Installation, Operation and Maintenance Instructions

METAL DETECTOR
MODEL 1250-E1 DIGITAL

ERIEZ HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506–1402 U.S.A.
GLOBAL LEADER IN SEPARATION TECHNOLOGIES

Introduction

This manual details the proper steps for installing, operating and maintaining the Eriez Model 1250-E1 Digital Metal Detector.

Careful attention to these requirements will assure the most efficient and dependable performance of this equipment.

If there are any questions or comments about the manual, please call Eriez at 814-835-6000 for Model 1250-E1 Digital Metal Detector assistance.

CAUTION

Safety labels must be affixed to this product. Should the safety label(s) be damaged, dislodged or removed, contact Eriez for replacement.

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ERIEZ MODEL 1250-E1 DIGITAL METAL DETECTOR

Safety Information

INTENDED USE

The equipment is to be used in the following applications only with the appropriate detection coil: Conveyor belt application. The ambient temperature of the machine must not exceed -40 to +65°C. Ensure that the installation area is free from steam, plasticizers or other materials that may damage the frame or enclosure.

SAFETY SIGNS

Mains voltage runs through the Eriez Model 1250-E1 Digital control unit housing and may also be connected to any external electric circuits (eg metal relays).

Therefore, the safety sign shown above is displayed on the cover of the electronics housing.

DANGERS ARISING FROM NON-COMPLIANCE WITH SAFETY NOTICES

Life-endangering electric shocks are likely in cases of non-compliance with the safety notices.

SAFETY INFORMATION FOR OPERATORS

The Eriez Model 1250-E1 Digital control unit must be in perfect working order and used for the purpose for which it was designed, in particular, ensure that the cover of the electronic housing is closed during operation. Any moisture which penetrates the electronic housing must be removed. Safety signage must not be removed and must be maintained in good condition. The instruction manual must remain complete and in good, readable condition. Only qualified personnel must operate, maintain and repair the equipment. People with heart pace-makers should not spend long periods near the detection coil. When inspecting materials which are likely to explode follow the appropriate regulations.

SAFETY INFORMATION FOR OPERATION AND MAINTENANCE

Before opening the electronics housing clean the outside area to reduce the risk of dirt and moisture penetrating inside. Disconnect power supply and external circuits before opening the cover. Any moisture which penetrates the electronic housing must be removed.

Only qualified personnel should operate, maintain and repair the equipment.

NOTES ON RESIDUAL RISKS

Electrical circuits may still be live even after having been isolated from the mains.

CONSEQUENCES OF UNAUTHORIZED MODIFICATION

Unauthorized modification or repair will invalidate all manufacturer declarations and guarantees.

IMPROPER USE

The control unit is not designed for any other use other than that stipulated in this manual. All operations must be within the specifications detailed in the technical data. Improper use also includes operating the equipment with excessive mechanical, static or dynamic loads (i.e. heavy machine parts or strong vibration). The inspection of aggressive materials such as those containing alkalis, acids and solvents is not permitted, nor is the equipment to be used in an environment where there is risk of explosion.

General Information

Eriez detectors are custom fabricated to suit each user's particular application. Each detector system is subjected to extensive testing both at the sub-assembly level and after final assembly to ensure compliance with performance and electrical safety standards.

Standard Warranty

Please refer to full warranty information.
Eriez metal detectors are warranted against defects in workmanship and materials 18 months from date of ship. This warranty does not cover failures due to misuse, neglect, abuse, improper handling, alteration, improper maintenance or accident, and Eriez shall not be liable for any direct, indirect, consequential or incidental damages from use, results of use or inability to use this product. Repairs by any other than Eriez authorized service personnel will void this warranty. Within the warranty period, the product will be repaired or replaced at Eriez' option, free of charge. Eriez does not always guarantee that shipping costs are covered. Except as mentioned above, no other warranty, expressed or implied, applies. If Modules are not covered by warranty as mentioned above, Customer will be billed for the repair and shipping. Non warranty repairs, Customer must issue
a PO # or Credit Card # prior to any repair.

Installation Assistance

Eriez detectors have been designed for installation by qualified personnel with detailed instructions provided with each shipment. When required, an Eriez Field Engineer will supervise or check the installation, activate the system and provide training on periodic adjustments and care of the Detector for user maintenance personnel. Please contact Eriez for Field Service rates.

Technical/Application Assistance

Eriez welcomes your inquiries concerning metal detectors and their application, installation and servicing. If technical or application assistance is needed, contact:

Eriez
2200 Asbury Road, Erie, PA 16506-1402 USA
Phone: 814-835-6000
Email: eriez@eriez.com
Website: www.eriez.com

Electronics Enclosure

Introduction

Pulse Induction Basics

Eriez metal detectors utilize a form of metal detection technology known as “Pulsed Eddy Current Induction” to detect metal. This means that metal that passes through the detection area gets pulsed with a magnetic field several thousand times per second. This causes eddy currents of electricity to develop in the surface of the metal, which create electromagnetic fields that can be detected by the electronics of the device. Only metal moving through the aperture can be detected.

Eriez metal detectors can detect conductive tramp metal debris and can safely ignore material being processed, including metallic ores and minerals with the appropriate settings.

Eriez Model 1250-E1 Digital

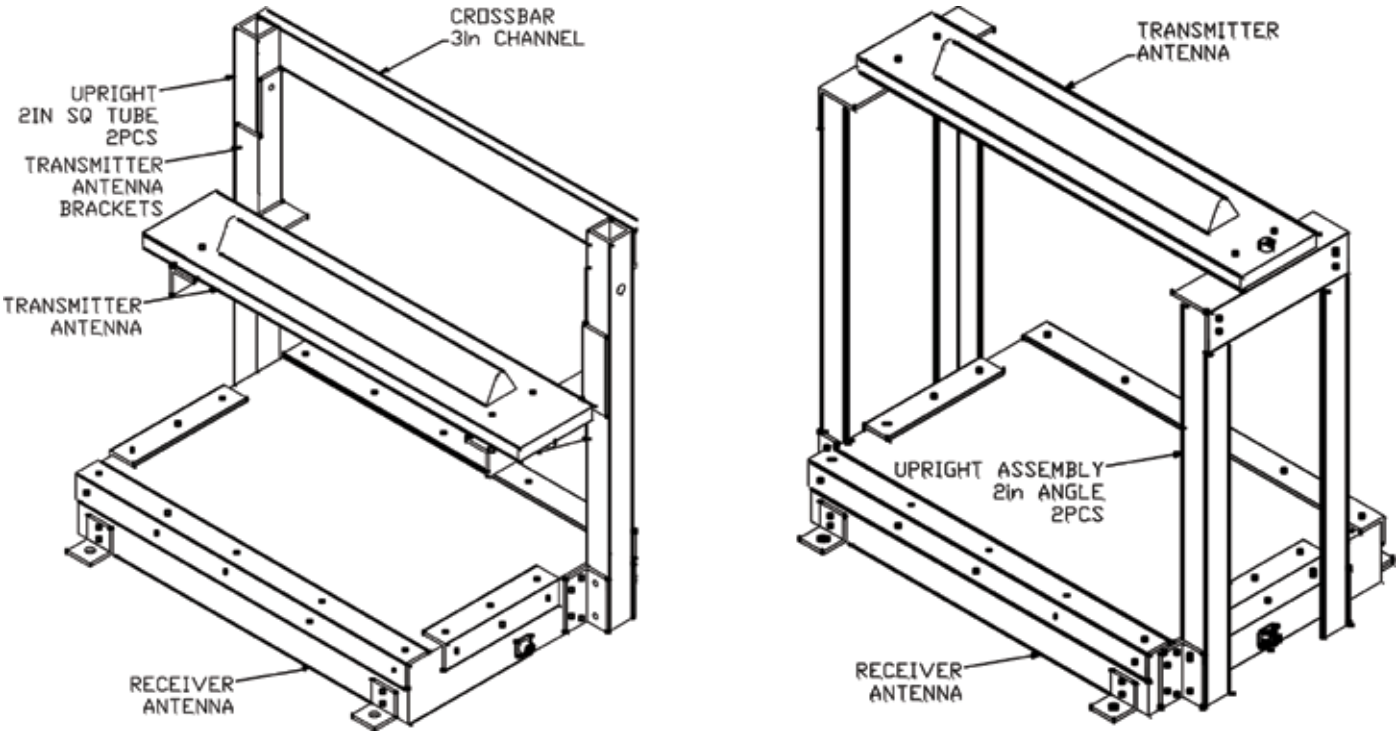
The Eriez Model 1250-E1 Digital metal detector is a digital device based on previous Eriez products. The digital interface allows for higher sensitivity, configurable user settings, memory for those settings, and communication with other control systems. The Model 1250-E1 Digital also incorporates several safeguarding features to protect itself from harmful conditions, as well as downstream equipment when those conditions occur.

The Model 1250-E1 Digital metal detector comes with the following:

- A junction box containing the electronics
- A four-pin XLR cable for the receiver coil
- A three-pin XLR cable for the transmitter coil
- A frame assembly for the receiver and transmitter coil
- An isolation kit for idler rollers

Please verify that all of these materials are accounted for before beginning on-site installations.

Idler Isolation Kit



NOTE

These drawings are samples of typical frame assemblies. We make custom detectors, so your detector may not look exactly like this. If you are unsure please contact Eriez for assistance. For custom detectors, please make sure you have the latest drawings from Eriez.

Installation

Long Term Storage

For long term storage, the metal detector should be left sealed inside the shipping container and stored in a dry location in temperatures between -10°C and +50°C (14° F - 122° F).

Recommended Tools

- 9/16" Deep Well Socket & Ratchet
- 9/16" Wrench
- 7/16" Wrench
- Needle Nose Pliers
- 3/32" Flat head Screwdriver
- Crescent Wrench
- #2 Phillips and Flat head screwdriver
- Speed Square

Unpacking

Upon receipt of the crate(s) containing the Metal Detector System, inspect the contents for physical damage and missing parts. If anything is broken or missing, please contact the carrier and notify Eriez immediately.

Antenna Chassis Location

While each application is unique, the guidelines listed below apply to most installations. Follow the steps listed below to choose the best location for the detector:

1. Choose a location for the search coils so the material handling system has ample time to react to tramp metal. Locate the search coils far enough in advance of the head pulley so the belt can come to a stop before the metal falls off the end of the belt. If a diverter is used, consider the reaction time of the diverter system and speed of the conveyor belt.
2. Select a site with minimum vibration. High vibration areas may degrade detector sensitivity and shorten component life.
3. Locate the Antenna Chassis away from sources of airborne electrical interference emitted from variable-speed drives and their power lines, large motors, ballasts, AM radio transmitters, induction furnaces and other radio frequency (RF) sources. Because RF signals travel directly along a straight line (line-of-sight), position the receiver coil or relocate RF sources so they are out of the direct line-of-sight with the top and bottom of the receiver coil.
4. If nearby, cables carrying high voltage or varying loads must be enclosed in steel conduit, grounded at both ends and located at least 4' from the detector antennas.
5. Position the entire search coil assembly so that the antennas are equally spaced between the two adjacent idler rollers. Use the cable terminals for the search coil assembly as the center line. **Do not center the 2" x 2" upright frame.**

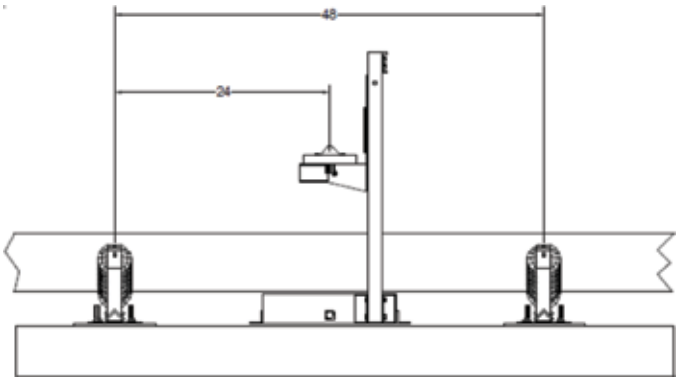


FIGURE 1

Diagram of appropriate distances for idler rollers

6. This 48" (1220mm) space between the carrying idler rollers is the metal free zone. Any metal cross bracing or return rollers in this metal free zone should be removed or relocated outside this area.

Idler Roller Insulation Installation

If conveyor idler rollers are used in your application, the idlers immediately adjacent to the search coil assembly must be electrically isolated from the conveyor frame. This is to help prevent false detections caused by eddy current loops generated by the metal detector in the idler roller frames. An idler isolation kit has been provided with your detector for this purpose. This consists of (8) pcs each of three different sized nylon shoulder washers to suit the mounting hardware you are using to secure the idler rollers to the conveyor frame. The sizes are for 1/2" (M12), 5/8" (M16) and 3/4" (M20) bolts. The kit also contains (8) 4" x 4" x 1/4" thick fiberglass reinforced plastic (FRP) pads. The pads should be placed between the idler mounting flange (1 pad for each bolt) and using a handdrill, drill out the appropriate size hole in the FRP pad. You may also have to enlarge the bolt holes in your idler flange and your conveyor frame (stringer). Place the appropriate size nylon shoulder washer between your existing metal washer & bolt and re-secure the idler flange to the conveyor frame. When you are done use an ohm meter to measure the resistance between the idler flange and the conveyor frame. The resistance should be “OPEN” or at least in the Mega-ohm range. If it is not, you must look for where there is metal on metal contact allowing current to pass between.

Bolt Size Imperial	Bolt Size Metric	Washer Major OD	Washer Minor OD	Washer ID	Washer L
1/2"	M12	1.25" (32mm)	0.6" (15mm)	0.54" (14mm)	0.41" (10.4mm)
5/8"	M16	1.525" (38mm)	0.75" (19mm)	0.65" (16.5mm)	0.5" (12.7mm)
3/4"	M20	2.065" (52.4mm)	1.05" (26.7mm)	0.806" (20.5mm)	0.5" (12.7mm)

FIGURE 2
Idler Roller Insulation Components

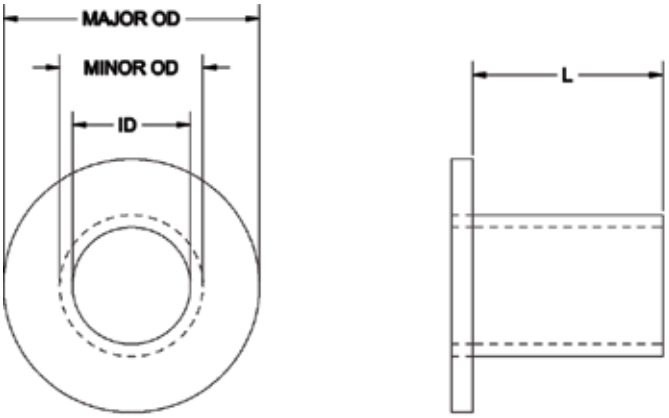


FIGURE 3
Diagram of shoulder washer diameters

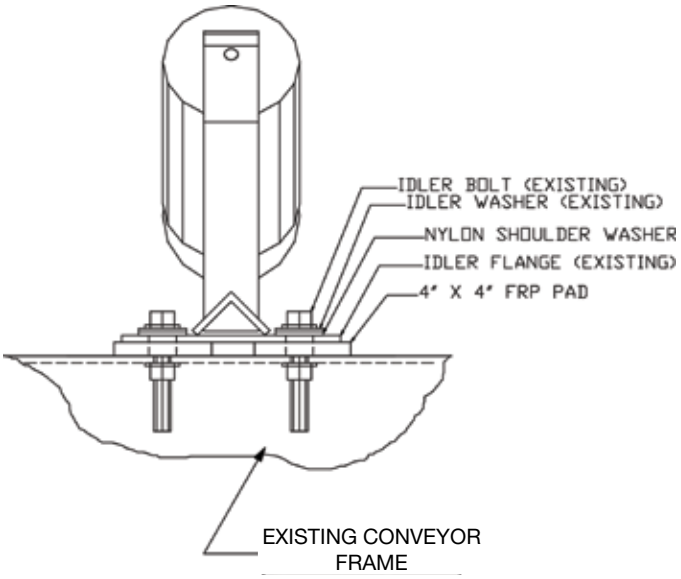


FIGURE 4
Diagram of idler roller insulation installation

Antenna Assembly

Note the material flow direction arrows, match marks and other identification on the Detector components before beginning work. Please refer to the Frame Assembly Diagram for Installation – Figure 5. (Or refer to custom drawings for custom detectors)

1. Place the receiver antenna into position on the belt ensuring it is properly centered in the metal free zone. (see Figure 1).

IMPORTANT

The receiver *must* be electrically isolated from any metallic support structure it is placed upon.

You have been provided with 2" x 2" x 1/4" FRP isolation pads and plastic shoulder washers to accomplish this. The pads should be placed between the receiver support feet and whatever support structure you are attaching the antenna to. In rare cases, Eriez provides 2" square tube as a shim instead of the 2" x 2" x 1/4" FRP pads. Please ask if you are unsure. The plastic shoulder washers should be used to isolate the bolts holding the receiver in place. It may be necessary to shim the receiver to achieve the desired 1-2" spacing between the receiver antenna and the belt. Please make sure to account for belt sag when the belt is fully loaded. Do not torque or twist or use excessive force when fastening the receiver antenna to the conveyor frame. Do not drill or weld the receiver antenna.

2. Secure the upright supports to the receiver antenna. Make sure the assembly is aligned and square. Use the hardware provided as called out in the assembly drawing.

