MM-246A

Installation, Operation and Maintenance Instructions

METALARM™ SERIES 3500 METAL DETECTORS

ERIEZ MAGNETICS HEADQUARTERS: 2200 ASBURY ROAD, ERIE, PA 16506–1402 U.S.A.
WORLD AUTHORITY IN SEPARATION TECHNOLOGIES

Introduction

Careful attention to the following 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 metal detection assistance.

CAUTION

Metal Detectors emit electromagnetic fields. Contact the American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio, U.S.A. (www.acgih.org) for additional information.

CAUTION

If you use a medical implant or similar device, you must never approach the equipment because your device may malfunction in the electromagnetic field, with consequences up to and including death.

CAUTION

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

Table of Contents

METALARM™ 3500 AND 3500CE METAL DETECTOR SYSTEM

Important Information From Eriez

This information is provided to assemblers and electricians due to the importance of proper methods for wiring of controls. These methods are revised and updated from time to time as Eriez perceives necessary. This information covers distances from various categories of cables and Eriez Metal Detector wiring standards. The cable categories are:

1. AC Power cables
2. DC Distribution (thermocouple, power supplies)
3. Signal and Logic
   - 3a. Analog (low level)
   - 3b. Digital logic

Category 1 cables are to be routed along frame members and panels. Avoid open space hanging.

Category 2 cables are routed as 1 but separate from 1.

Category 3 cables are routed separately from 1 and 2.

Category 3b are to be spaced 2.5 cm (1") from Category 1 for each meter of run.

Category 3a cables are to be spaced 25 cm (10") from category 1 for each meter of run.

Use separate machine entry holes for categories 1, 2 and 3 cables.

When Eriez Metal Detectors are being installed in plants using VFC drives, the following precautions are recommended:

1. Route VFC wiring and Eriez Metal Detector wiring into separate metallic conduits.
2. Separate power sources should be used for VFC drives and Eriez Metal Detectors.
3. The use of a Harmonic Neutralized Constant Voltage Transformer for the Eriez Metal Detector power is recommended. Use separate conduits for in and out wiring.
4. Twist AC common circuit run wires together to minimize electromagnetic field interference.
5. Follow cable category separations as detailed above.

Description

The Metalarm™ 3500 and 3500-CE Metal Detector consists of a control unit, one or more sensor coils dependent upon the application, and optional accessories such as the sack dropper.

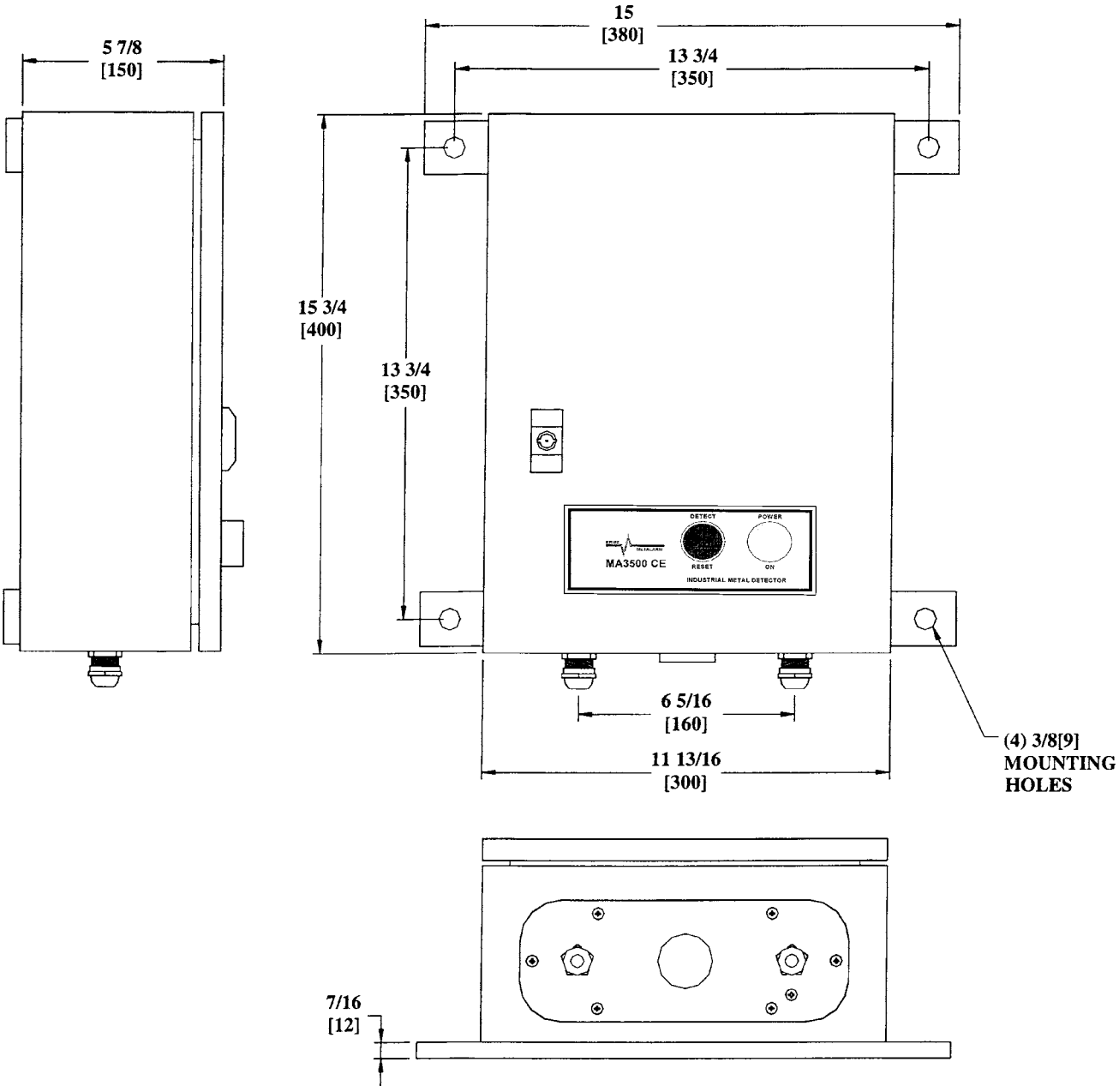


FIGURE 1
Control unit dimensions

Installation

CONTROL UNIT MOUNTING
The Metalarm 3500 control unit is supplied with four mounting brackets for wall mounting. The dimensions are shown in Figure 1.

Ideally the control unit should be mounted within 10-15' (3-5 m) of the sensor coil unit and no more than 66' (20 m).

The control unit must be mounted in a location with low amounts of vibration, if the area exhibits a high level of vibration, independent mounting of the control enclosure must be implemented. Shock mounts for the control enclosure may be another consideration, based on the severity of the installation.

The Metalarm 3500 control unit will normally be mounted by means of four 5/16 inch or M8 bolts utilizing the four mounting holes.

Adequate clearance must be allowed below the control unit enclosure to allow for cable entry and exit.

NOTE: Do not replace the HDPE mounting bars, as these are provided to electrically isolate the control unit from the metal conveyor framework. Similarly no metal work should be in contact with the metal control unit case after mounting on the conveyor.

Failure to comply with the above mounting procedures will invalidate the 'CE' certificate covering the EMC regulations.

SEARCH COIL MOUNTING
The following instructions give details of how to install the various types of standard search coils supplied as part of the Metalarm Metal Detector.

The search coil should be assembled using the instructions supplied with the search coil.

UNDERBELT COIL (MODEL TR) - IDLER CONVEYORS
Locate a suitable position in the conveyor mid way between two idlers where:

- There will not be a return idler or cross piece beneath the search coil.
- There is not a joint in the conveyor frame.
- Metal, when detected, can easily be removed from the conveyor belt.
- There is no moving metal in the vicinity.
- Any metal base plate present can be removed or replaced by non-metallic material.
- Any metal covers over the belt can be removed or replaced by non-metallic material.

