrective Actions

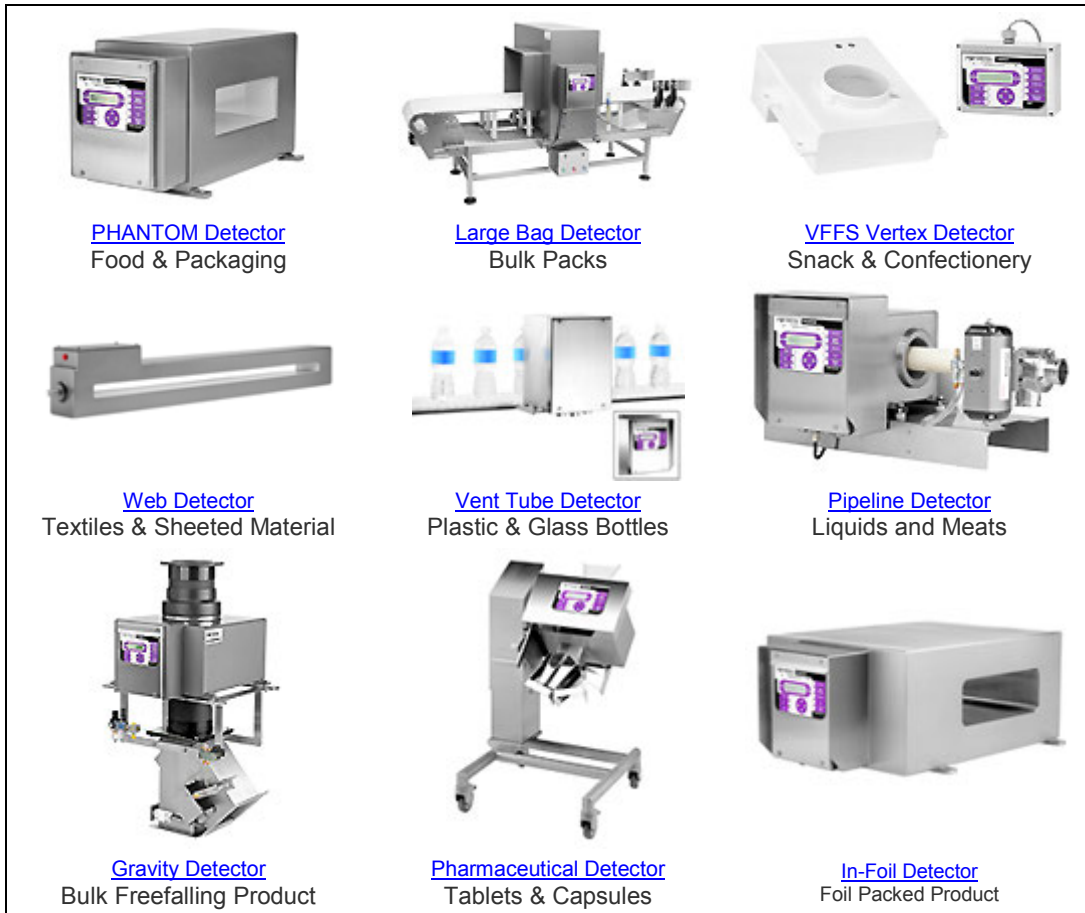
Fault	Possible Cause	Corrective Action
24V	Power supply not functioning properly	Power supply needs to be checked and / or replaced
Reference	- DSP PL1 Wire not connected properly - SH Board oscillator circuitry maybe faulty	- Check if DSP PL1 board interconnection cable/plug are fully located with no loose connections. - Call Fortress for assistance to check if SH board is faulty
Balance	- There is metal located within the detector aperture - The detector balance is excessive	- Verify that no metal is located within the detector aperture - Check if LD3 (yellow LED) on DSP board is on. Measure voltage on test point TP11 (orange, below LD3) call Fortress for assistance - Call Fortress for assistance
PROD Memory	Product memory may be corrupted	Cycle power to clear memory or reset the product record via Reset in the Factory Settings submenu
Phase Limit	A phase limit was reached during a calibration or auto phase update	- Can be cleared via the Clear soft key (S3) - Check the phase point and perform a fast phase calibration
Test Signal	Test signal was not detected during a test procedure	Check the sensitivity and perform a manual test. Fault can be cleared via the Clear soft key (S3)

Fault	Possible Cause	Corrective Action
Reject Check	Reject confirmation device(s) failed to verify that the contaminated product was properly rejected	- Check that the reject device is functioning properly and that the confirmation devices are positioned correctly. Also check if the polarity setting and the time delay within the software is set correctly - The sensor at the entry to the bin may be blocked or misaligned - Call Fortress for assistance
Peye Block	- The infeed Photoeye is blocked for an excessive amount of time - Infeed Photoeye may not be functioning properly	Set the reject mode to “normal” instead of “photo”, since an infeed photoeye is never used with a Gravity system.
Rej Position	Reject confirm device is blocked for an excessive amount of time	- Check that a package is not blocking the reject path - Check the reject confirm polarity, can be inverted in the software - Check the device for proper function
Air Pressure	- The air pressure sensor connected to the isolated input of the DSP board (PL10 pins 9 & 10) is indicating a low pressure which may impair the proper function of the reject device - Air pressure sensor not functioning properly	- Verify air pressure going to the sensor with the reject device set to factory default; typically about 60-80 p.s.i. - Verify air pressure sensors are installed - Verify air pressure proper functionality - Fault can be cleared and masked in the software, until a technician has verified and corrected the causes of the fault
Excess Reject	The number of rejects has exceeded the limit set within the software. Feature is enabled via Fault Setup menu.	- Check rejected product for metal contaminants - Make sure the detector is calibrated for the running product - Can be cleared via the Clear soft key (S3) and masked in the software’s Fault menu
Large Metal	- The large metal threshold limit has been exceeded - The Large metal threshold has been set too low. Feature is enabled within Sensitivity submenu.	- Verify that no metal is located within the detector aperture - Increase the large metal threshold - Can be cleared via the Clear soft key (S3) and masked in the software’s Fault menu - Check last packs through metal detector for large metal contaminant
Bin Full	The reject bin is full (this may prevent product from being successfully rejected into the bin)	- Check the bin and empty rejected product – handle according to operational procedures. - Check that the sensor in the bin is not misaligned - Check the polarity of the input

Appendix #4: Phantom Models

Complete Metal Detector Product Line

Phantom metal detectors are available in a range of unique models for a variety of industrial applications.



Learn more at www.fortresstechnology.com



Make your Phantom metal detector a
Critical Control Point with CONTACT
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For automated Event Logging and Data
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