3. (See Figure 5) Assemble the top transmitter coil (with swing-away brackets attached if applicable) to the upright supports using the pre-drilled holes in the brackets/antennas/uprights. For standard swing away frames, use two 3-1/2" bolts with washers (provided). Each of the two bolts contains four flat washers and two nuts. Make sure two washers are located between the swing-away bracket and upright support to insure proper spacing and freedom of movement. The remaining washers are located at the end of each bolt. Tighten, by hand, each bolt with a nut until light drag is exerted on the swing-away bracket. Tighten the second nut against the first nut to serve as a jam nut. Verify that the swing-away brackets are free to move.

CAUTION

If the swing-away assembly is not free to move, damage to the transmitter coil may result if hit by overburden.

4. (See Figure 6 if applicable) With the 4 upright post design, alignment blocks have been riveted to the frame. The edge of the transmitter antenna should be tight up against the stop block before bolts are tightened. Inspect the antenna assembly for alignment and tighten all connections. The entire assembly should be rigid, square and sturdy.

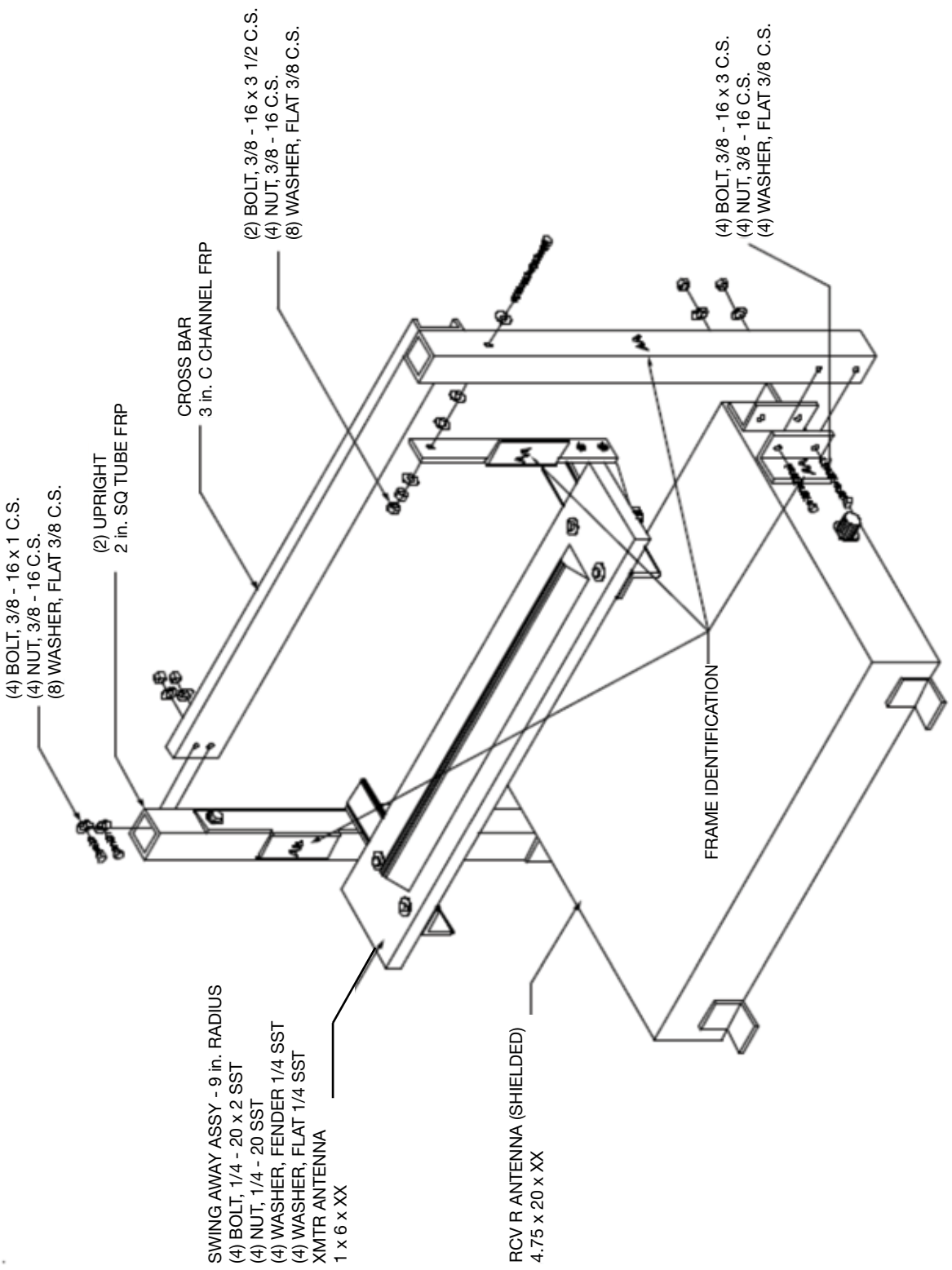


FIGURE 5
Standard Model 1250-E1 Digital Antenna with Swing Away Bar

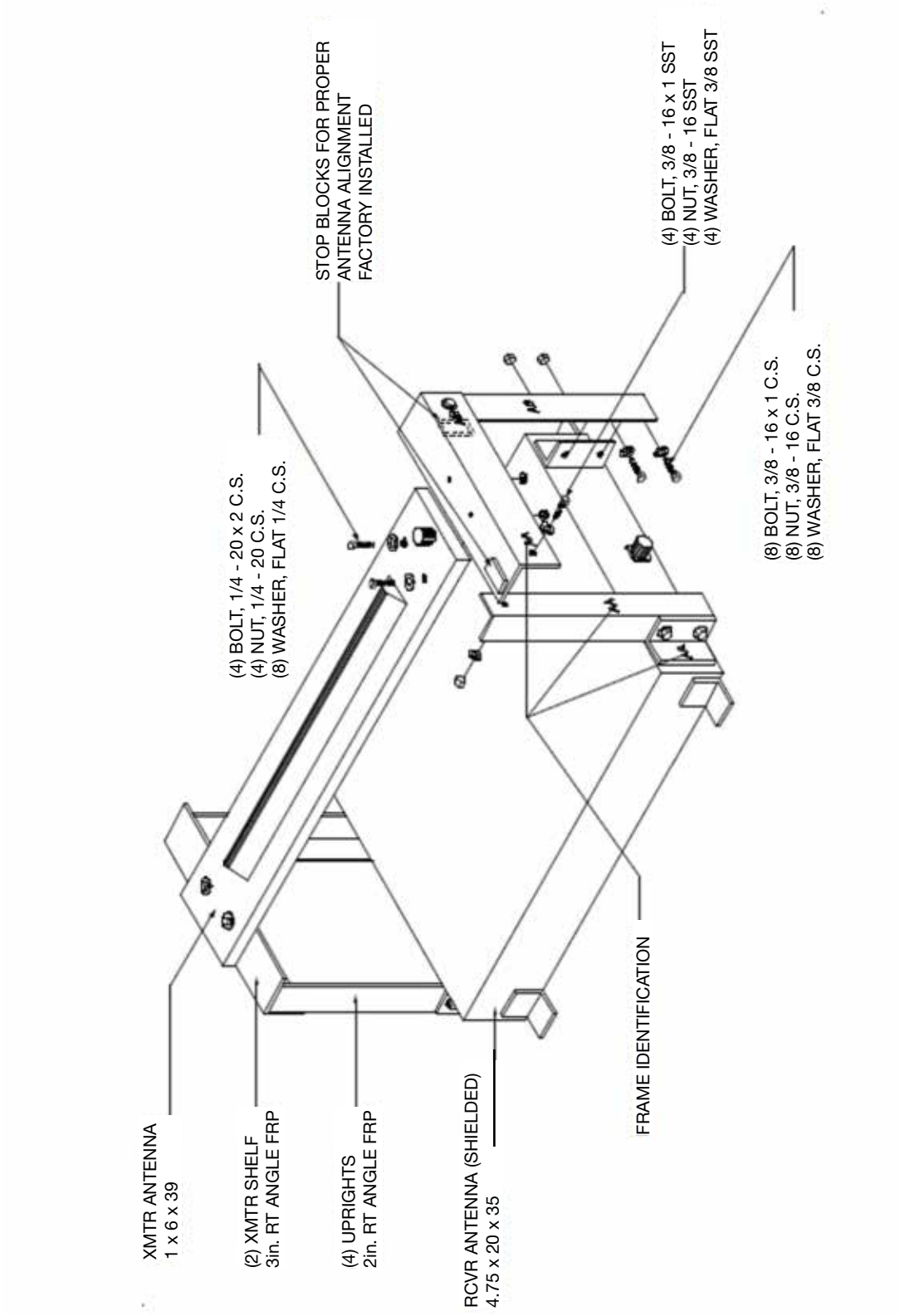


FIGURE 6

Standard Model 1250-E1 Digital Antenna with Four-Post Mounting

Control Enclosure Mounting

After installing the Search Coil Assembly, select a place to mount the Main Control Enclosure for ease of operation and within the length of the cables provided. Avoid high vibration areas.

DO NOT INSTALL IN AN ENVIRONMENT WHERE THERE IS A RISK OF EXPLOSION!

Note the length of interconnecting cables and the location of the connectors on the coil. Locate the Control Enclosure on the same side of the conveyor frame as the connectors for ease in routing the cables.

If a diverter is not being used, it is recommended that the enclosure be mounted near where any detected tramp metal will end up when the belt stops.

1. The Enclosure should be positioned so the front panel hinge is on the Right side and the display is on top. Fix control unit cabinet to wall or frame using the 4 screw holes provided. Ensure that it is securely fixed to support the weight of the control unit (approx. 21lbs [9.5kg]). The detector electronics must be installed in its own cabinet. DO NOT install it in other cabinets with other electrical equipment as there is a high risk of interference.
2. Fabricate and install a sun/rain shade for added protection over the Enclosure if it is mounted outdoors. Do not obstruct the natural airflow around the Enclosure.
3. Familiarize yourself with the type of electrical connections required for this installation and any safety precautions before proceeding. Please refer to the Appendix A control connection diagrams for information about connections and color code hook-up.
4. Use the existing entry holes on the bottom of the Enclosure. Do not run metal conduit along the sides or near the Search Coil Assembly.
5. Transmitter and receiver cables do not need to be in conduit but they need to be secured to the conveyor frame. If there is a danger of cables being cut or damaged by the product then the cables should be routed in conduit, for protection of the cables. **Do not run any power wiring in the same conduit or near the transmitter and receiver cables. Always discuss with Eriez before altering cable length. Always use original cables supplied with unit!**

IMPORTANT

Do not splice or alter cable lengths in any way!

6. Synchronization of several metal detection units: If several metal detectors are installed within 100' (30m) of each other, a shielded 2 core “twisted pair” cable must be used to synchronize them. Refer to wiring diagram for specifics on synchronizing detectors.

Cable Routing

When routing the cabling for the receiver and transmitter antennae, please keep them separate from any conduit that contains AC power connections.

The connections between the antenna and the control enclosure are made via the supplied cabling with XLR connections. All four connections are unique and are not interchangeable.

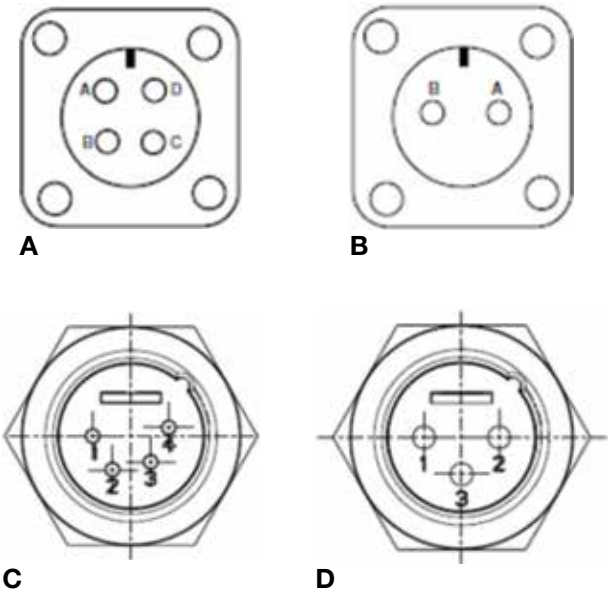


FIGURE 7
Enclosure to Antenna Cabling Connections
A: Four-pin Rx connection at Antenna
B: Two-pin Tx connection at Antenna
C: Four-pin Rx connection at Enclosure
D: Three-pin Tx connection at Enclosure

The connections at the antennae must be screwed into place for a sealed, water-tight connection. The connections for the enclosure are pushed in with the pins matched, until a click is heard. Only when the connection clicks is it mechanically coupled to the enclosure and sealed for an IP65 rating.

Software Setup

Basic Navigation

The enclosure door houses four buttons and a switch for menu navigation. The figure below shows the locations of the Up, Down, Enter, and Reset Buttons, as well as the Power Switch/Escape Button.

To enter the menu system, press any button. Use the up and down buttons to move through the menu selections. To exit any selection at any time, turn the escape switch to the right to return to the previous menu or signal display.