Place the search coil on the conveyor frame at the chosen position. There should be at least a 1' (25mm) gap between the underside of the conveyor belt and the top of the search coil. If not cut out notches in the bottom of the search coil at all four corners so as to lower the search coil within the conveyor frame.

User supplied stainless steel "L" brackets are suggested for securing the search coil assembly to the conveyor. Brackets should be fitted to the coil, in the area marked for such purposes, as shown on the coil assembly drawing. (See Figure 2)

The search coil should then be bolted to the conveyor frame with the coil electrical connection on the opposite side of the conveyor frame to any heavy-duty cables or wiring.

A recommended idler spacing of 48"- 60" should apply to the infeed and outfeed idlers adjacent to the search coil. An idler isolation kit is recommended and may be purchased from the factory. The idler isolation kit provides suitable materials to electrically insulate the idlers from the conveyor frame. Insulating the idlers directly adjacent to each side of the search coil will help to alleviate any possible false tripping. Electrical loops can be created from the metal detectors field in relation to the surrounding metal. The idlers on each side of the search coil should be checked to see that all nuts and bolts have been securely tightened.

The cable connecting the search coil to the control unit should then be attached to the connector on the underside of the search coil and to the control unit. The cable should be secured and protected from damage.

The search coil coax cable must not cross directly under the search coil, as this may cause false tripping to occur. The cable should be replaced should any nicks in its outer cover occur.

If standard metal conduit must be used to protect the search coil, separate conduits must be used for each cable; receiver and transmitter. If a clip detector is required, the cable may be run in the same conduit as the receiver or transmitter coil.

TR10 TYPE SEARCH COIL - IDLER CONVEYORS

Locate a suitable position in the conveyor mid way between two idler sets where:

- There will not be a return idler or cross piece beneath the search coil.
- There is not a joint in the conveyor frame.
- Metal when detected can easily be removed from the conveyor belt.
- There is no moving metal in the vicinity.
- Any metal base plate present can be removed or replaced by non metallic material.
- Any metal overbelt covers can be removed or replaced.

Place the search coil on the conveyor frame at the chosen position. There should be at least a 1" (25mm) gap between the underneath of the conveyor belt and the top of the search coil. If not cut out notches in the bottom of the search coil at all four corners so as to lower the search coil within the conveyor frame.

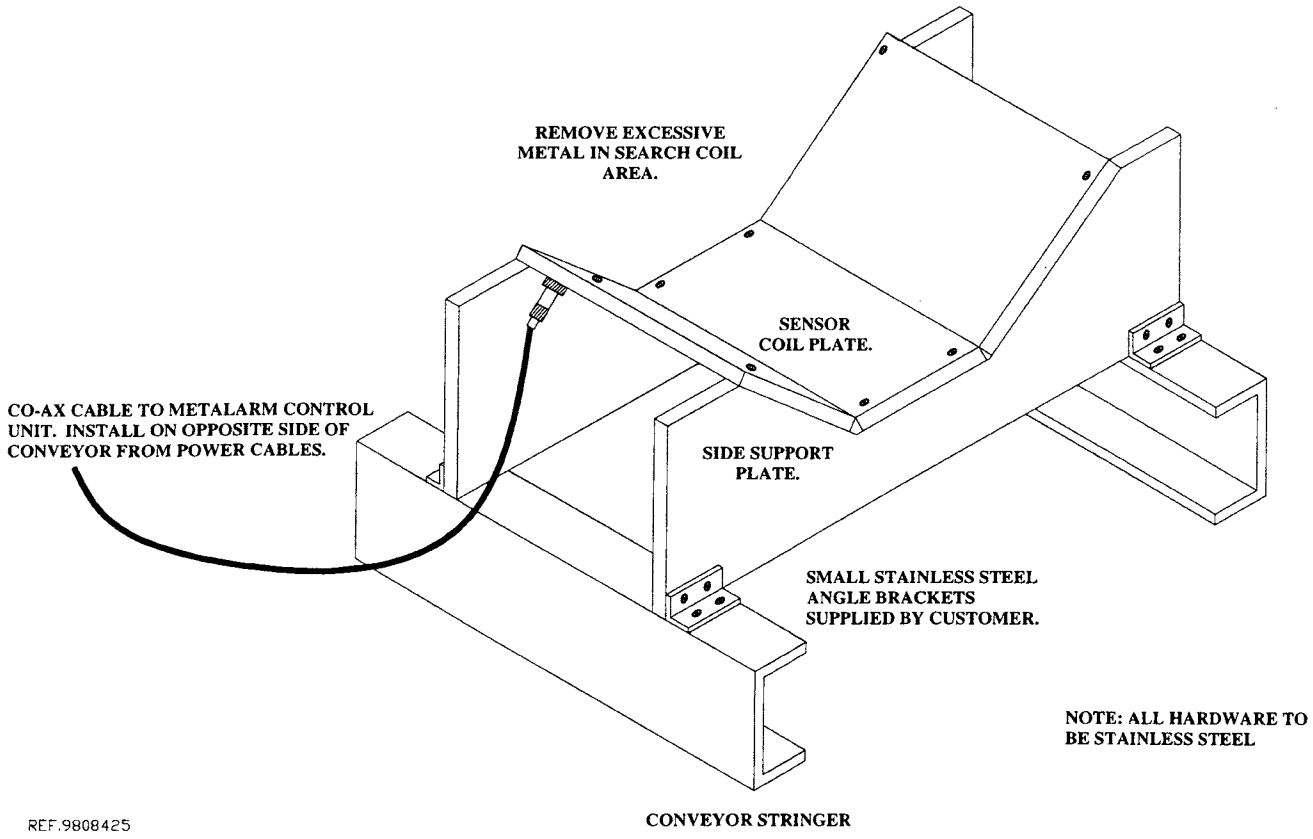


FIGURE 2
Coil assembly

Installation *(cont.)*

Brackets (not supplied) to hold the search coil to the conveyor frame should be fitted to the coil on the side supports shown in Figure 3.

The search coil should then be bolted to the conveyor frame.

Fit top search coil section and bolt down.

The pair of idlers adjacent to either side of the search coil should be checked to see that all nuts and bolts have been tightened down firmly. Preferably the idler frames should also be spot welded once at each of the four corners to the conveyor frame.

This type of coil configuration is designed for transmit/ receive mode operation only and both coils are connected directly to the control unit. See Electrical Connection: Sensor Coil Connections and Figure 3. Remember to make sure the cables are tied to the conveyor frame to prevent them from being damaged.

BRIDGE TYPE (MODEL BR) SEARCH COIL - IDLER CONVEYORS

Locate a suitable position in the conveyor mid way between two idler sets where:

- There will not be a return idler or cross piece beneath the search coil.
- There is not a joint in the conveyor frame
- Metal, when detected, can easily be removed from the conveyor belt
- There is no moving metal in the vicinity
- Any metal base plate present can be removed or replaced by non-metallic material.
- Any metal overbelt covers can be removed or replaced by non metallic material

Place the search coil on the conveyor frame at the chosen position. There should be at least a 1" (25mm) gap between the underside of the conveyor belt and the top of the search coil. If not cut out notches in the bottom of the search coil at all four corners so as to lower the search coil within the conveyor frame.

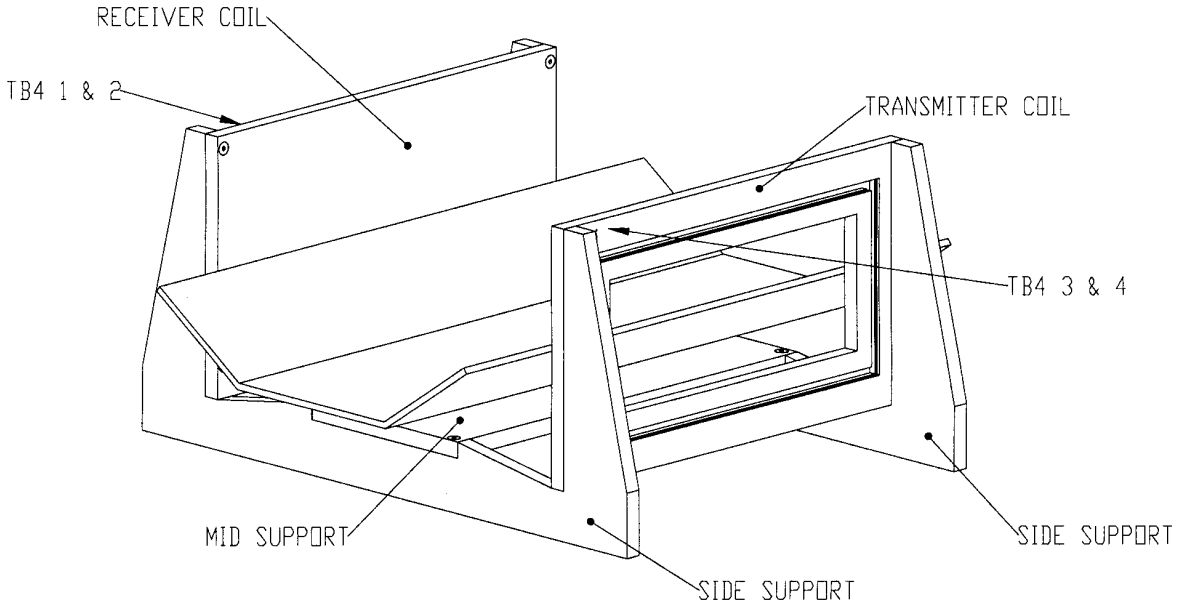


FIGURE 3

User supplied stainless steel “L” brackets are suggested for securing the search coil assembly to the conveyor. Brackets should be fitted to the coil. The area for this purpose is shown on the coil assembly drawing. (See Figure 4)

The search coil should then be bolted to the conveyor frame so that the coil socket is on the opposite side of the conveyor frame from any heavy-duty cables or wiring.

Fit the top search coil section and bolt it in place.

A recommended idler spacing of 48"- 60" should apply to the infeed and outfeed idlers adjacent to the search coil. An idler isolation kit is recommended and may be purchased from the factory. The idler isolation kit provides suitable materials to electrically insulate the idlers from the conveyor frame. Insulating the idlers directly adjacent to each side of the search coil will help to alleviate any possible false tripping. Electrical loops can be created from the metal detectors field in relation to the surrounding metal. The idlers, either side of the search coil, should be checked to see that all nuts and bolts are tight.

In the case of series connection, connect the lower coil using the short length of cable provided to the unmarked socket on the top coil. The cable to connect the search coil to the control unit should be connected to the socket marked ‘CU’ on the top search coil. In the case of transmit/receive mode operation, both coils are connected directly to the control unit.

In both cases make sure the cables are secured to the conveyor frame and protected to prevent them being damaged.

The search coil coax cable must not cross directly under the search coil, as this may cause false tripping to occur. The cable should be replaced should any nicks in its outer cover occur.

If standard metal conduit must be used be used to protect the coil cable(s), separate conduits must be used for each cable; receiver and transmitter. If a clip detector is required, the cable may be run in the same conduit as the receiver or transmitter coil.

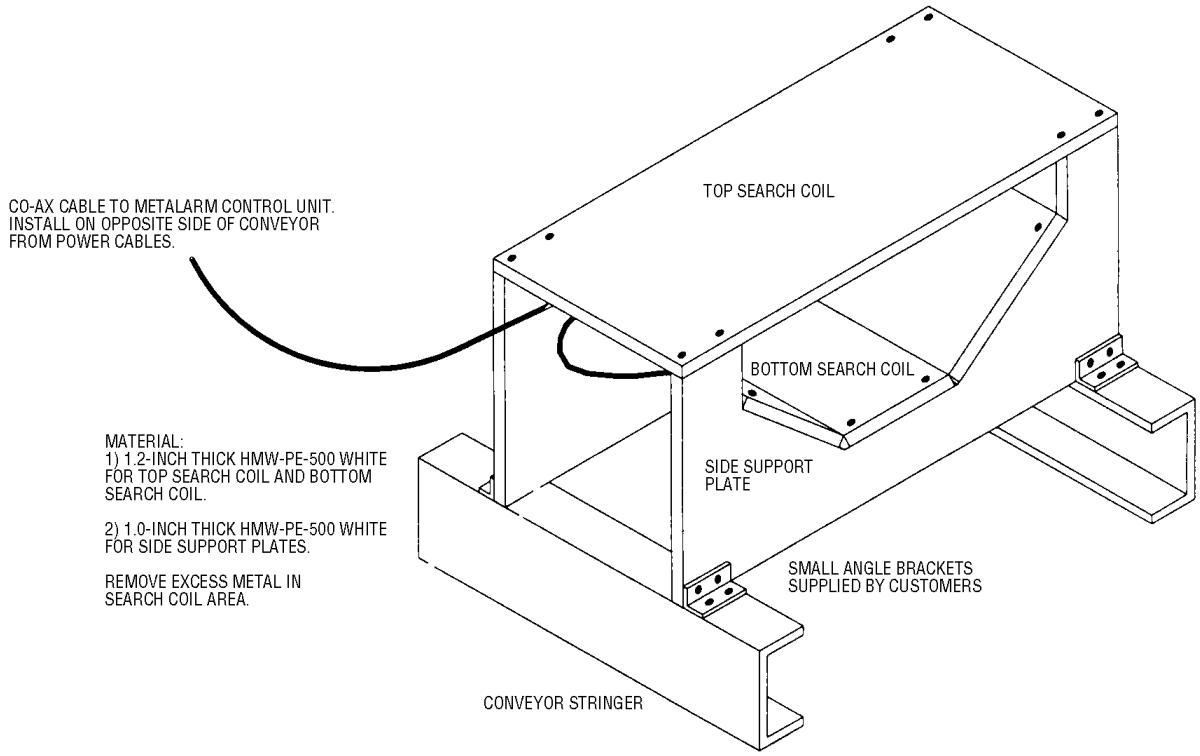


FIGURE 4

Installation *(cont.)*

MODEL VC "U" SECTION BELT CONVEYORS OR VIBRATOR CONVEYORS - SEARCH COILS

Locate a suitable position in the conveyor where there is going to be no metal within approximately 20" (500mm) of the underside of the search coil when it is mounted onto the conveyor. There should be no moving metal in close proximity to the search coil. In the case of vibratory conveyor the coil is usually located midway between two of the vertical supports. Cross braces under the search coil should be cut and moved. To install a trough coil, it is necessary to cut out a length of the base and part of the side walls of the conveyor. (See Figure 5).

The exact dimensions of the required cut out will be shown on the search coil assembly drawings supplied with the search coil.

Draw a line 1" (25mm) from the edge of the cut out. Along this line drill 5/16" dia (M8) holes at 4" (100mm) spacing or longer depending upon the weight and width of the search coil. Countersink the holes from the inside of the conveyor.

Locate the search coil into the cut out and clamp it in position. Using the holes in the conveyor as a guide, drill through side and base of the search coil.

Bolt the search coil into position using countersunk 5/16" (M8) bolts x 1-1/2" (40mm) long and shakeproof lock washers.

The cable from the search coil to the control unit should be connected into the underside of the search coil. The cable should be secured and protected from damage.