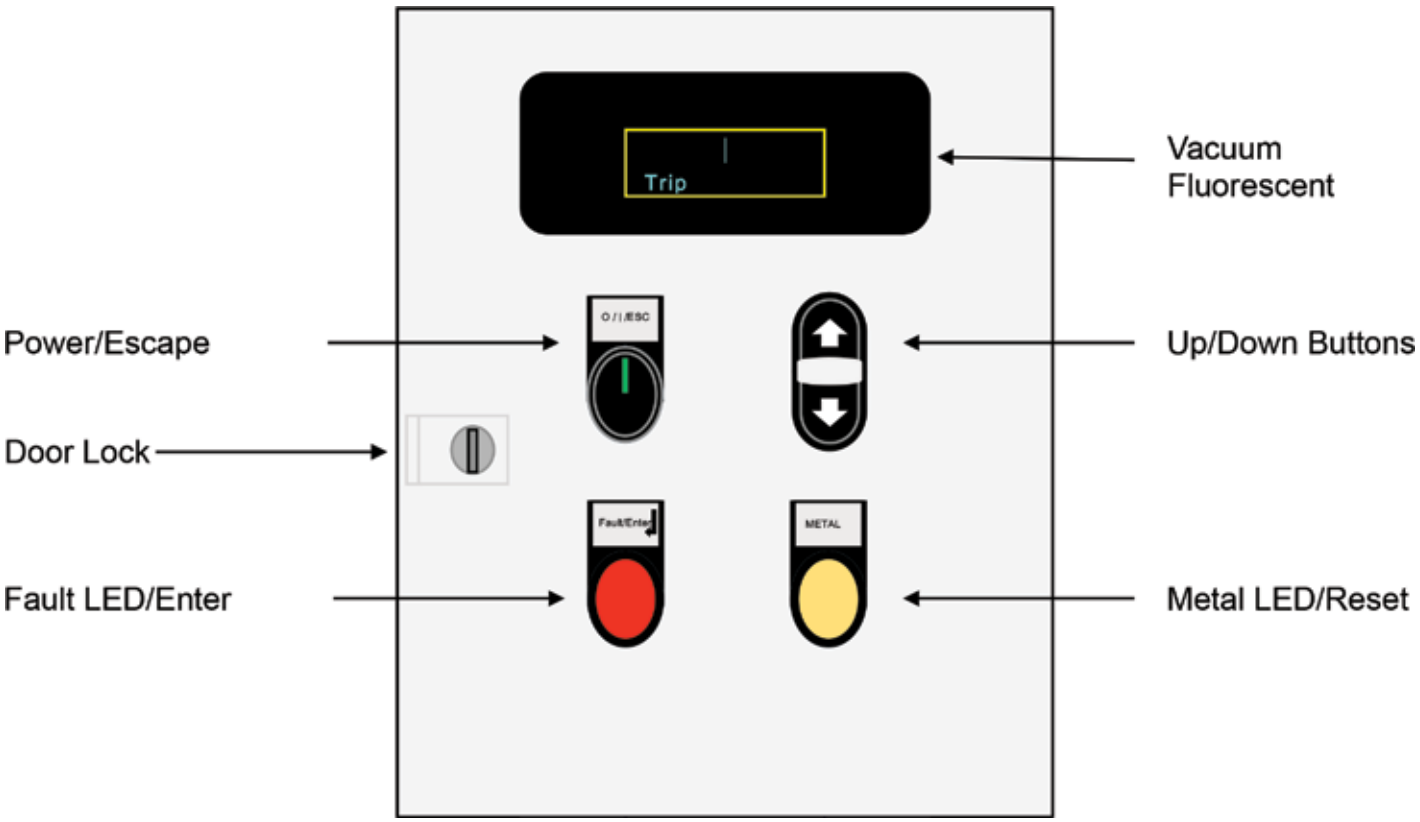


FIGURE 8
User interface layout

Menu Map

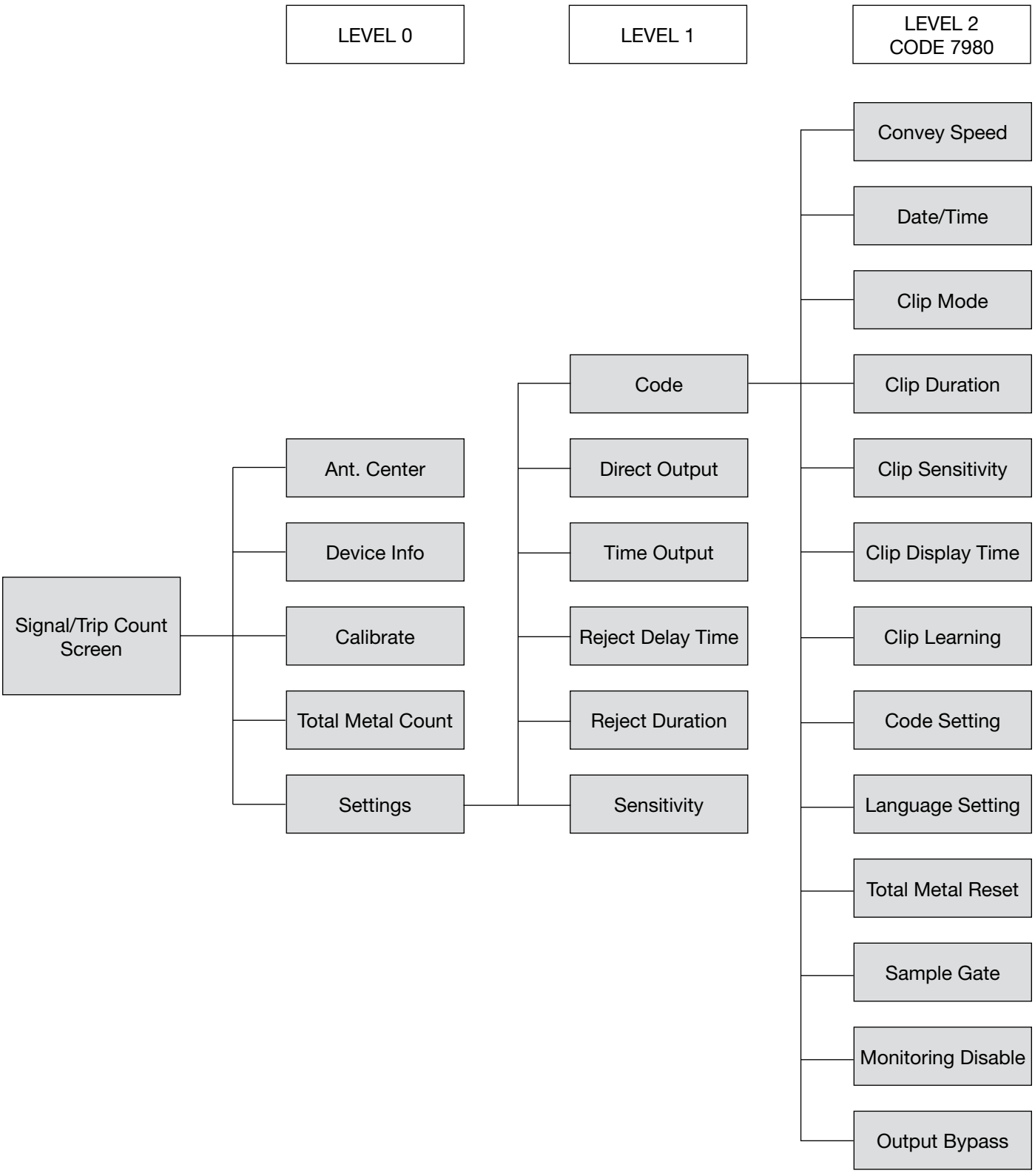


FIGURE 9
Map of menu options

Menu Selections

The details below highlight the functions of each selection in the menu system. They are organized by menu level as seen on the menu map.

LEVEL 0

Settings: This menu selection allows the user to access the various settings on level one that configure the operation of the controller. When the user code is set, entering this selection will immediately prompt for the user code.

Total Metal Count: This menu selection displays the total amount of detections that have occurred over the time in which it has been in operation. This number can be reset in the level 2 menu.

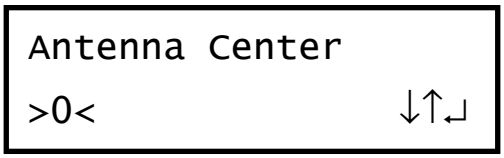
Calibrate: Entering this menu selection prompts a “yes” or “no” designation for the user to enter the calibration routine. If the metal signal has a constant solid bar or group of bars illuminated during operation due to material being conveyed or other EMI issues, select yes to enter the calibration routine and resolve the issue. Please note, initiating the calibrate function should be done only after the installation is complete according to the instructions in this manual. Calibrating with a poor installation may result in low sensitivity.

Device Info: This menu selection has two options:

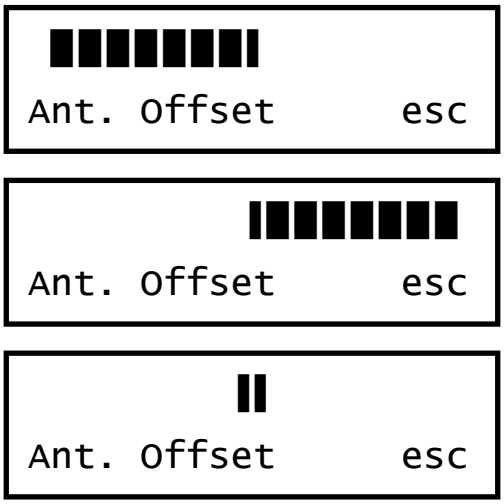
- **Software Version:** Indicates the numerical version of the software.
- **Logbook:** Entering this menu selection allows the user to cycle through the timestamped events recorded by the detector during operation. Events such as power cycling (turning on/off), faults and metal detection events are recorded.

Antenna Center: This should only be required if you are replacing an older 1250-E1 Digital electronics with a new Model 1250-E1 Digital electronics, or if you have a lot of metal around the detector. It is recommended metal near the detector is removed prior to performing this procedure.

1. Place the provided jumper wire between the Out test point and TP 500 on the termination board.
2. Repeatedly press the up arrow until Antenna Center is shown.
3. Press the enter button to select.



4. The bar graph indication will show how far the offset is for the antenna as an increasing graph the farther away from center. The indicator is for rough centering and will provide adequate centering that will be approximately +/- 250mV from center. This is adequate for most operations. However fine tuning can only be performed with an oscilloscope attached to the out test point.
5. Loosen and remove the bolts securing the transmitter antenna.
6. With the antenna resting loosely on the mounting brackets, slide it upstream or downstream to identify the direction required to reduce the bar graph signal.
7. Move the antenna until the offset graph disappears from either side and the remaining || is displayed.



8. Ensure the antenna is perpendicular to the belt, by verifying the gap between the bracket and the back of the antenna is identical on both sides. This will give the safe range of operation for the offset.
9. Clamp the antenna in place and drill new holes in the mounting bracket by chasing the holes in the antenna. Reinstall and secure the antenna using the mounting bolts removed in step #5.
10. Press the esc key, and remove the jumper from the Out and TP 500 test points.
11. Verify normal operation and sensitivity of the newly installed electronics.
12. In the event, the antenna offset can’t be completed due to antenna contact with the uprights. The polarity of the receiver can be switched to allow for moving the antenna further away to find center.

On the interior of the enclosure, connecter ST7. Swap the position of the black and white wires, and repeat antenna position centering.

LEVEL 1

Sensitivity: This menu selection allows the user to adjust the sensitivity level of the detector by pressing the up and down buttons. The value displayed is the percentage of the sensitivity of the detector, meaning at 100%, the detector is operating with maximum sensitivity. This setting is primarily used to calibrate the detector for specific size/type of metal to be detected. Reducing sensitivity can be used to reduce false detections, but it is better to find the source of the false detection and correct it.

Reject Duration: This menu selection allows the user to set the amount of time in which the timed output relay stays on. This setting is ideal for operation of diverters, electromagnets or other timed tramp metal removal devices.

Reject Delay Time: This menu selection allows the user to set the amount of time between metal being detected and the timed output relay switching. This delay is meant to allow the tramp metal to travel to the diverter or other removal device before activation.

Timed Output: This menu selection allows the operator to choose between “manual” and “automatic” reset options. If manual reset is chosen, once metal is detected, the timed output relay will remain switched until an operator presses the reset button or initiates a remote reset. If automatic reset is chosen, once metal is detected the timed output relay will remain switched for the programmed period of time (Reject Duration)

Direct Output: This menu selection allows the operator to choose between “manual” and “automatic” reset options. If manual reset is chosen, once metal is detected, the direct output relay will remain switched until an operator presses the reset button or initiates a remote reset. If automatic reset is chosen, once metal is detected the direct output relay will remain switched for 1 second and then switch back.

Code: Entering this menu selection prompts the user for an access code to access menu level 2. Pressing up or down cycles through the numbers, and pressing enter enters the number on the display before moving to the next. The code for accessing menu level 2 is 7980.

LEVEL 2

CODE 7980

Convey Speed: This menu selection allows the user to optimize the detection algorithm for belt speed. The belt speed is entered in meters per second. (1fpm = .00508m/s)

Date/Time: This menu selection allows the user to enter the date and time. Pressing enter begins the date/time entry prompts, moving the up and down buttons changes the values shown on the display. The time is retained by the system via a backup supercapacitor after the unit is switched off. The maximum time in which the date and time are retained is 36 hours without power.

Clip Mode: This menu selection allows the user to select whether single or dual clip mode is in use during operation.

Clip Duration: This menu selection allows the user to manually input the time in which clip mode is active. (not used in dual clip mode)

Clip Sensitivity: This menu selection allows the user to manually input the sensitivity level for clip mode.

Clip Learning: This menu selection begins the clip learning mode. When ready to run the belt with the clips and clip detectors installed, press enter. The screen will change to **“waiting for clip”**. When you can be sure the clip will pass through the detector within 15 seconds, press “Enter” and the screen will change to **“learning mode activated”**. When the belt clips/splice is detected by the clip detector the display will change to **“clip detected”** and will remain until the clips pass. During this process it will record:

1. Time for clip to pass through the detector and exit the metal free zone
2. The sensitivity reduction required to allow the clip to pass without tripping the metal detector.

Once clip learning is complete the display will show:

Duration: XX seconds
(This is not shown in dual clip mode)

Sensitivity: XX%

Press Enter to confirm the values received, or hit “ESC” to start the learning process again.

If the clips or splice are not detected check your clip detector wiring, and position of clip detector relative to the belt clips / splice. The sensing range for the clip detector is only about 1.5" (40mm) from the top face of the clip sensor.

Code Setting: This menu selection allows the user to set the four digit access code. This code takes effect at Level 1.

Language Setting: This menu selection changes the language setting for the display.

Total Metal Reset: This menu selection allows the user to set the total metal count zero.

Sample Gate: This menu selection allows the user to select one of five preset sample gate settings. The sample gate is used to tune out conductive materials on the belt such as some metallic ores. If the metal detector appears to be tripping on the material you can change the sample gate to a higher number to attempt to tune out the material more effectively.

Monitoring Disable: This menu selection allows the user to disable certain fault monitoring functions. This is used for troubleshooting. Primarily used for disabling transmitter and receiver connection faults for disconnecting antennas to find source of false detections.

Output Bypass: This menu option allows the user to disable the relay outputs whenever a metal detection event occurs. This is commonly used for troubleshooting to prevent the relays from switching while working on the detector. The detector functions normally in bypass mode, but the metal detection relays will not switch.

Basic Operation

Signal Display

The main display of the metal detector shows the signal level of the search coils in real time, the threshold bar for detection, and a read out of how many trips have occurred since the metal reset button was last pressed.

Depending upon installation conditions, the metal detector can be set to a high enough sensitivity such that background noise will trip the threshold. When the bars below the threshold bar illuminate for more than three or four bars during normal operation, then the user should consider lowering the sensitivity and recalibrating.

Setting Sensitivity

There are several ways in which the sensitivity of the metal detector can be adjusted. The most direct way is to adjust the percentage found on the “Sensitivity” selection in Menu Level 1. The sensitivity of the metal detector is best chosen based on speed and a target piece of metal. Typically, these specifications are given and tested prior to shipping the detector, but there can be different needs and materials encountered during the life cycle of the detector that require adjustment.

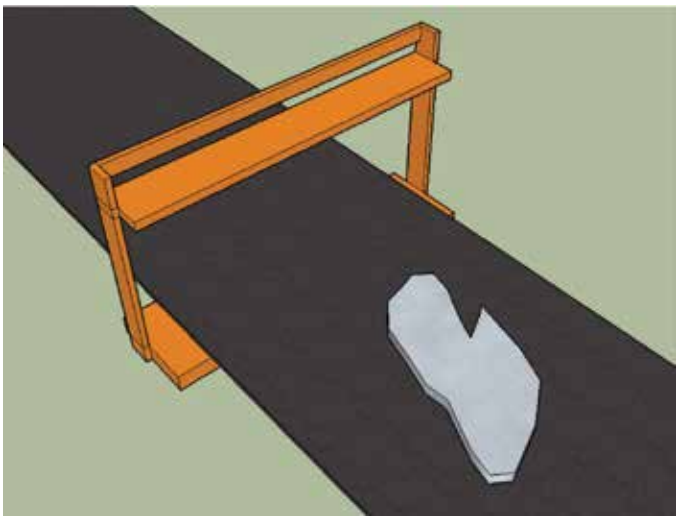
To properly determine a target piece, one must take into account size, material, and symmetry of the target.

Size: The signal strength of detector correlates with the surface area of the metal moving through the aperture. Because of this, hollow or empty containers such as cans and buckets can give as high of a signal (or higher in some cases) as a solid piece of metal in the same shape. Because of this, relatively harmless material such as foil may be detected in the same way as harmful material such as bolts and chains.

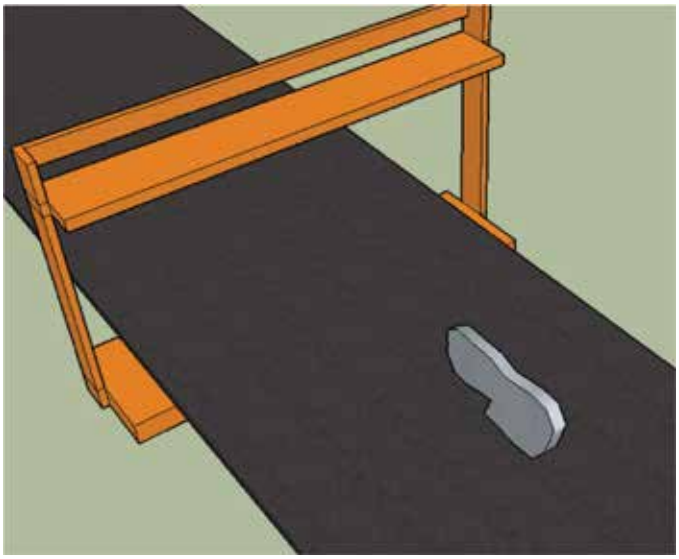
Material: Different types of material give different signal levels. When selecting a target piece, please note that tramp metal made of other material may be more or less sensitive than the chosen target piece. The order of signal strengths are as follows:

1. Magnetically sensitive metal (Iron, Steel, Nickel)
2. Non-magnetically sensitive, highly conductive metal (Aluminum, Copper, Tin)
3. Non-magnetically sensitive, poorly conductive metal (Stainless Steel, Bronze, other alloys)

Symmetry: When choosing a target piece, a symmetrically shaped piece will give the most consistent results and apply to the selection chart in the most direct way. Unfortunately, what is desired to be caught by the detector is often asymmetric and will give different signal strengths with different orientations as the metal moves through the aperture.



"X" ORIENTATION



"Z" ORIENTATION

FIGURE 10
Example of different orientations

Eriez Rating: Eriez rates the smallest detectable size of metal by a percentage of aperture height, that is, the distance from the top of the receiver to the bottom of the transmitter. The following tables show the minimum sized cubes of metal that the different models can detect for carbon and stainless steel

Minimum Size Cube of Carbon Steel Detected (Inch)

Burden Height/Belt Rise (in.)	Aperture Height (in.)	2.5% Model 1250-E1 Digital
6	10	0.250
7	11	0.275
8	12	0.300
9	13	0.325
10	14	0.350
11	15	0.375
12	16	0.400
13	17	0.425
14	18	0.450
15	19	0.475
16	20	0.500
17	21	0.525
18	22	0.550
19	23	0.575
20	24	0.600
21	25	0.625
22	26	0.650
23	27	0.675
24	28	0.700

Minimum Size Cube of 304 Stainless Steel Detected (Inch)

Burden Height/Belt Rise (in.)	Aperture Height (in.)	3.6% Model 1250-E1 Digital
6	10	0.360
7	11	0.396
8	12	0.432
9	13	0.468
10	14	0.504
11	15	0.540
12	16	0.576
13	17	0.612
14	18	0.648
15	19	0.684
16	20	0.720
17	21	0.756
18	22	0.792
19	23	0.828
20	24	0.864
21	25	0.900
22	26	0.936
23	27	0.972
24	28	1.008

Output Modes

Within the menu system there are two different modes in which the detector switches the two relays available to indicate detection: Manual and Automatic. (Level 1 of menu system)

Manual: This mode switches the output relay immediately and illuminates the yellow “Metal” light immediately. The relay will remain on until an operator presses the reset button.

Automatic: This mode allows the metal detector to operate the output automatically without the need for pressing any buttons. The delay and duration of the relay output are configurable in the level 1 selections: “Reject Delay Time” and “Reject Duration”.