The search coil coax cable must not cross directly under the search coil, as this may cause false tripping to occur. The cable should be replaced should any nicks in its outer cover occur.

If standard metal conduit must be used to protect the coil cable(s), separate conduits must be used for each cable; receiver and transmitter. If a clip detector is required, the cable may be run in the same conduit as the receiver or transmitter

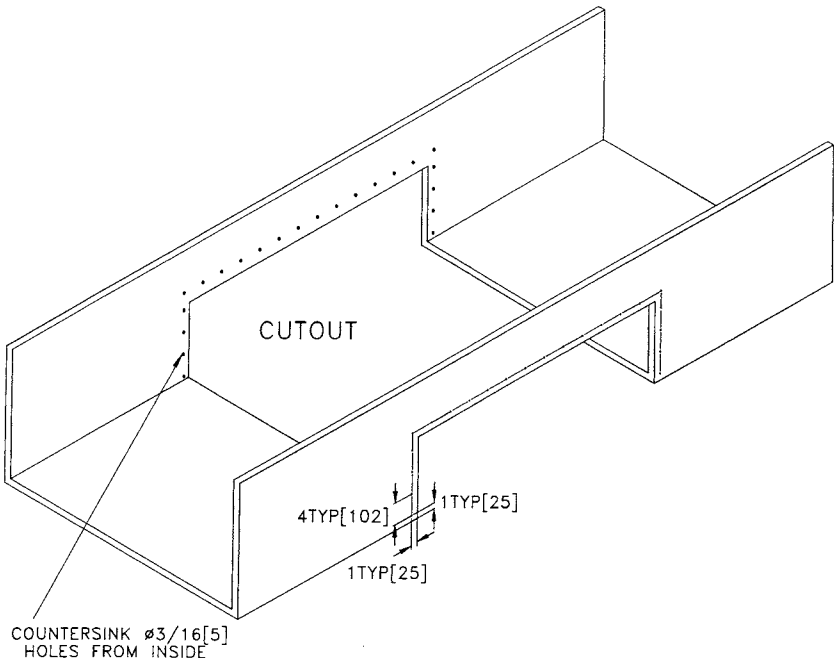


FIGURE 5

MODEL PL PLATE COIL

Plate coils can either be mounted under a previously prepared metal free section such as wood or fiberglass or if the plate coil is a SF or SFC type item directly mounted onto the base of a metal-sided conveyor.

In the latter case if the base of the conveyor is metal, a section of it must be removed for the length of the coil plus 1/8" (3mm). The search coil can be drilled into or through in any of the crossed areas shown on the drawing supplied with the search coil.

The PL search coil should be mounted such that the conveyor belt passes above the plain surface of the coil with the resin side facing down.

INSTALLATION RECOMMENDATIONS FOR CONNECTING RFI FILTERS TO HIGH FREQUENCY INVERTER DRIVES

Because of the complex circuit design used in these filters a Ground Leakage Current of 8 to 80MA may be observed. It is possible that nuisance tripping of extremely sensitive type of ground fault circuit breaker may occur so this figure should be considered when choosing such a device. It is important to provide well-defined paths for the high frequency currents involved. The best results are achieved when both filter and inverter are mounted securely on the same conducting, grounded backplate and not on rails etc.

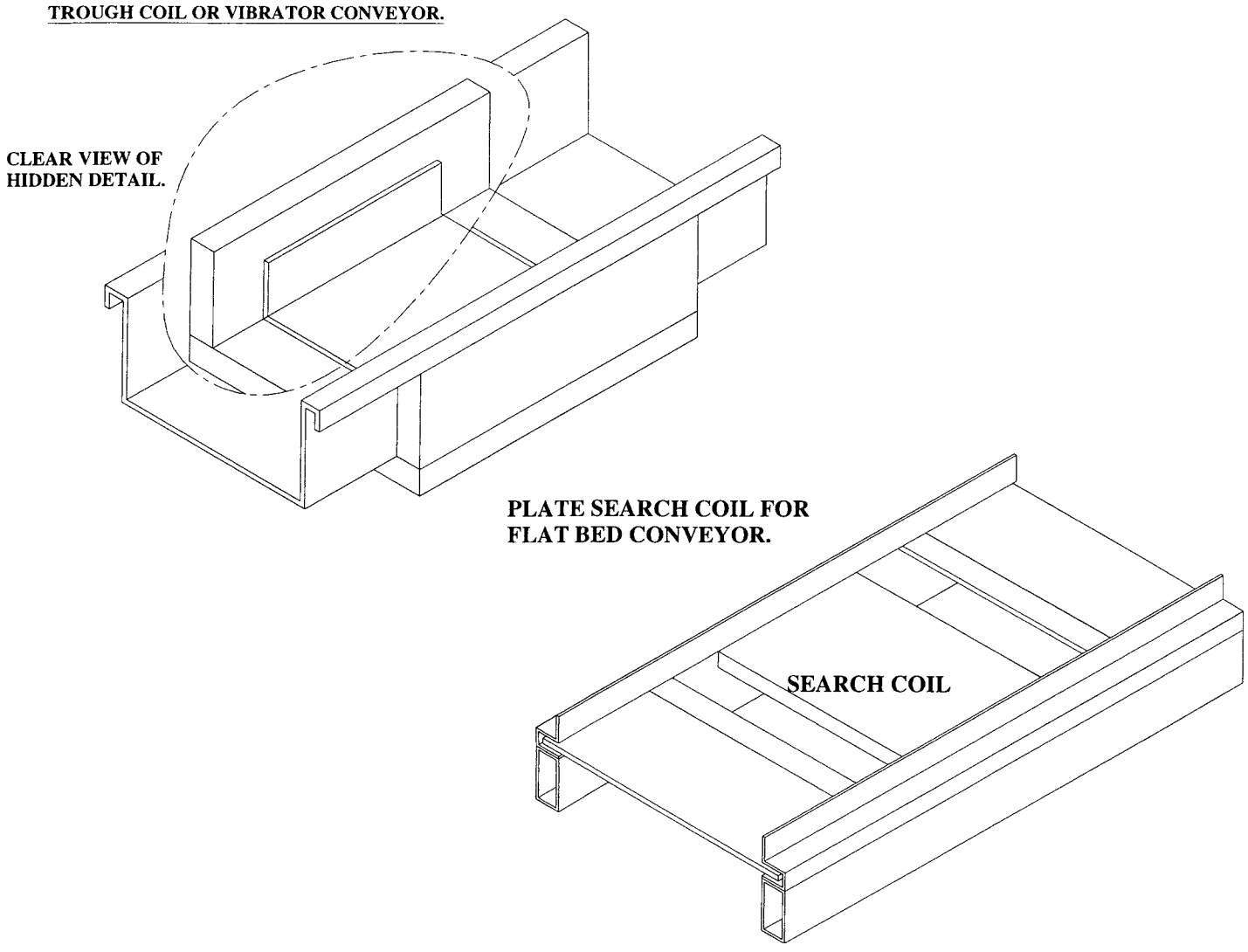


FIGURE 6

Installation *(cont.)*

SUPPLY CABLE
The supply cable should be a stranded conductor and not a solid conductor type to achieve proper connection inside the terminal block. Cable lengths inside the wiring cabinet should be kept to a minimum i.e. cable entry to filter and filter to inverter. This will reduce the effect of radiated emissions back into the input cables. (See Figure 7).

MOTOR CABLE
Since the cable between the inverter and motor is a major source of radiated and conducted interference, it should be a shielded type and as short as possible with the shield and safety ground wire connected directly to the bonded ground post at one end and to the motor ground at the other. Never connect only one end of the shield to ground, as this can be detrimental. (Pig tail effect). It is strongly recommended that the conducting cores (not the ground or shield) are threaded through, or, if possible, wound around an output cable filter choke as shown. (See Figure 8).

GROUNDING
The point here is to clearly define the paths through which high frequency earth currents flow, and thereby minimize their harmful effect on other nearby, sensitive devices.

All grounding leads, including the filter ground, inverter ground and shielded cable grounds, should be as short as possible and securely fastened to the bonded backboard ground post. Poor connections and loops of cable will act as aerials and pick up stray radiated emissions.

SEPARATION
Keep the separation of the input and output cables as great as possible to prevent feedback. Input and motor output cables should never be run together in the same trunk or conduit. (See Figure 9).

CONTROL CABLES
The control cables to the inverter or any other equipment in the vicinity are obviously highly susceptible to radiated emissions in the same way and should never be run with the motor output cables.

MULTIPLE INVERTERS
Where more than one inverter is used, for effective suppression, it is preferable that a separate filter should be used for each inverter. (See Figure 10).

BAG DROPPER INTRODUCTION
The bag dropper is used to indicate the location of tramp metal on the conveyor after the belt has stopped. The bag dropper consists of a bag dropper control unit and a bag.

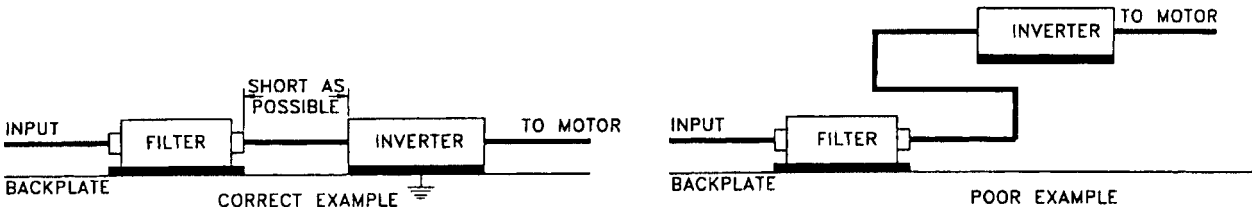


FIGURE 7

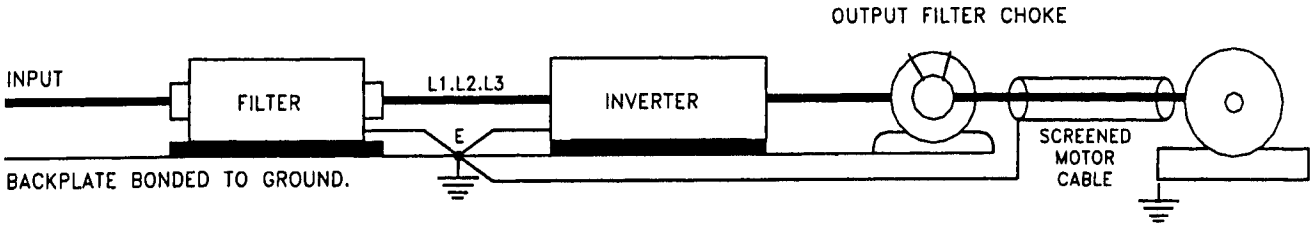


FIGURE 8

INSTALLATION

A frame should be constructed over the top of the conveyor to mount the bag dropper control unit. If the frame is constructed of metal, it must not be in the search field of the sensor coil, so a distance of at least 5' (1.5 meters) down line from the sensor is recommended.

Remove the bag dropper control unit by removing the 4 screws located in each of the four corners of the top cover. Mount the control unit to the frame over the conveyor by bolting through the existing holes. The fixing centers are marked on the back. Make sure the entry release hole and cable outlets are directed downwards.

CONNECTION

The 3-wire power supply cable can be connected to the Metalarm power supply at terminal block TB 1 on the Metalarm circuit board.

The blue wire of the 2-wire cable is used to trigger the bag dropper and it is connected through the Metalarm relay contacts. The red wire is used to disable the Metalarm and connects to terminal 3 on TB3.

Wire	Dropper	QM2
Red	O/P	TB3-3
Blue	I/P	TB2-11
Screen	OV	TB3-1

Also a jumper on the QM2 is required from TB2-12 to TB3-1. Refer also to the drawing on the following page.

ADJUSTMENT

Switch the power on to both the bag dropper and the Metal Detector. It should not be possible to start the conveyor. If the conveyor can start refer to section entitled IMPORTANT NOTE on the next page.

Push the bag stem all the way into the aperture on the underside of the control unit and press reset on the Metalarm. The conveyor should now be able to run.

In the bag dropper, check that the green LED (D1) is on and that the amber LED (D3) and the red LED (D2) light up when metal is detected.

D3 (amber) shows the delay from detection to the drop. This must be set up so that an object detected at the search coil will be under the 'bag dropper' when the bag drops (indicated by the red LED D2). Adjustment is made by rotating RV2 (coarse) and RV1 (fine).

RV3 is for the adjustment of the solenoid 'on time' and should not need any adjustment.

When satisfied that the operation of the bag dropper is correct the lid of the control unit needs to be replaced and tightly sealed against moisture.

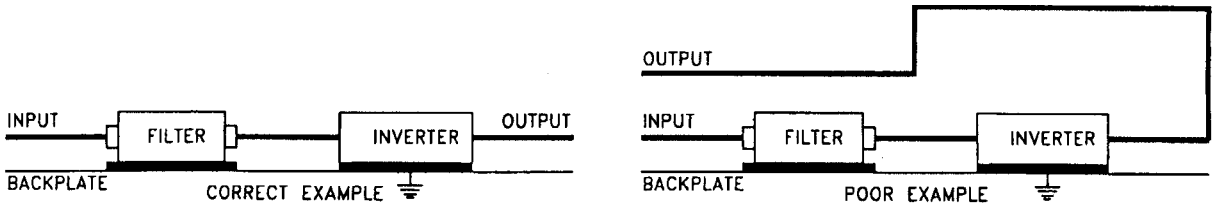


FIGURE 9

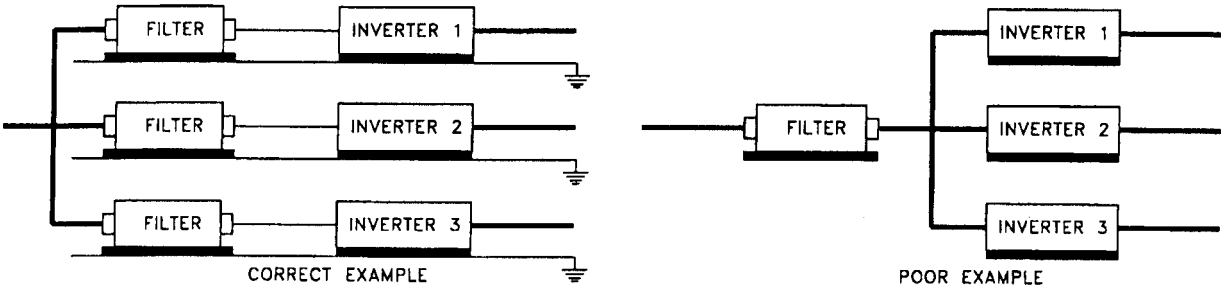


FIGURE 10

Installation *(cont.)*

IMPORTANT NOTE

The bag dropper is set to run in Fail-Safe Mode and therefore will prevent the operation of the Metalarm when the bag is not present. This is indicated by the “Detect” light being illuminated.

It is vital that the conveyor is wired to stop when metal is detected, otherwise the bag stem may enter the equipment being protected. Although aluminum alloy has been used in its construction, it would still mean replacement of a relatively expensive part.

For any further information, please do not hesitate to contact ERIEZ customer service.

Electrical Connections

The standard electrical connections are for power supply connections and for sensor coil connections. Other cables may be added as necessary for control and monitoring functions.