Clip Mode

For some applications, belts will have metal clips for spliced or damaged belts. These clips could potentially set off the metal detector depending on the type of material they are made of and how sensitive the detector settings are. To avoid detection of the clips, a separate detector for the clip can be purchased. This detector enables “clip mode” whenever a clip is detected.

In “clip mode” the detector reduces its sensitivity to allow the clip to pass undetected, but still high enough to detect metal in the vicinity of the clip. Clip mode can be activated for single and dual clips. For dual clips the timing and sensitivity can be either manually entered into the system, or set automatically in the “Clip Learning” selection of the Level 2 menu. For hardware connections and installation of the clip detectors, please refer to the Hardware section of the manual.

Faults

There are certain conditions that may prove hazardous to the electronics of the detector that are automatically sensed during operation. When one of these conditions occur, the detector stops operation, activates the “Fault” relay and awaits evaluation. The display will show the fault condition that has occurred. To translate the fault message to the condition that has been sensed, please refer to the troubleshooting section. Once the condition has been fixed, or evaluated to be non-harmful, pressing the Enter button will resume operation of the detector. The logbook found in the “Device Info” selection of menu Level 0 will record each fault event.

Hardware Connections

Terminal Block I/O

Eriez metal detectors have a user I/O terminal block for power, metal event signaling, fault event signaling, and accessory connections with higher power requirements. The following images and wiring schematics detail the connections available to the user.

Fuse: The connection at the end of the terminal block houses a 240V 5A fuse. An indicator light glows when it blows.

Control Board Connections: These connect to the control board, and should not be tampered with.

Auxiliary/Parallel Connections: The middle row is available for parallel connections and accessories.

Input Section: The bottom row of the terminal block is removable without disconnecting any wires. Used for removing electronics from enclosure for service.

Power: The connections for power input are shown below. The power supply module is rated for either 240 or 120VAC from 50-60 Hz.

Direct and Timed Outputs: The direct and timed outputs feature dry contact relays rated for 250V AC at 5 A, or 30V DC at 5 A. The wiring as well as the closed and open circuit conditions are shown in Figure 13.

Fault Signal Output: The signal indicating a fault condition and shut down of the metal detector features a dry contact relay rated for 250V AC at 5 A, or 30V DC at 5 A. The wiring as well as the closed and open circuit conditions are shown in Figure 14.

Remote Reset: Resetting the detector after a metal detection can be done remotely by connecting a SPST switch that connects terminals 13 and 14 when closed. The wiring for this configuration is shown in Figure 15. **DO NOT APPLY VOLTAGE ACROSS THESE CONTACTS!**

Auxiliary Power: The controller board supplies 24 V DC power for accessories and other devices. The wiring for this auxiliary power is shown in Figure 16.

Spray Marker: To wire the 24V DC spray marker, connections to both the auxiliary power and timed output are made.

See following pages for diagrams related to these connections

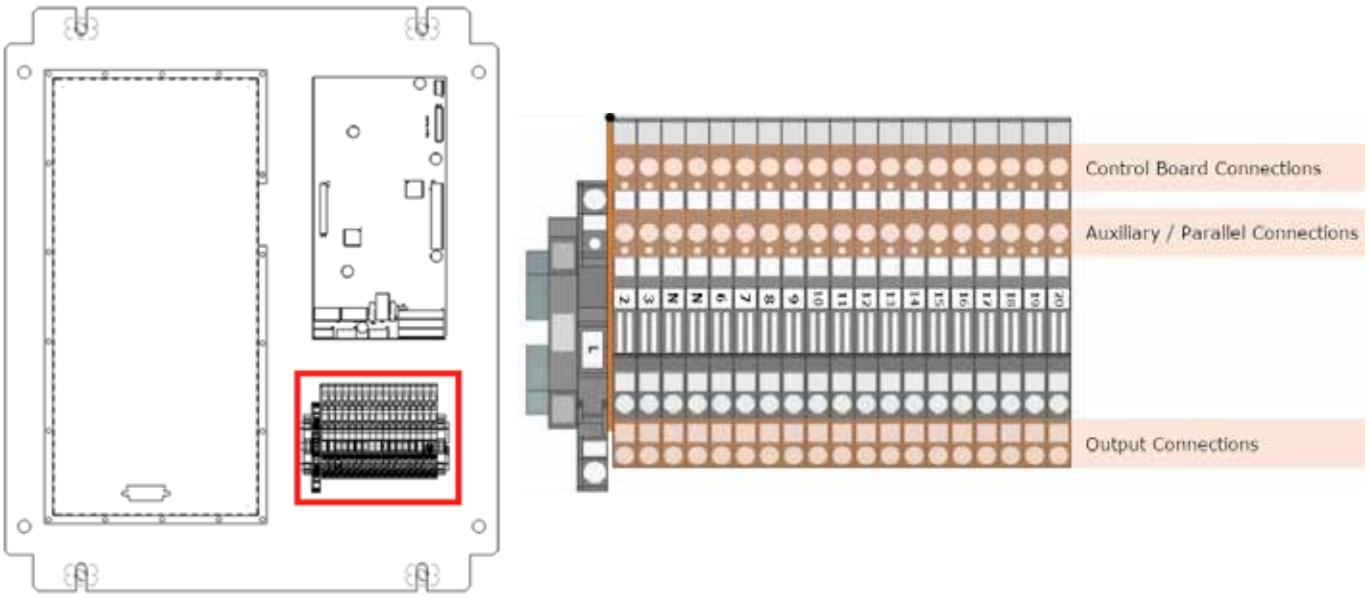


FIGURE 11
Location and close-up of terminal block I/O

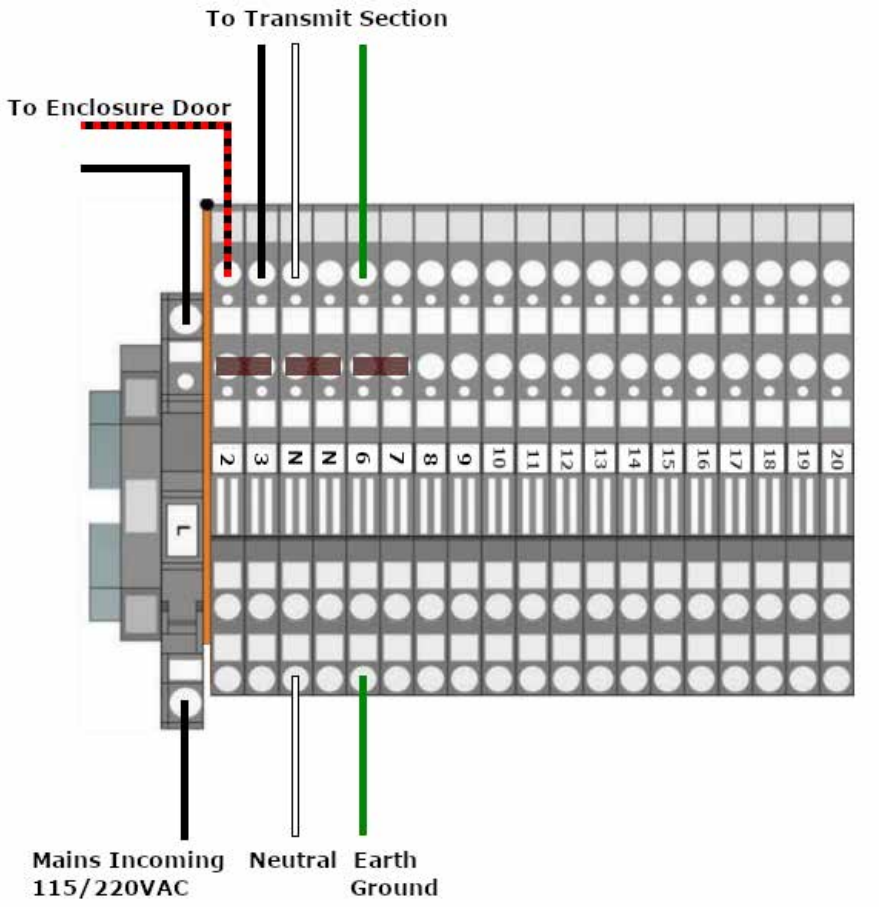


FIGURE 12
Wiring diagram for input power connections

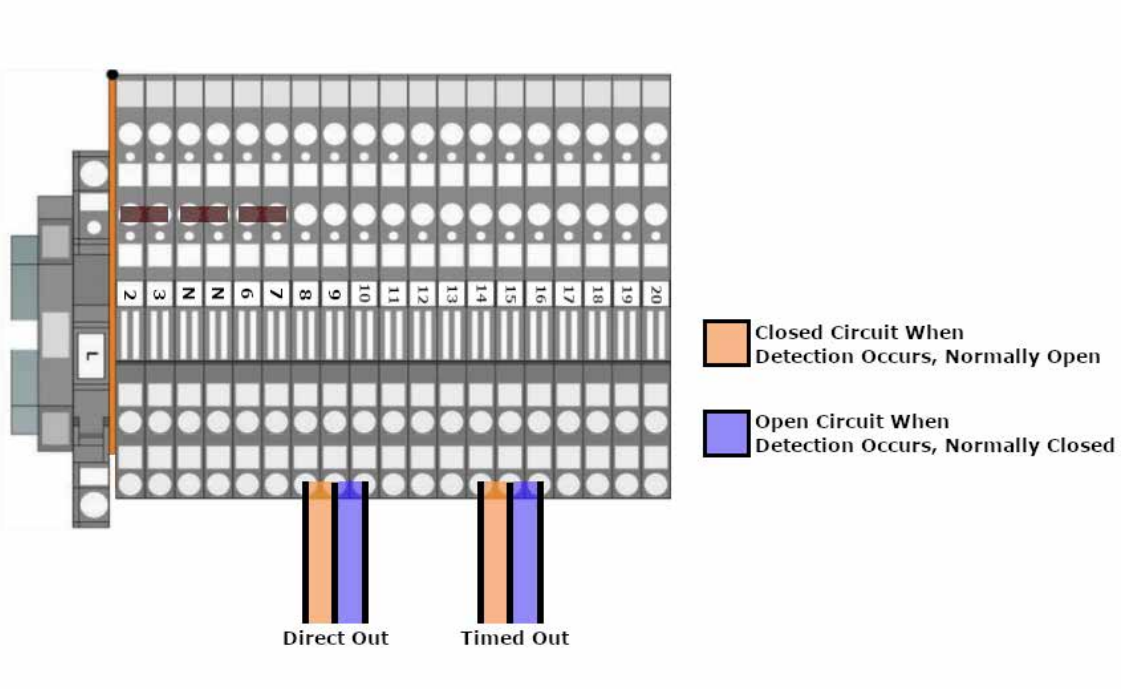


FIGURE 13
Wiring diagram for direct and timed outputs

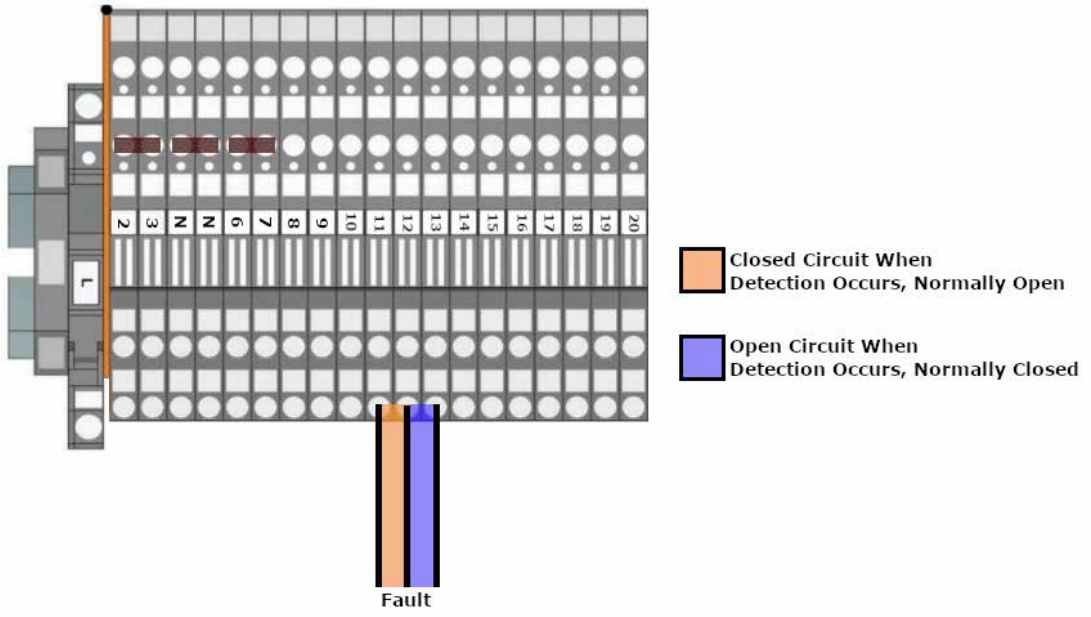


FIGURE 14
Wiring diagram for fault output

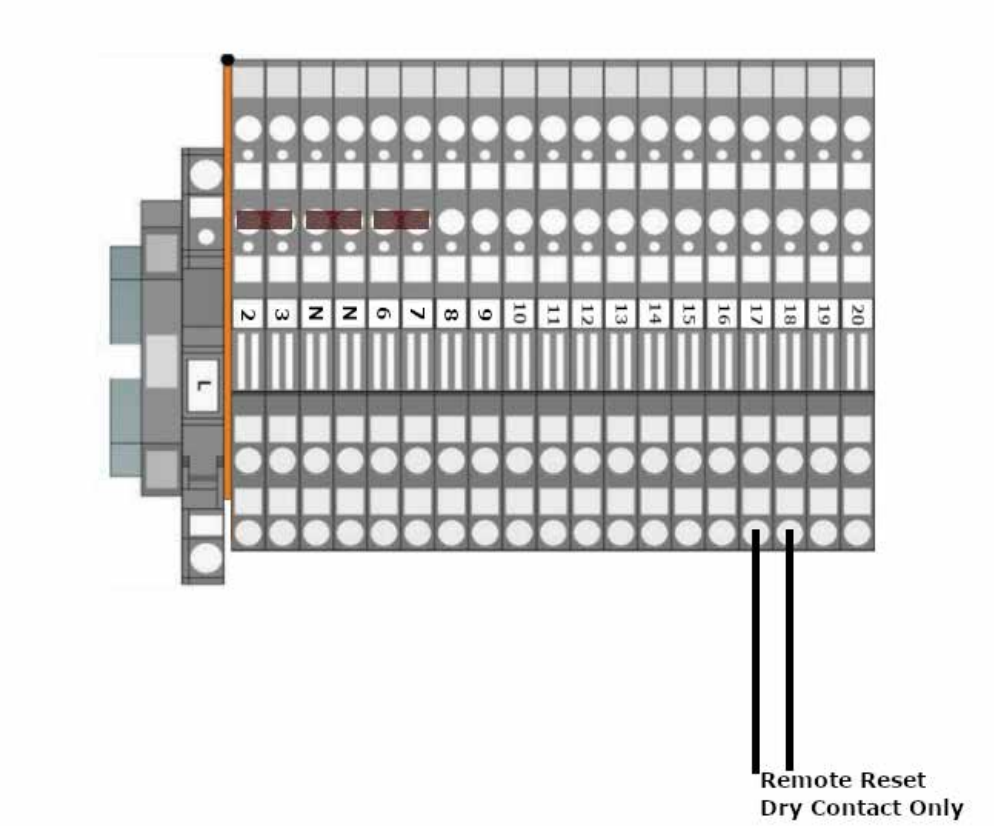


FIGURE 15
Wiring diagram for remote reset

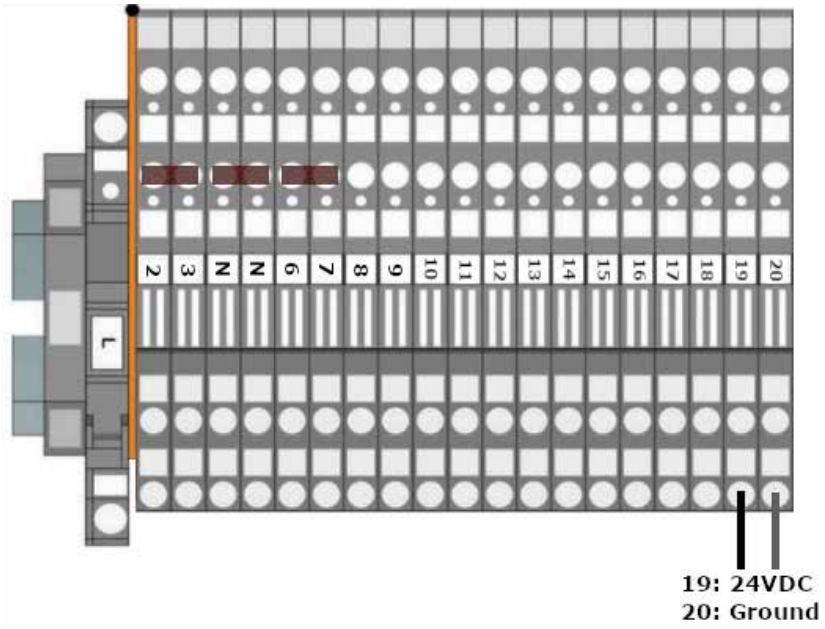


FIGURE 16
Wiring Diagram for Auxiliary Power

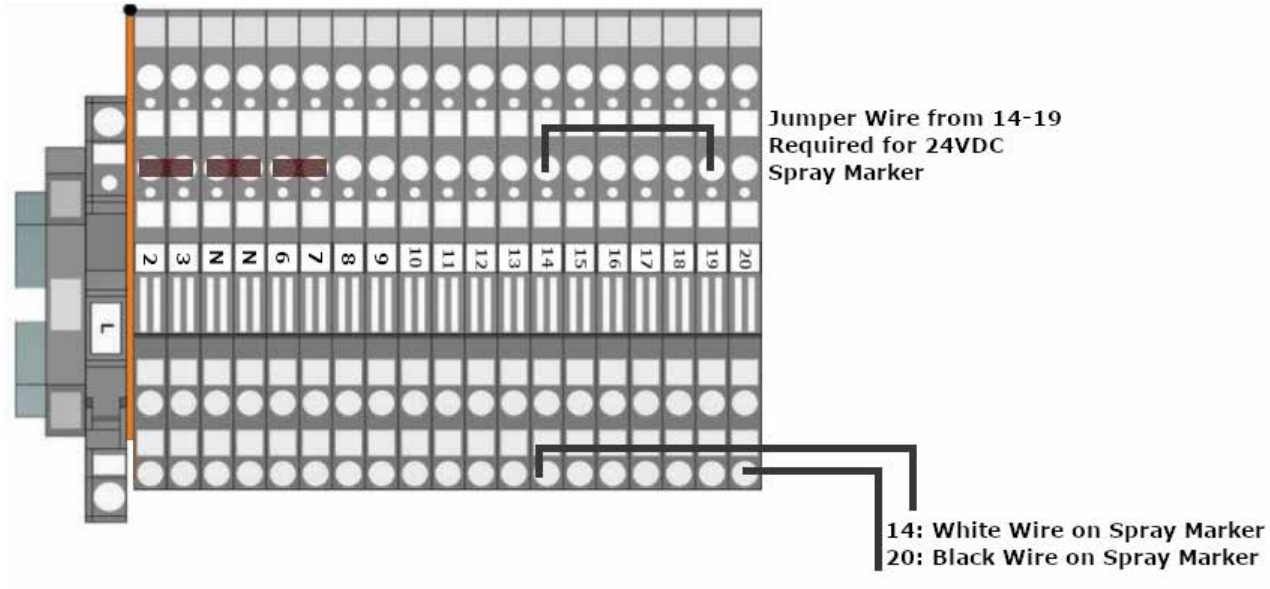


FIGURE 17
Wiring diagram for spray marker

Control Board I/O

In addition to the I/O of the terminal block, the control board also houses I/O terminals for connecting peripheral devices such as clip detectors, spray markers, and alarm devices. An image of this section of the board is shown in Figure 18.

Clip Detector 1: The first or single clip detector connects to terminals 1-3 on the control board terminal. The wiring is shown in Figure 19.

Clip Detector 2: If applicable, a second clip detector connects to terminals 4-6 on the control board terminal. The wiring for this is shown in Figure 20.

Synchronizing Two Detectors: When using another or several detectors within 50' of each other, synchronizing the timing of the detectors can prevent possible interference. The wiring connections for synchronizing two detectors are shown in Figure 21.

Swing Away Switch: The “swing away” switch is an optional switch connected to the transmitter swing away arm indicating that overburden material has swung out the transmitter and the signal created is not a metal detection. The wiring configuration is shown in Figure 22.

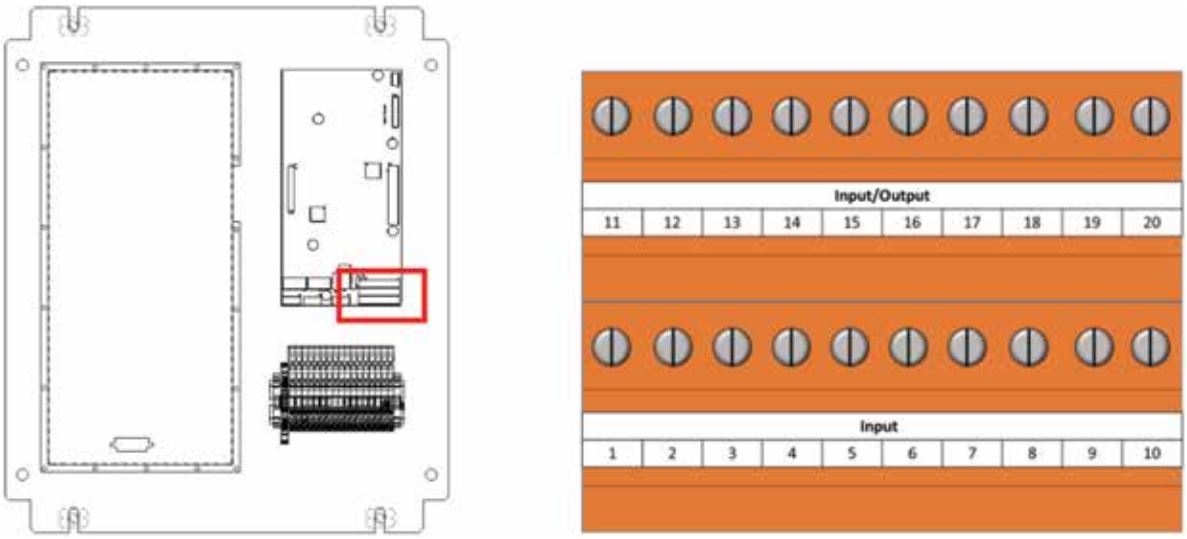


FIGURE 18
Location and close-up of Control Board I/O

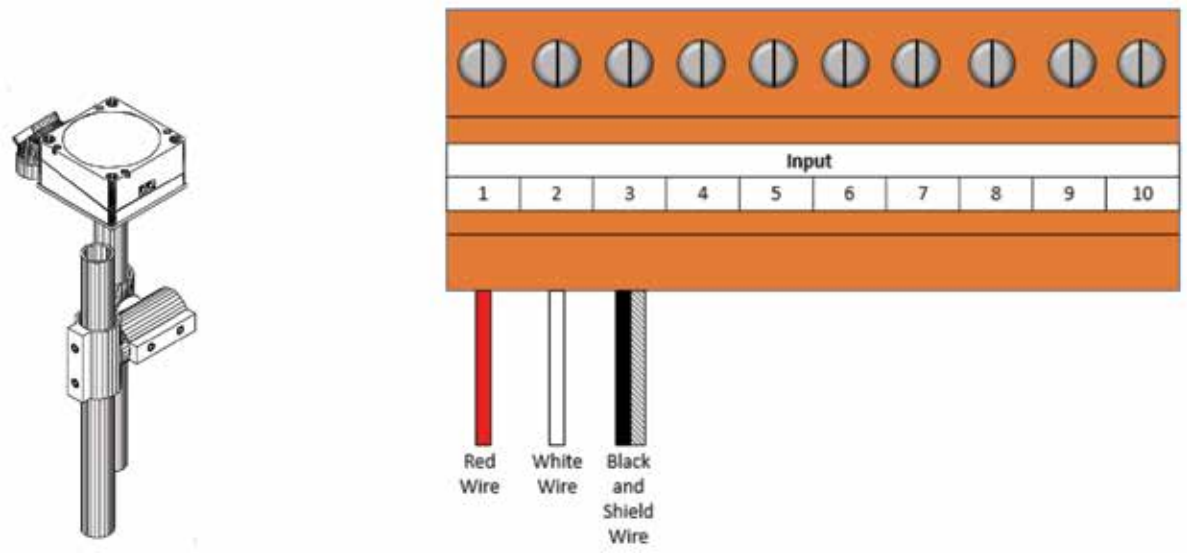


FIGURE 19
Wiring diagram of clip detector 1

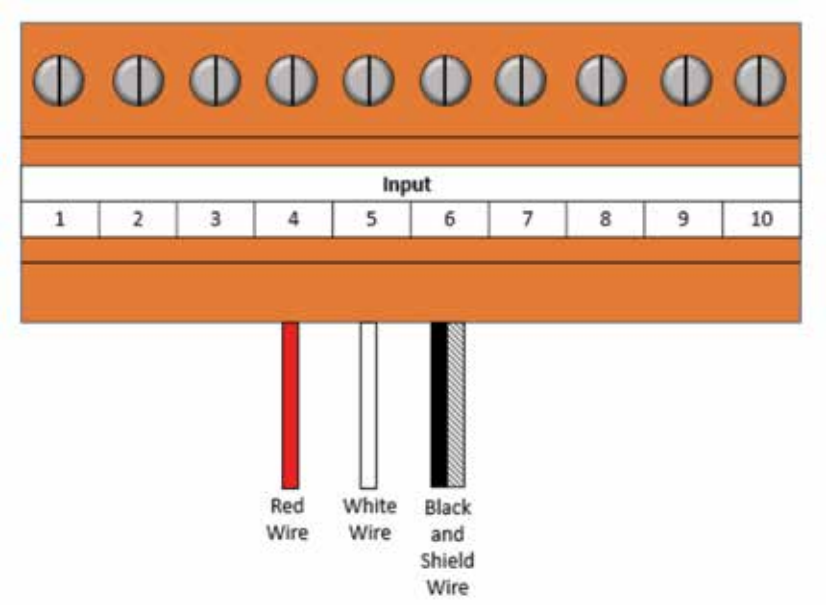


FIGURE 20
Wiring diagram of clip detector 2

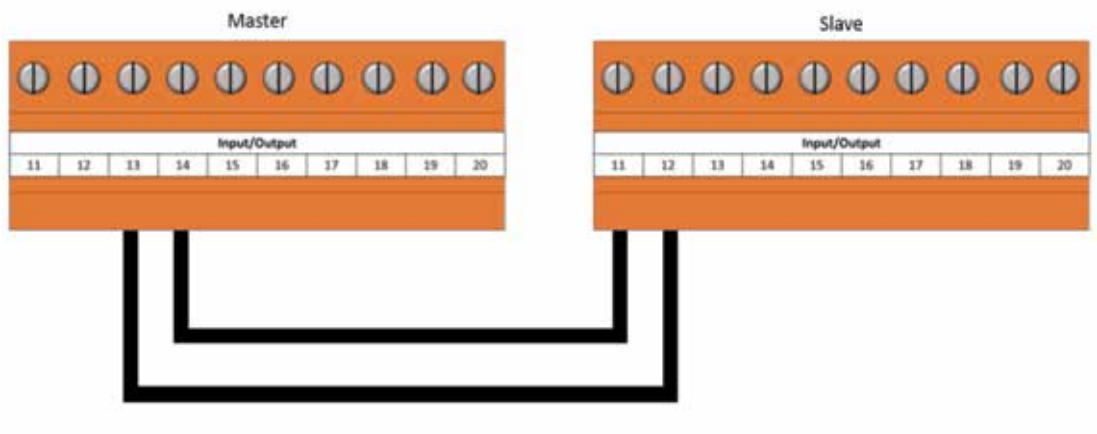


FIGURE 21
Wiring diagram for two synced detectors

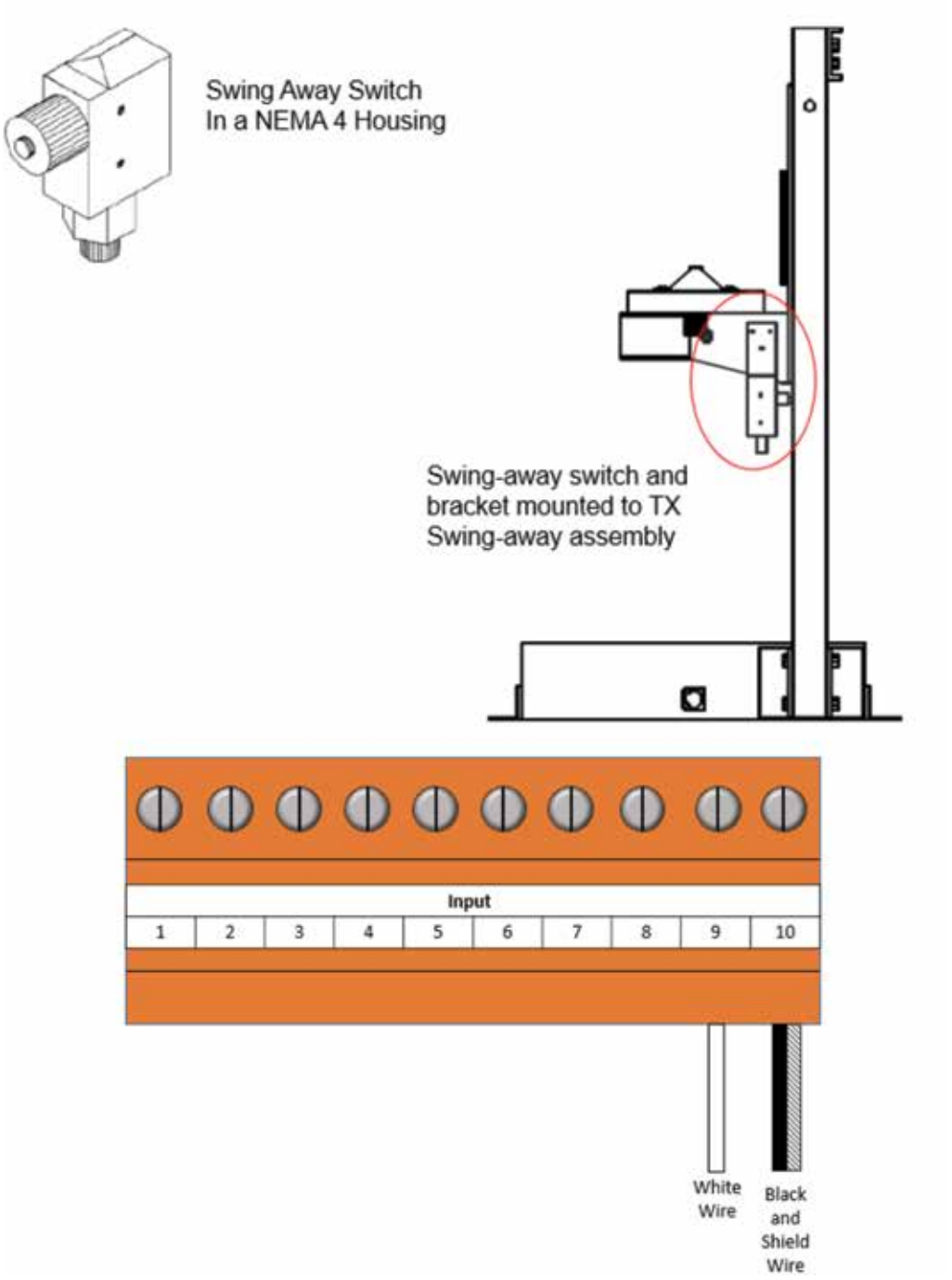


FIGURE 22
Wiring diagram for swing away switch

Voltage Regulator

If remote generators are being used to power the equipment, a voltage regulator is recommended to condition the power supplied to the detector. This helps eliminate noise frequently encountered from generators.

Voltage Regulator Terminal 1 – Input Power 115VAC or 220VAC
Voltage Regulator Terminal 2 – Input Neutral or 220VAC
Voltage Regulator Terminal 3 – Ground (Earth) (Input and Output)
Voltage Regulator Terminal 4 – Output Neutral or 220VAC
Voltage Regulator Terminal 5 – Output 115VAC or 220VAC

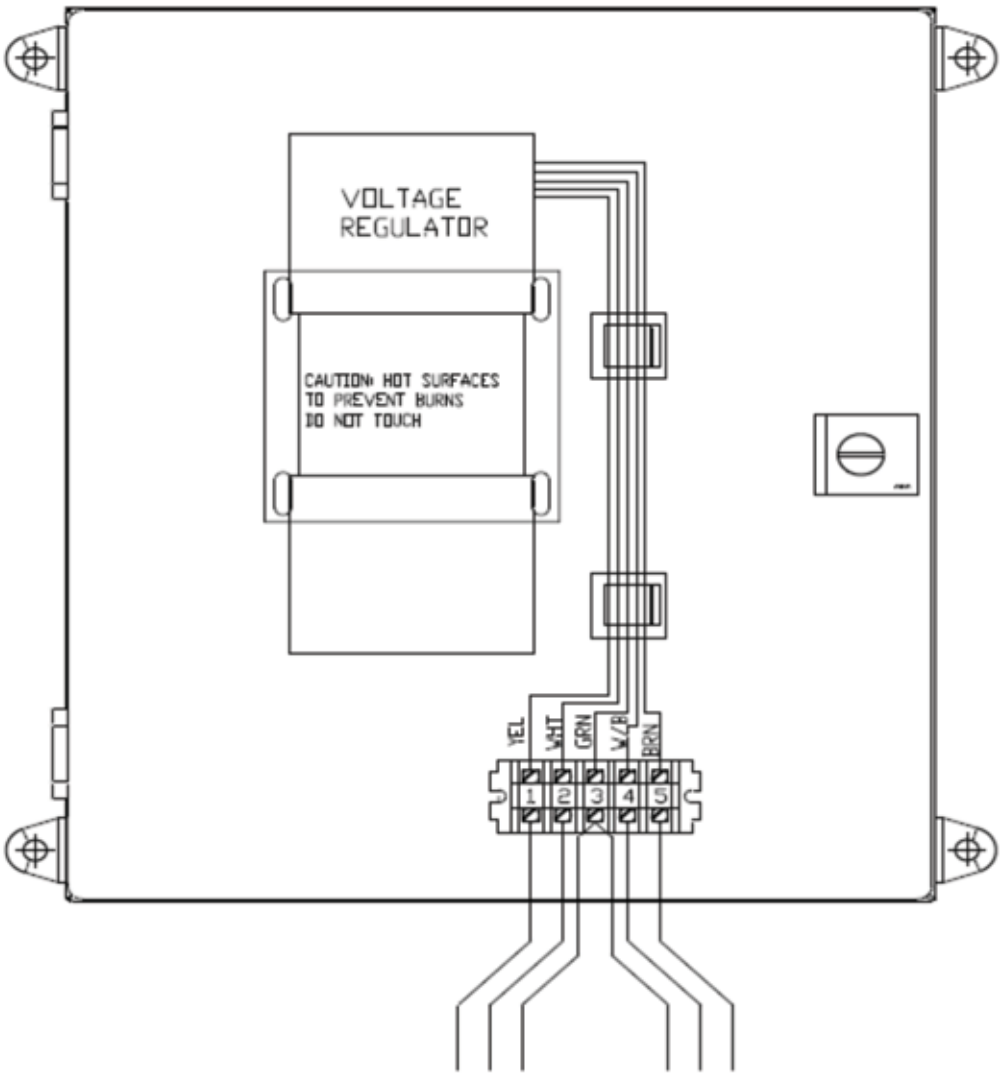


FIGURE 23
Wiring diagram for voltage regulator

Accessories

Swing Away Switch

The swing-away switch is a switch mounted on the swing-away bracket. Its purpose is to prevent the metal detector from tripping when the transmitter coil is hit by an overburden of material. Route the free end of this cable in the same conduit as the transmitter cable to the main control enclosure. Be sure to leave enough slack in the cable to allow the transmitter antenna to swing freely.