Please note where armored cables are being used, the armor must be cut back at the gland plate of the control unit so that it does not touch the Metal Detector Control Unit. The control unit must be electrically isolated.

POWER SUPPLY

The mains connection is made via the green terminal block (TB1) using ‘E’ for earth/ground connection, either of the ‘L’ terminals for live positive connection and either of the ‘N’ terminals for live negative connection.

The spare ‘L’, ‘N’ and ‘E’ terminals can be used for driving external controls or the bag dropper accessory.

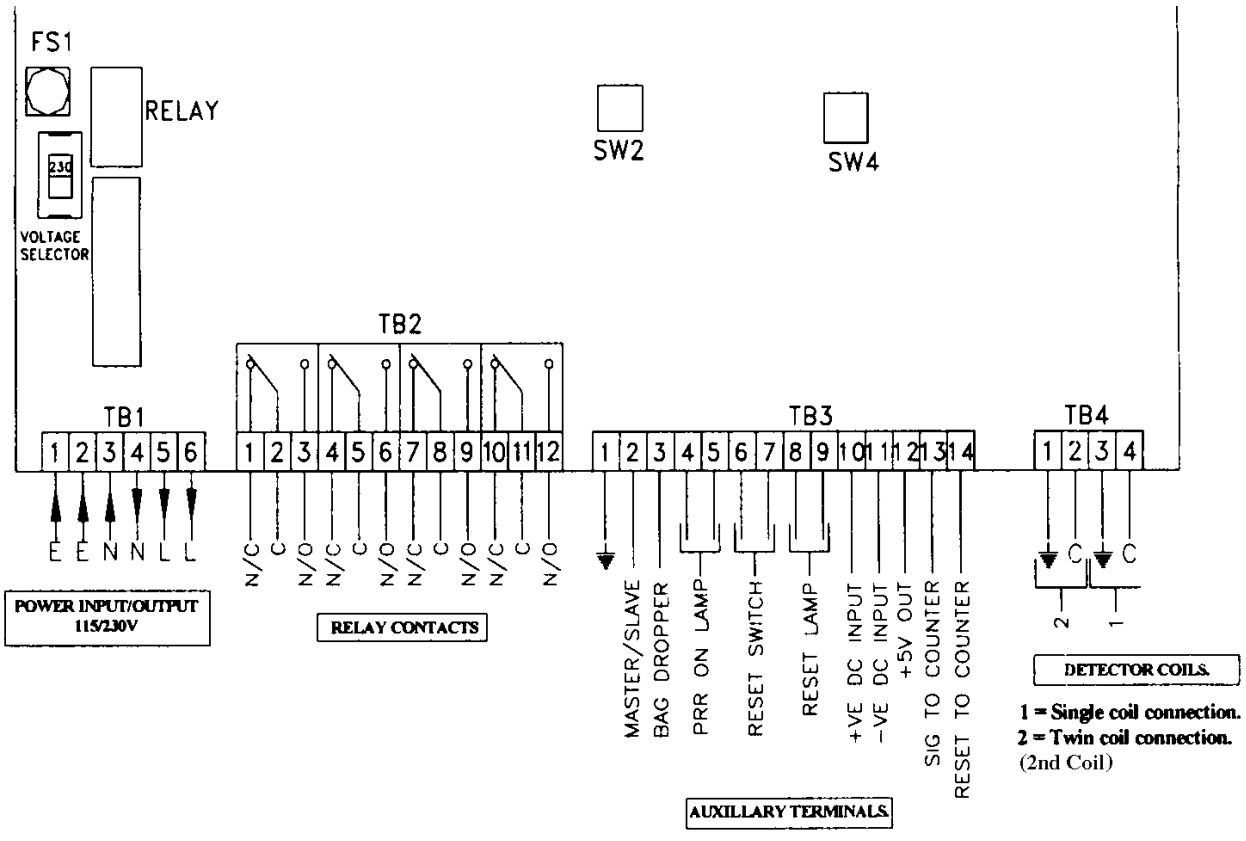


FIGURE 11

The Voltage Selector Switch should be set to 240V AC or 120V ac as required. This is located just above the green terminal block (TB1).

CONTROL RELAY CONTACTS
Connection to the output contacts of the control relay is made to terminal block (TB2) as indicated in Figure 11. Four sets of DPDT relay contacts are provided.

The contacts are rated for 5 amps resistive, for either low voltage DC application or for a maximum of 250V AC application.

Terminals 11 and 12 are used for a 'fault' indication.

FUSE
Note there is only one fuse on this Control Unit. It is located on the front panel and is rated at 0.5A.

SENSOR COIL CONNECTIONS
The sensor coil connections are made to the right hand 4 position terminal block (TB4). The inner conductor is connected to terminals 2 or 4. The outer shielding (ground) is connected to terminals 1 or 3 for all coils respectively.

SINGLE SEARCH COIL (SEE FIGURE 12)
For all single search coils (i.e. a TR or PL), the unit is connected to TB4, terminal 3 (for the ground/shield) and terminal 4 (for the center conductor).

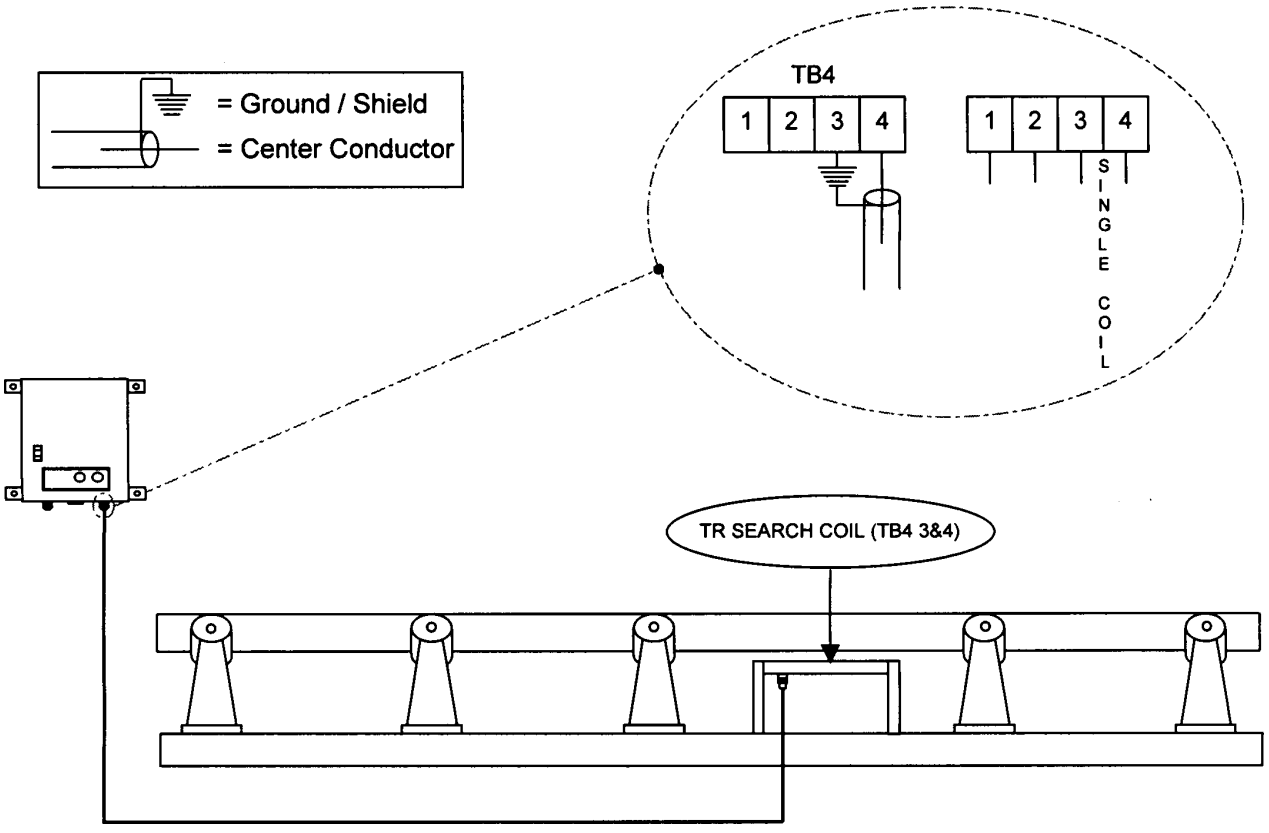


FIGURE 12

Electrical Connections *(cont.)*

BRIDGE (APERTURE) TYPE SEARCH COIL IN SERIES CONFIGURATION (SEE FIGURE 13)

A Bridge type search coil will be supplied in a series configuration for optimum sensitivity. The top and bottom search coils will be connected together by means of a 20" (.5 meter) or 40" (1 meter) interconnecting cable.