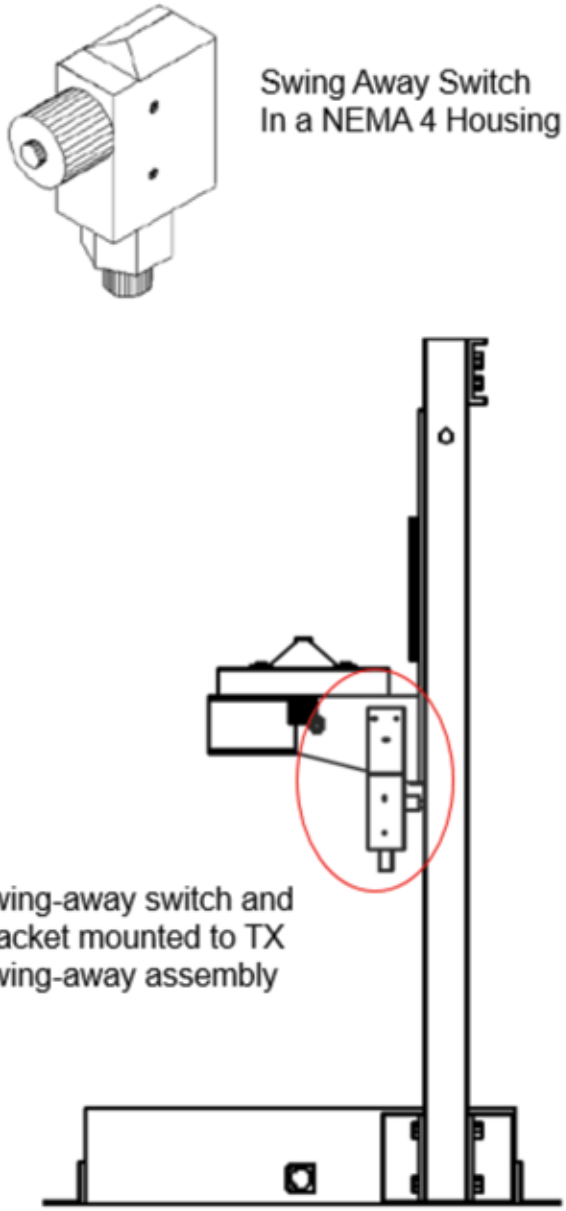


FIGURE 24
Diagram of swing away switch as installed

Clip Detector

The clip detector consists of a compact sensor head and mounting bracket. The clip detector senses the proximity of repair clips as they pass over the sensor's head. Once the clips are detected, the Metal Detector is desensitized, but not disabled. Any large piece of metal riding on the clips will still trigger the Detector. Clip Detector assembly comes with swivel mounting bracket 25' cable optional length available.

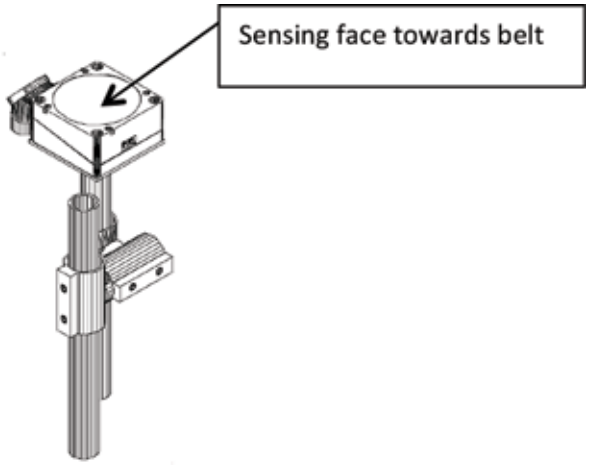


FIGURE 25
Diagram of clip detector

Two clip detectors are used when the belt is variable speed, one is mounted upstream of the first upstream adjacent idler roller and the second is mounted downstream of the first downstream adjacent idler roller. The first clip detector senses the clips and signals the metal detector to enter "clip mode" to reduce sensitivity and allow the clips to pass. The second clip detector confirms the clips have passed and returns the metal detector to normal operation.

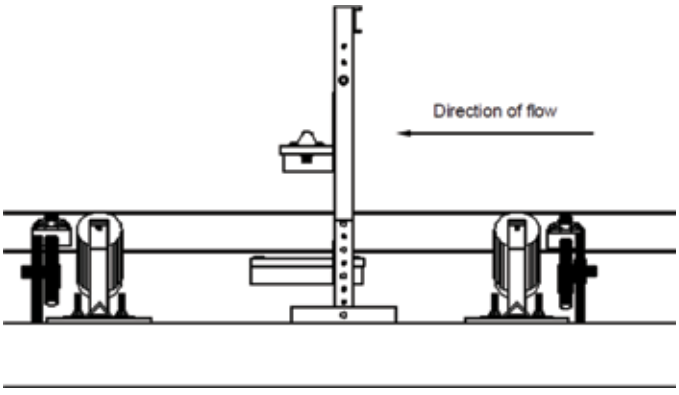


FIGURE 26
Example of dual clip detector installation

Installation

For best results, please use stainless steel clips for repairs and splices.

If there are idlers adjacent to the antenna, position the Clip Detector Sensor approximately 2" upstream of the nearest upstream idler before the Search Coil Assembly. For slider bed type conveyors, position the Clip Detector Sensor approximately (but no closer than) 2' from the center line of the receiver antenna on the upstream side of the Antenna Assembly. The flat face of the Clip Detector should be facing toward the belt with approximately 1/2" to 1" of clearance. **This clearance must be maintained in order to assure proper operation.** The Clip Detector should be a few inches from the edge of the belt. Do not mount the Sensor too far from the edge, as tramp metal lying close to the belt may trigger the sensor and pass through the search coils as a repair splice.

With the Clip Detector Sensor in the proper position below the belt, weld the 3/4" support pipe (provided) to the conveyor frame. The pipe may be cut to the proper size for an easier fit. The multi-axis swivel joint will provide adequate movement for proper adjustment.

It is recommended that the Clip Detector cable running to the Main Control Enclosure is installed in conduit. The same conduit that houses the transmitter coil cable may be used. Please refer to the Hardware Connections section for wire connections to the controller.

If a small patch of clips are used on the belt which would not pass directly over the clip detector, reference clips are required. Reference clips are made by installing two or more clips which will pass directly over the clip detector to trip it. Numerous repair and reference clips on the belt will degrade the Detector's performance because it will frequently be desensitized. The clip delay time must be increased to allow the entire repaired area to pass the first downstream idler roller. For long repairs it is better to have more reference clips closer together and shorter clip delay times, this will reduce the length of time the detector is in clip mode for normal splice and for shorter repaired areas.

Clip Detector set up – Clip Learning

When ready to run the belt with the clips and clip detectors installed, press enter. The screen will change to **"waiting for clip"**. When you can be sure the clip will pass through the detector within 15 seconds, press "Enter" and the screen will change to **"learning mode activated".** When the belt clips/splice is detected by the clip detector the display will change to **"clip detected"** and will remain until the clips pass. During this process it will record:

1. Time for clip to pass through the detector and exit the metal free zone
2. The sensitivity reduction required to allow the clip to pass without tripping the metal detector.

Once clip learning is complete the display will show:

Duration: XX seconds
(This is not shown in dual clip mode)
Sensitivity: XX%

Press Enter to confirm the values received, or hit "ESC" to start the learning process again.

If the clips or splice are not detected check your clip detector wiring, and position of clip detector relative to the belt clips / splice. The sensing range for the clip detector is only about 1.5" (40mm) from the top face of the clip sensor.

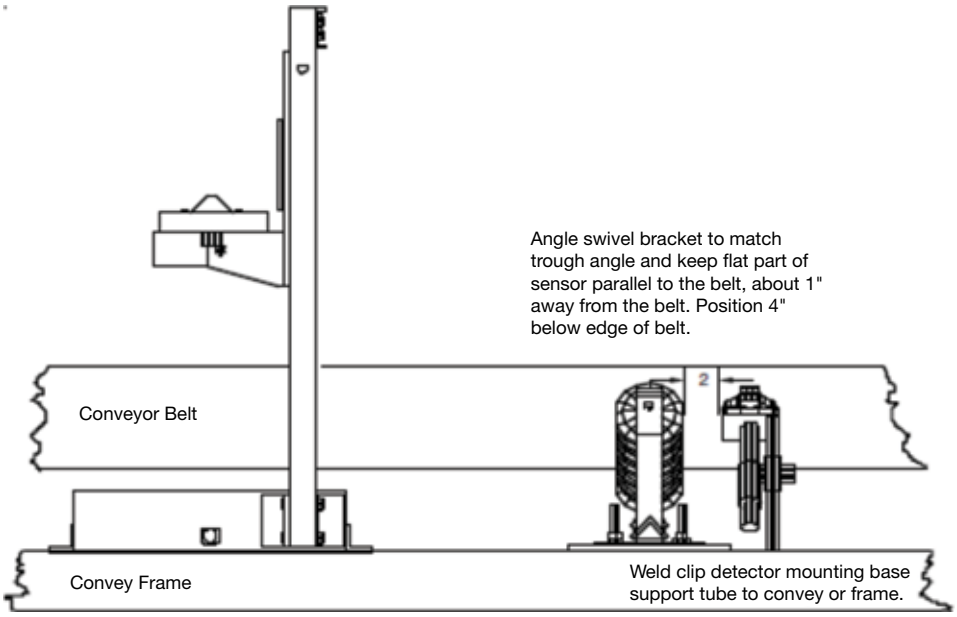


FIGURE 27
Example of clip detector installation

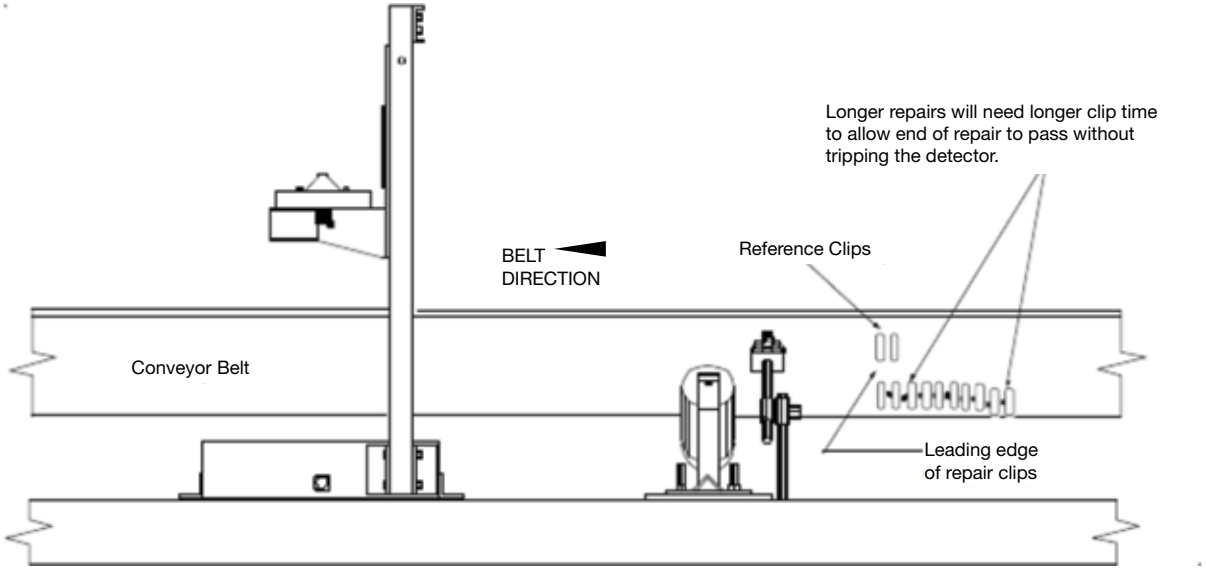


FIGURE 28
Example of clip detector installation with reference clips

Flag Drop Marker

The Flag Drop Marker is a device which drops a tag or flag onto the belt to pinpoint the location of tramp metal when detection occurs. This eliminates costly search and down time.

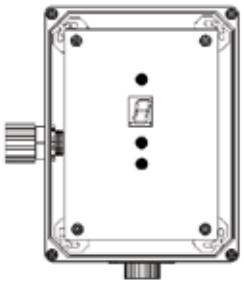


FIGURE 29
Flag Drop Marker Enclosure

Installation

1. Gather and account for all installation components. These components are detailed in Figure 30.
2. Attach the upright support to the upright. Consider ~1-2 seconds of belt travel for positioning the flag drop marker downstream of the metal detector
3. Lay the upright support on the top of the C channel and adjust the upright so that it is straight up and down.
4. Clamp in place and drill a hole in the side of the C channel to secure the bottom of the upright and drill two holes through the upright support and top of C channel.
5. Secure the support to the conveyor C channel.
6. Attach the frame cross bar with gusset to the upright.
7. Mount the flag drop marker to the horizontal cross bar. Position the box on the cross bar so that the flag will drop on the product where the edge of the product touches the belt, (if the product comes to the edge of the belt then position the box so the flag is far enough in so that the flag does not fall off of the belt).
8. Route the power cord across the horizontal bar and down the vertical upright, secure cord with ty-raps.

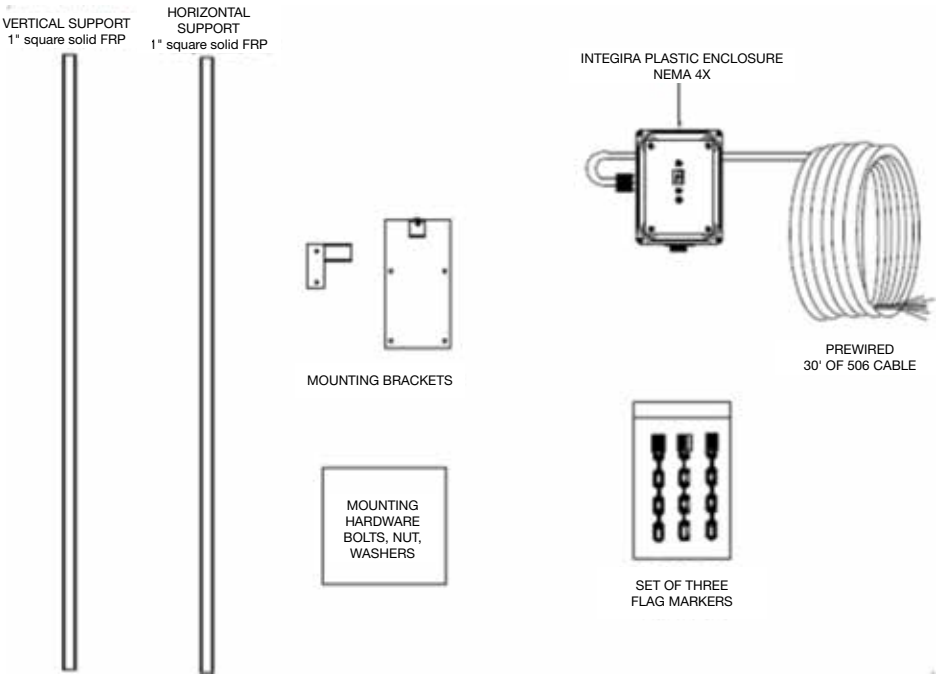


FIGURE 30
Flag drop marker components

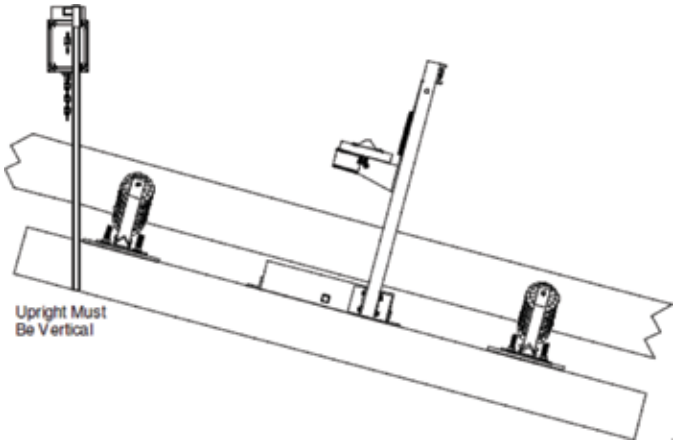


FIGURE 31
Example of flag drop marker installation

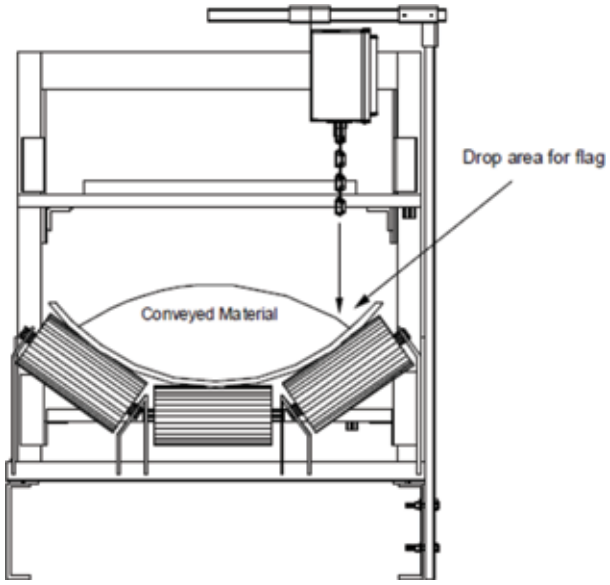


FIGURE 32
Flag drop marker drop area

Spray Marker

The spray marker is a pressurized, solenoid activated liquid spray system which sprays the location of tramp metal with colorant when detection occurs. This helps eliminate costly search and down time.

Specifications

Tank Pressure Rating: 50 psig (3.4bar) maximum working pressure
Tank Capacity: 2.5 Gallons (liquid)
Operational Voltage: 115/220 VAC (50/60 Hz), 15 Watts
Air: Plant air or any source of compressed air

Installation:

1. Assemble components according to the diagram below and the wiring according
2. Position the solenoid support upright and cross arm as shown. Distance from the coils should be 3' to 6'. Clamp in place temporarily.

NOTE

The 1" x 1" support structure is a fiberglass bar. Consider minimum ~1 or 2 seconds of belt travel for how far to place the spray marker from the metal detector to the schematic given in the hardware connections section.

3. Position the support bracket of the solenoid spray valve so that the nozzle is pointed directly on the center of the conveyor belt. The nozzle may be positioned as shown or on the opposite side of the arm. Bolt the bottom of the support frame to the conveyor frame.
4. Connect the hose between the tank outlet and the solenoid valve.
5. Check that the facility air source is shut off and no pressure is in the tank
6. Remove the top of the spray tank.
7. Mix the solution and pour it into the holding tank. The recommended mixture is five (5) fluid ounces of colorant, Chrome Yellow (or other contrasting color) mixed with a two (2) gallon solution of water and antifreeze appropriate for local climate conditions (minimum of 25% antifreeze). **DO NOT USE PAINT. Paint will clog the spray valve.**
8. Replace the cap.
9. Connect the facility air source to the tank regulator inlet.
10. Verify that the pressure regulator valve is closed prior to turning on the facility air.
11. Apply the facility air and adjust the pressure regulator between 35-40 psig (2.5-2.75bar), as noted on the pressure gauge on top of the holding tank.

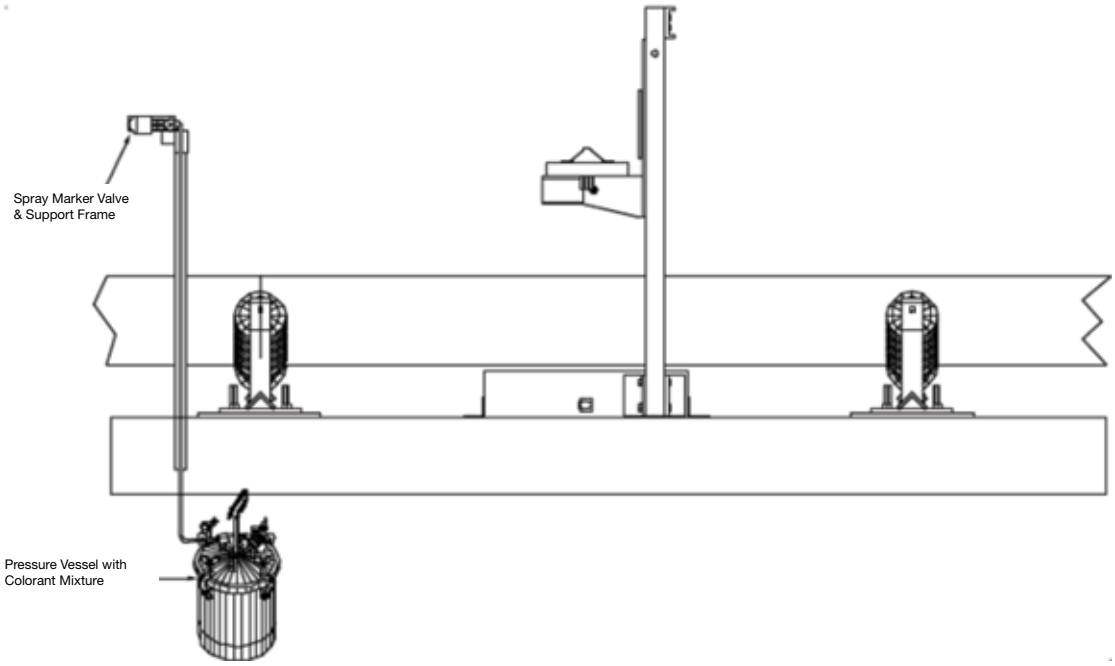


FIGURE 35
Example of spray marker installation

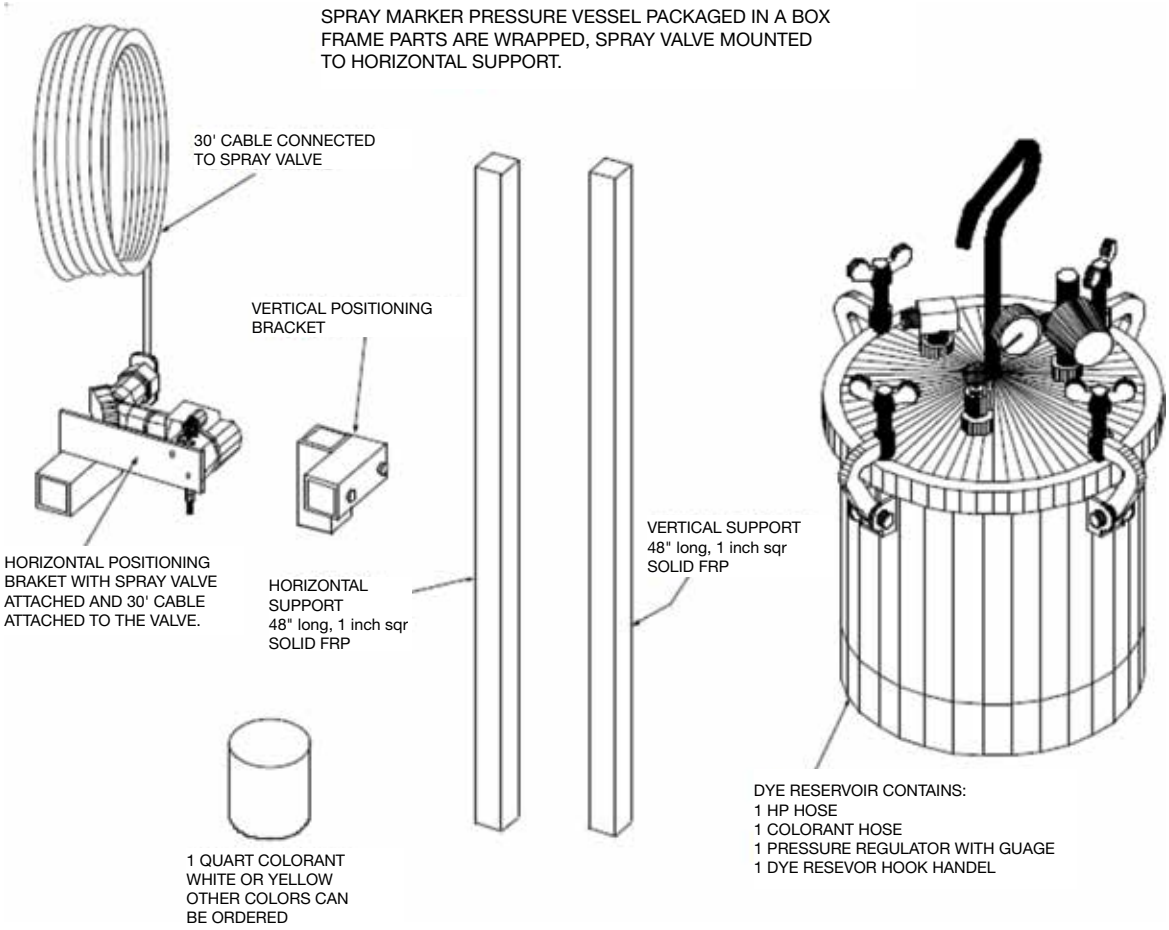
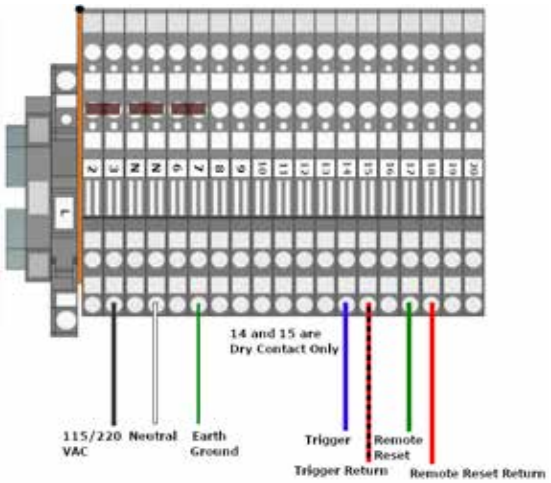


FIGURE 33
Spray marker components



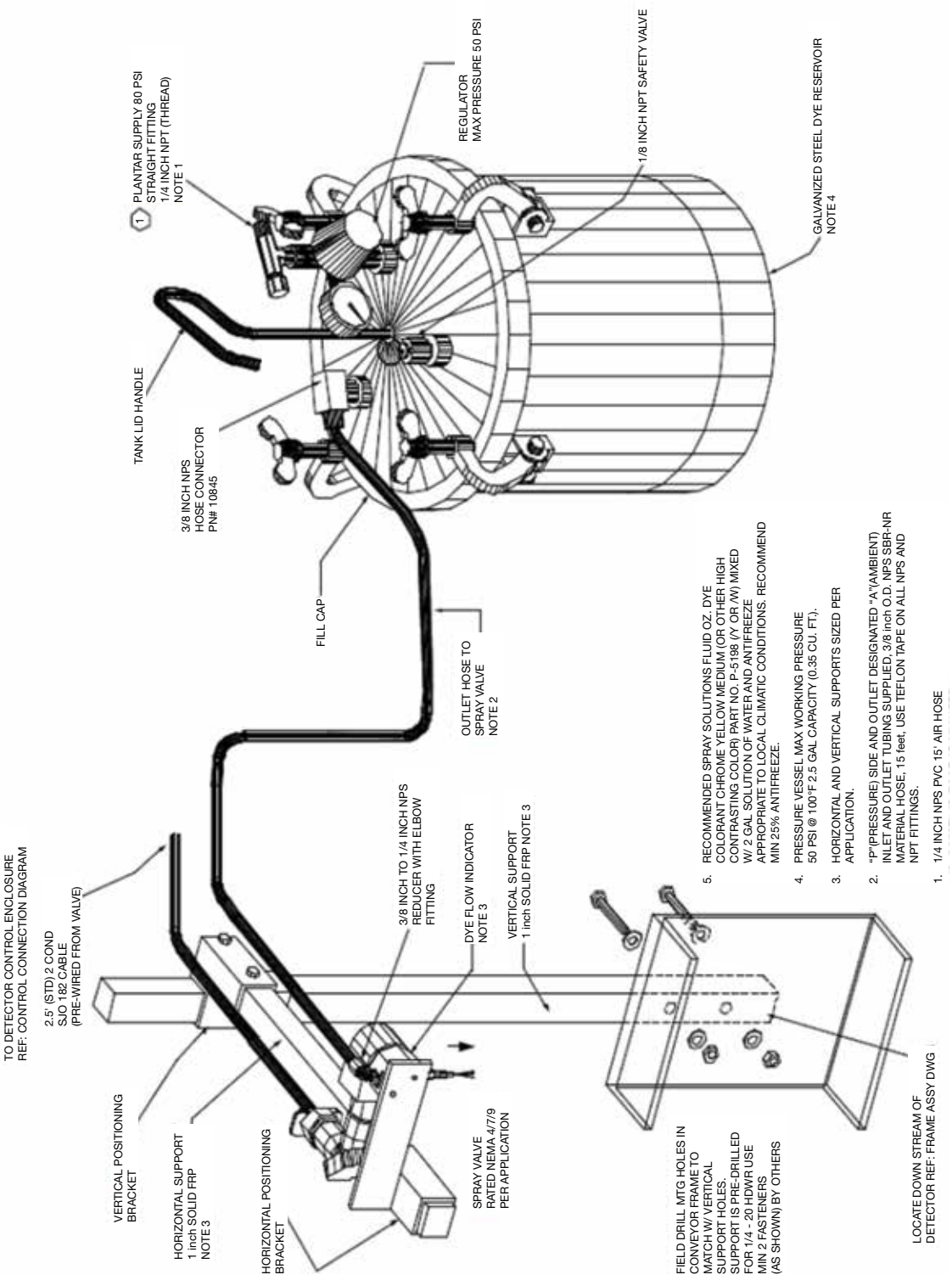


FIGURE 34
Spray marker assembly

Operating Environment

To ensure the prevention of false detection, evaluate the environment in which the detector is being installed as well as the material being conveyed.

EMI Interference: There are three main sources of electromagnetic interference: radio transmitters, power cables, and electric motors. When selecting a site, and installing equipment afterwards, please keep in mind that the closer that any three of these sources get to the detector, the more likely they are to cause interference and false tripping.

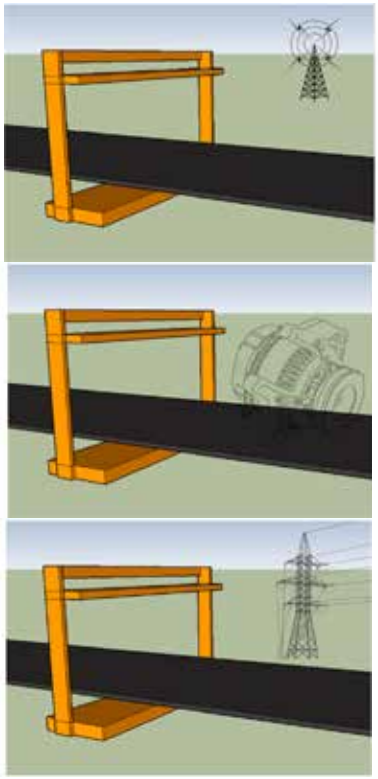


FIGURE 36
Examples of harmful EMI sources

Make-and-Break Circuits: Metal all around the metal detector will have induced eddy currents from the transmit pulse of the metal detector. Generally this is not a problem because the eddy currents are stable and decay normally over time. However, when you have two separate pieces of metal that are only loosely connected (electrically speaking) and can vibrate against each other, the vibration can act like a switch. To test whether this is the cause of interference, turn off fault monitoring in Level 2 of the 8 menu system, and once complete, unplug the transmitter. If the detector no longer receives a high signal or trips when nothing is moving through the aperture, this is likely the cause.

To remedy the issue, plug the transmitter antenna back in, and turn fault monitoring back on. Turn the sensitivity to 100% and while the conveyor is off, use a non-metallic implement, like a heavy rubber mallet or a piece of wood to strike the conveyor frame and any metal within 10' (3m) of the metal detector. In particular you are looking for places where you have 2 separate pieces of metal vibrating against each other. (This is why we provide the idler isolation kit, because the adjacent idler rollers are commonly a source for make and break circuit loops) Expanded metal, loose conveyor covers, or highly corroded junctions in metal structures are all common locations for make and break circuits. By hitting the conveyor structure with a rubber mallet or heavy piece of wood you are trying to simulate the vibration that occurs when the conveyor is operating.

When you strike a spot and it causes the metal detector to trip, you have located the source of the make and break eddy current loop. There can be multiple, so don't give up after finding one.

Once you've found the spot, you need to either electrically isolate the two pieces of metal vibrating against each other by using something non-metallic to prevent direct metal on metal vibration, or alternatively you can weld the spot tight so there is always a good electrical connection. Either solution works, but generally isolation is preferred because it tends to be more permanent. We've seen weld crack over time and the problem can return.