There will then be one main cable,which connects the search coil to the control unit. The cable is connected to TB 4 terminal 3 (for the ground/shield) and terminal 4 (for the center conductor).

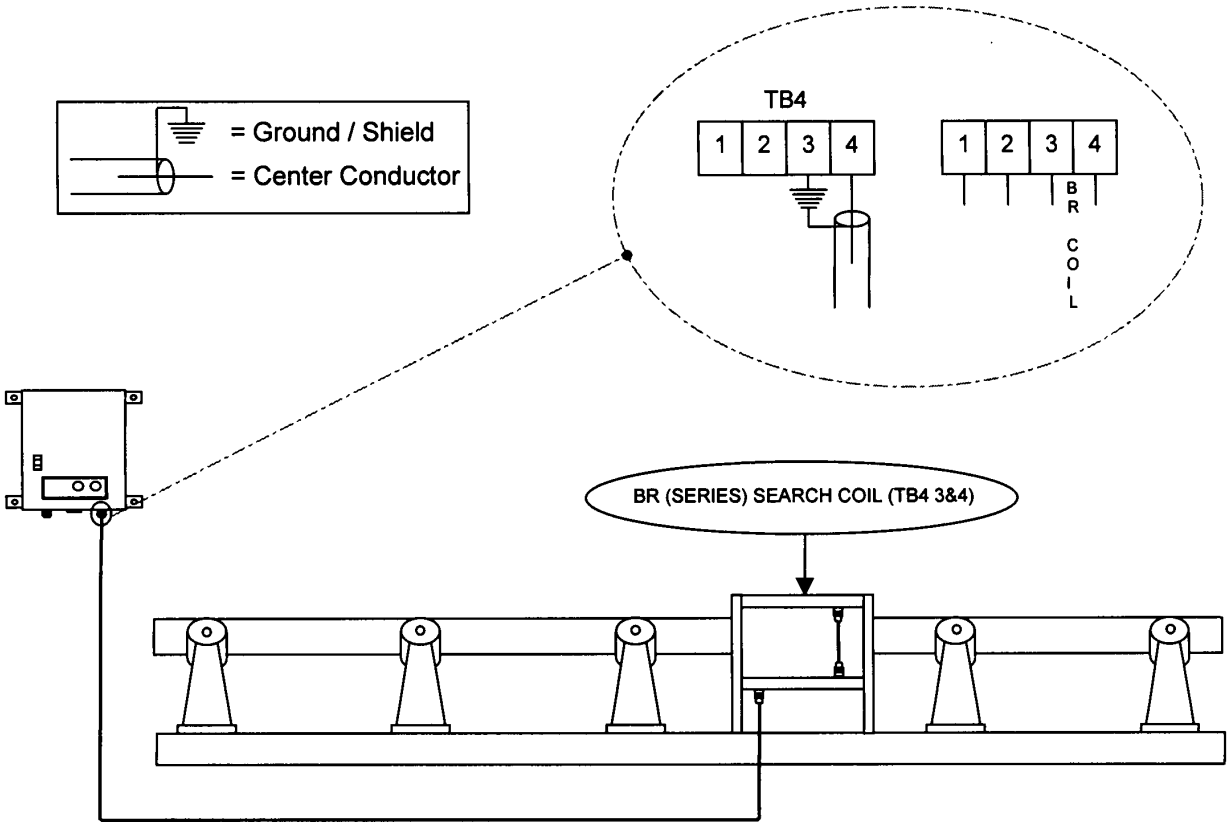


FIGURE 13

BRIDGE (APERTURE) TYPE SEARCH COIL IN TRANSMIT/RECEIVE CONFIGURATION (SEE FIGURE 14)

NOTE: When operating in a transmit/receive configuration, Switch 4 should be moved to position 2.

A Bridge type search coil will be supplied in a transmit/receive (TX/RX) configuration when either a conductive material is being conveyed or when a certain size piece of metal is to be detected and all smaller pieces being ignored.

When in the TX/RX configuration, both the top and bottom search coils are independently connected to the control unit. The lower coil, which is the transmitter, will be connected to TB4 terminal 3 (for the ground/shield) and terminal 4 (for the center conductor). The top coil, which is the receiver, will be connected to TB4 terminal 1 (for the ground/shield) and terminal 2 (for the center conductor).

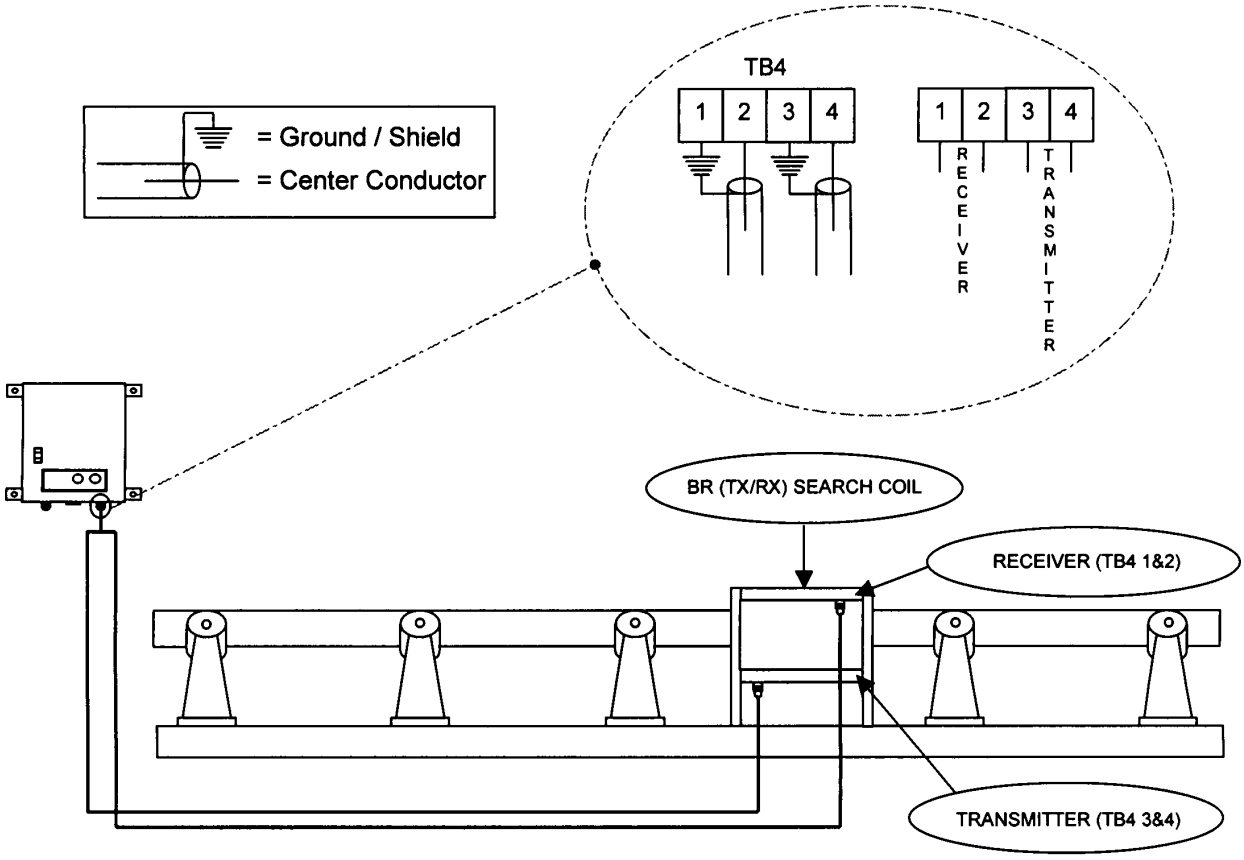


FIGURE 14

Operating Instructions

Switch on the line power and the 'ON' lamp on the case door illuminates. (See Figure 15).