Conveyed Trash: Once a target piece has been selected and a sensitivity level set, please note that softer metal debris that is the same size or larger will be detected. This includes foil, cans, and other common items that may not damage equipment but still produce a signal. In general materials with a lot of surface area are easier to detect.

FIGURE 37
Example of magnetite and magnet

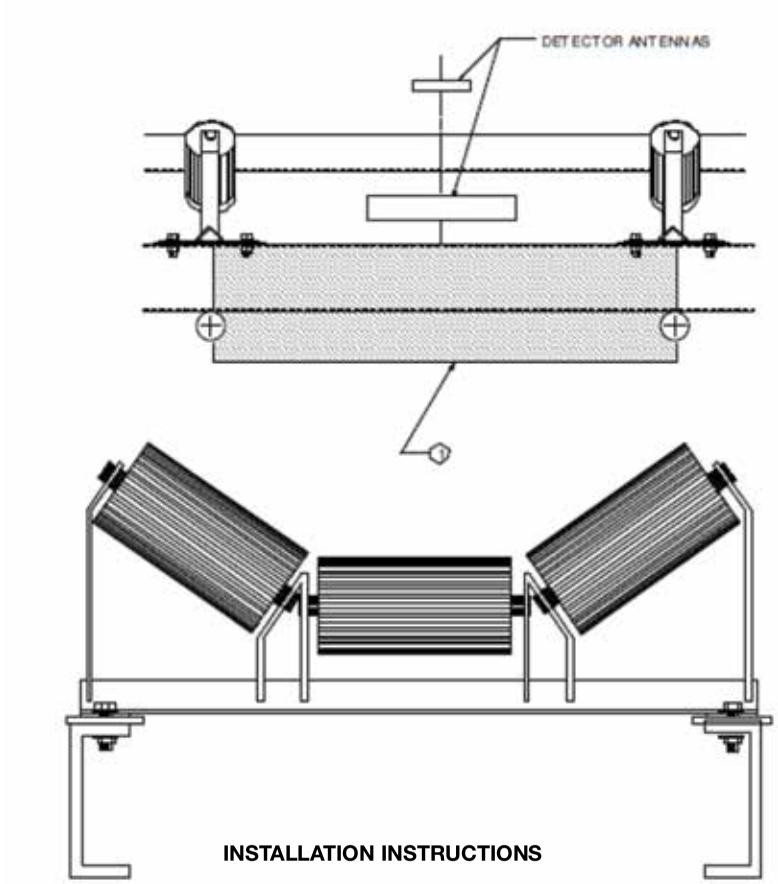
Magnetic Minerals: Material that naturally responds to magnetic fields can also cause unwanted detection. The most common material is magnetite, but other materials exist that have a more active response to magnetic fields. To test whether your conveyed material contains magnetite or other magnetically active material, apply a magnet to some samples from a section of material that gave an unwanted detection. If the magnet sticks to the material as shown below, it probably contains magnetite.

Fault Conditions

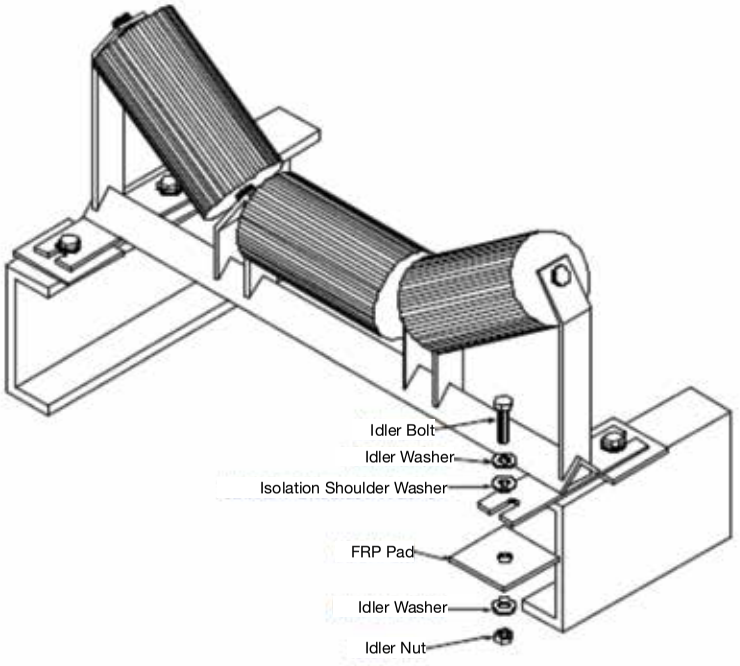
The operating system for the metal detector continuously monitors for hazardous conditions during operation. If one of these conditions occurs, the detector will stop operation, signal for the fault condition via the “Fault” relay and display a message indicating the fault condition. To resume operation, press the “Enter” button. A table indicating the fault conditions and possible solutions is detailed below.

Fault Message	System Affected	Solutions
TRANSVOLT FAIL	Transmitter	1. Check XLR connections for secure connection at bottom of enclosure.
		2. Check XLR connections for secure connection at transmitter.
		3. Examine condition of cable, if cable is severed or the jacket is compromised, replace cable.
TRANSAMP FAIL	Transmitter	1. Check XLR connections for secure connection at bottom of enclosure.
		2. Check XLR connections for secure connection at transmitter.
		3. Examine condition of cable, if cable is severed or the jacket is compromised, replace cable.
P24 VOLT FAIL	Power Supply	Contact Eriez
P24 AMP FAIL	Power Supply	Contact Eriez
N24 VOLT FAIL	Power Supply	Contact Eriez
N24 AMP FAIL	Power Supply	Contact Eriez
CLIP FAIL 1	Clip Detector 1	The clip detector has activated and has not deactivated. Check cabling and clip detector mounting for improper installation.
CLIP FAIL 2	Clip Detector 2	The clip detector has activated and has not deactivated. Check cabling and clip detector mounting for improper installation.
SWING AWAY FAIL	Transmitter Swing Away Switch	The transmitter swing away arm has activated the switch and has not returned to position. Check condition of the transmitter to see if it is stuck or damaged.

APPENDIX



ITM	QTY	DESCRIPTION
1	8	Shoulder Washer 1/2" ID (12mm)
2	8	Shoulder Washer 5/8" ID (16mm)
3	8	Shoulder Washer 13/16" ID (20 mm)
4	2	ISOLATION PAD, FIBERGLASS 4 x 4 x 3/4 INCH THK. Set of 4.

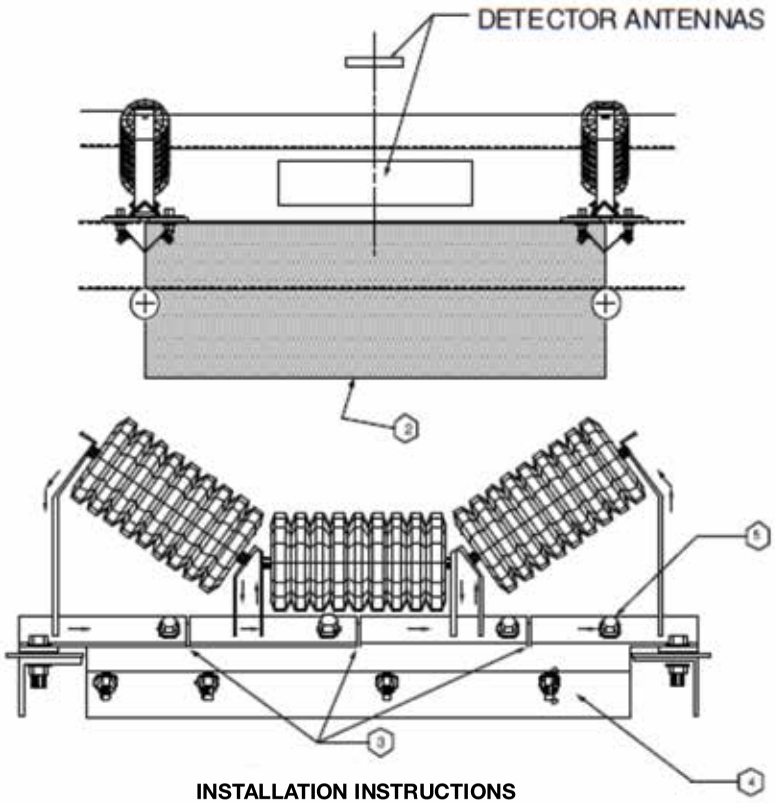


INSTALLATION INSTRUCTIONS

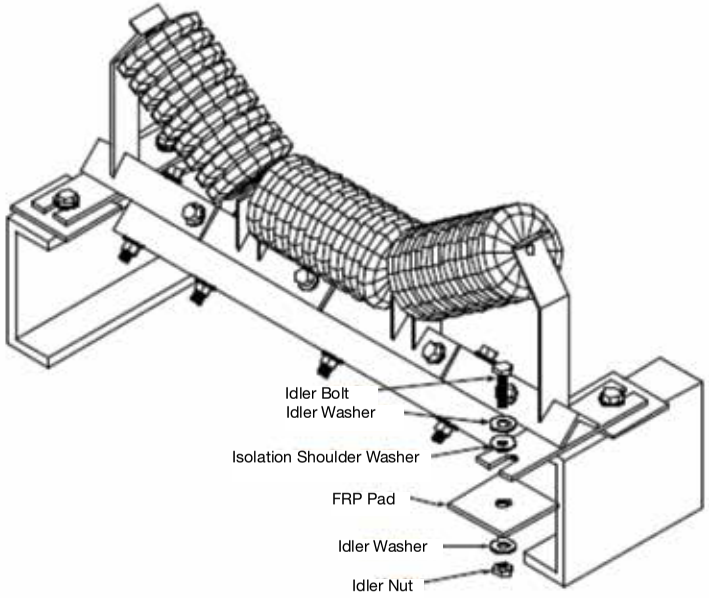
1. Remove the adjacent idler on either side of the detector installation location.
2. Select Shoulder Washers that is the closest fit for the idler bolt.
3. Position 4 isolation pads under idler feet (two on each side_ so they are centered on the idler foothole, drill a holes into the four isolation plates large enough to allow the shoulder washer flange to fit.
4. Re-mount the idlers onto the frame so that the isolation plates are in between the idlers mounting foot and the conveyor frame. Secure the idlers with the bolt, washers, shoulder washer and nuts. When completed, the idler will be electrically isolated from the conveyor frame.

Note: Be sure to use a metal flat washer on top of the nylon shoulder washer to spread the bolt head pressure evenly.

⬡ 1 NO METAL DECKING, CROSSBRACING, OR RETURN IDLERS BELOW OR BETWEEN IDLERS ADJACENT TO RECEIVER ANTENNA.



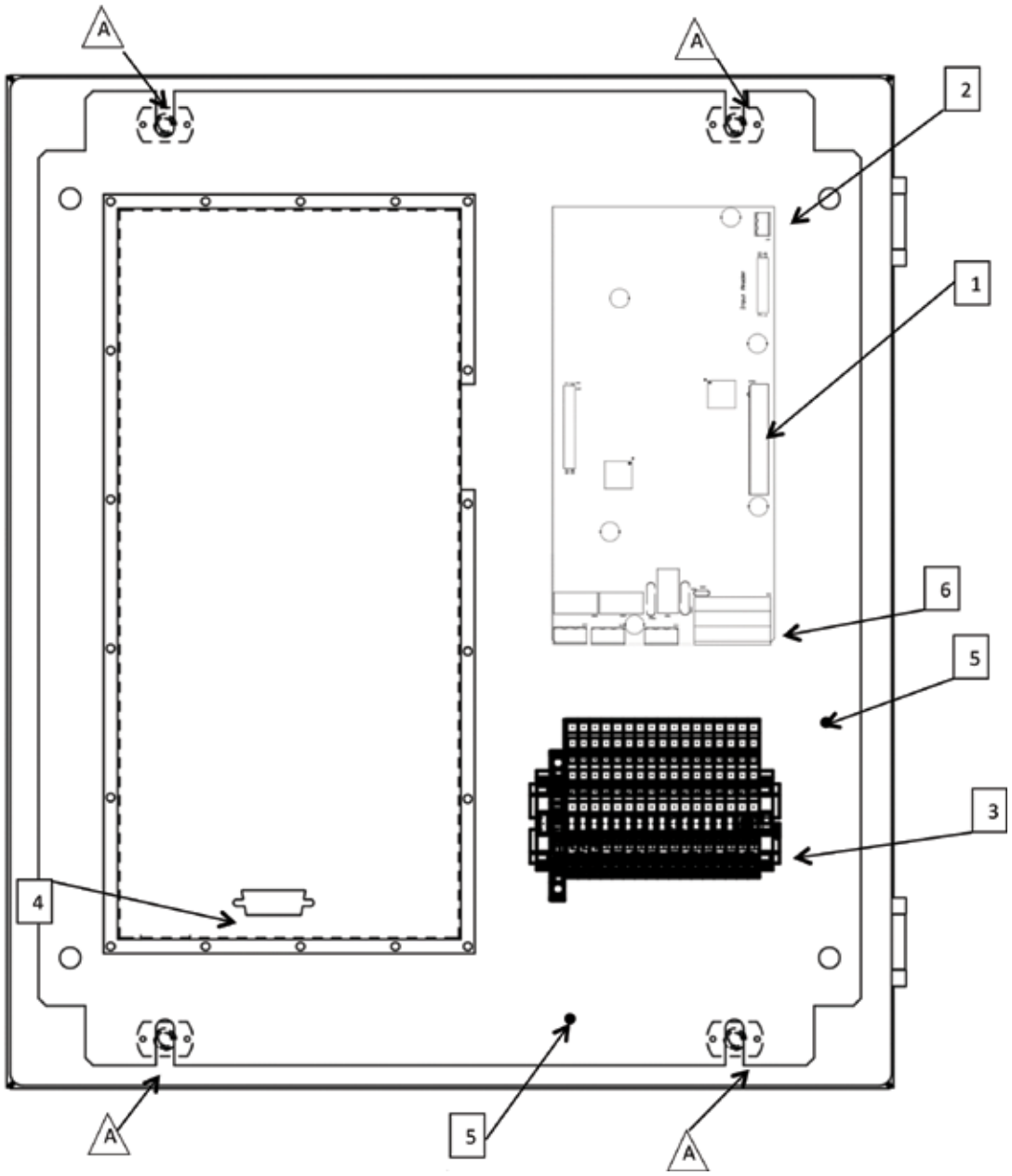
ITM	QTY	DESCRIPTION	By
1	8	SHOULDER WASHER 1/2" ID (12MM)	Factory
2	8	SHOULDER WASHER 5/8" ID (16MM)	Factory
3	8	SHOULDER WASHER 13/16" ID (20 MM)	Factory
4	8	ISOLATION PAD, FIBERGLASS 4 X 4 X 3/4 INCH THK. SET OF 4.	Factory
5	A/R	WOOD, FIBERGLASS NON-CONDUCTIVE MATERIAL	By Others
6	A/R	FASTENERS - AS REQUIRED FOR STRENGTH	By Others



INSTALLATION INSTRUCTIONS

1. Remove the adjacent idler on either side of the detector installation location. Replace adjacent idlers with rubber impact type as shown.
2. No metal decking, cross bracing, or return idlers below between idlers adjacent to receiver antenna.
3. Cut idler base (3) three places as shown along length to break electrical current loops depicted by the arrows. The idler base sections must be supported with a brace.
4. The brace can be wood or plastic. Easiest is a 4" by 4" by (length 1/2" less than frame ID) piece of hard wood placed under the cut sections.
5. Drill holes in the metal sections and use lag bolts to secure base to the wood support. There must be at least 1/4" gap between the cut sections.
6. Select Shoulder Washers that is the closest fit for the idler bolt.
7. Position 4 isolation pads under idler feet (two on each side) so they are centered on the idler foot hole, drill a holes into the four isolation plates large enough to allow the shoulder washer flange to fit the idlers mounting foot and the conveyor frame. Secure the idlers with the bolt, washers, shoulder washer and nuts. When completed, the idler will be electrically isolated from the conveyor frame.

Note: Be sure to use a metal flat washer on top of the nylon shoulder washer to spread the bolt head pressure evenly.



Parts of the Electronics

1	Ribbon cable connector	Disconnect when removing electronics for repair
2	Receiver Connector	Disconnect when removing electronics for repair
3	DIN Rail with Connector	Quick Pull connectors to facilitate ease of board removal
4	Transmitter Connector	Disconnect when removing electronics for repair
5	PE/Chassis GND point	Physical Earth Grounding Point for external power ingress and chassis
6	Board IO Connector	IO connector for low voltage connections
A	Back Plate Mounting Screws	Screws mounting back plate to enclosure

Instructions for removing the electronics from the enclosure for servicing:

1. Turn the detector off using the on/off switch on the exterior of the electronics box.
2. Disconnect the transmitter connector (4) and receiver connector (2)
3. Pull the connectors from the terminal blocks (3) to disconnect input power, and all connections to interface with plant control system, and accessories
4. Disconnect ribbon cable (1) that connects to the display PCB on the inside of the electronics door.
5. Remove the 4 screws (A) that secure the electronics back plate to the enclosure.
6. Remove the back plate with the electronics still attached from the enclosure

DO NOT SEND THE ENTIRE ENCLOSURE BACK UNLESS SPECIFICALLY INSTRUCTED BY ERIEZ TO DO SO. Most repairs only require the electronics mounted to the back panel.

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