The red 'FAULT' light will be on if the sensor coil is not connected. When the sensor is properly connected the light will extinguish.

NOTE: The illuminated fault light will also cause the 'Detect' lamp to be on.

Rotate the SET ZERO control fully clockwise. If the right hand light illuminates, rotate the Set Zero control counter-clockwise until this light extinguishes and the green light illuminates.

This adjustment compensates for or "zeros out" any near by metal in the sensor coil detection area. If this light cannot be illuminated there may be too much metal near the sensor coil. This can be confirmed by positioning the sensor coil away from all surrounding metal and repeating the test.

After these adjustments, the 'Detect' light and the 'Reset' light on the detector door may be illuminated. Pressing the 'Reset' lamp button will extinguish both lights.

The relay function is controlled by the 'Relay' control switch. In the OFF position only the 'Detect light and door 'Reset' lamp operate when metal is present in the sensing area.

In the ON position, the 4 pole DPDT relay, the 'Detect' light and the door 'Reset' light operate when metal is present in the sensing area.

In the LATCH position, the relay and above indicators operate but after the metal is removed, the relay and the indicators remain on until either the door 'Reset' button is pressed or the 'Relay' control switch is turned to the ON or OFF position.

The 'Gain' control is a sensitivity adjustment control to adjust for the detection of the desired size of metal or to allow for smaller pieces of metal to be ignored.

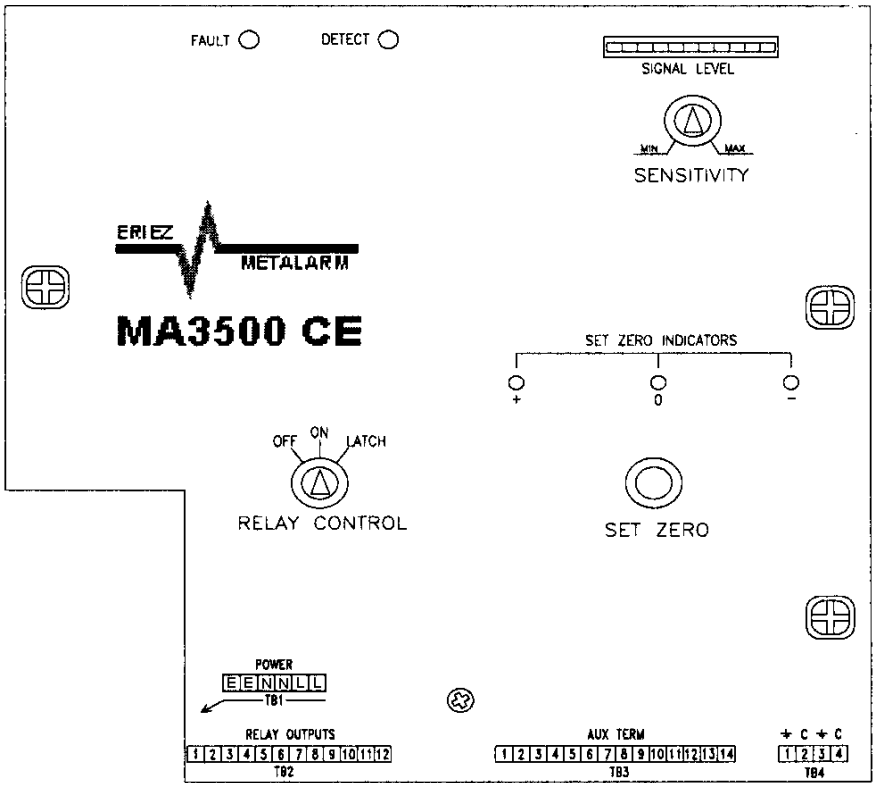


FIGURE 15

INDICATOR LIGHTS
SET ZERO
When the Metalarm is operating and correctly set, the green light of these three lights is the only one illuminated. If a piece of metal passing across the Sense coil is large enough it will cause the green light to go out and the right hand red light to illuminate while the metal is within the detect range of the Sense coil.

DETECT
This red light illuminates whenever metal is within the detect range of the Metalarm.

COIL FAULT
This red light illuminates if the sensor is either open circuit, not connected or short circuited.

This light also causes the Detect light to illuminate to prevent operation of the Metalarm until the coil fault is rectified.

Normally, the Metalarm control unit should not require any major re-adjustments after performing the adjustments during installation. After switching the control unit on, the green 'Set Zero' light should illuminate immediately without the need to turn the 'Set Zero' control. Proper operation may be verified by depressing the 'Test' button, which is mounted on the electronic circuit board beneath the front panel.

Certain extremely large objects may produce an overload signal causing the unit to indicate continuously even after the object has passed clear of the sensor coil. Depress the 'Reset' button to cancel the indication.

NOTE: Although the control unit will adequately zero out stationary masses of background metal, it will respond to moving metal near the sensor coil. When mounting the sensor coil, consideration should not be limited to only large objects such as forklift trucks, but should be extended to smaller objects such as maintenance workers carrying metal tools and equipment in the vicinity.

Although the metal detector system is suppressed against both airborne and power supply interference, some false alarms may nevertheless occur occasionally.

Such triggering is usually due to transient effects, which are both infrequent and unpredictable.

Metallic framework encircling the search coil can act as a "shorted turn". It may be necessary to insert insulating sections to prevent comparatively small masses of metal generating very large background signals.

SENSITIVITY ADJUSTMENT
The 'sensitivity' controls permit adjustment of the circuit gain for detecting or rejecting the desired size of metal objects. Rotate the 'sensitivity' control clockwise to increase the Metalarm sensitivity or counter-clockwise to decrease the sensitivity.

A coarse sensitivity adjustment (VR2) may be performed by means of the sensitivity adjustment control on the control unit printed circuit board. (See Figure 13.) Extreme care must be used in performing the coarse sensitivity adjustment. Consult the factory prior to making any coarse sensitivity adjustments. Refer to page 22 for coarse sensitivity adjustment details.

⚠ CAUTION
Take particular care with the mains supply connected, parts of the printed circuit board will be carrying high voltages. Therefore DO NOT touch anything other than the coarse sensitivity control.

The sensitivity of the control unit may be reduced by rotating the coarse sensitivity adjustment control (VR2) in the clockwise direction. Rotate this control one section at a time, checking each time to determine whether the gain has been reduced sufficiently.

After each coarse sensitivity adjustment, it may be necessary to re-zero the internal lights using the 'Set Zero' control and depress the reset button on the enclosure door.

SIGNAL LEVEL INDICATOR
This consists of a row of ten lamps, which light in sequence from left to right, as the detected signal level increases when metal approaches the sensor. The Metalarm will produce an alarm when the signal level reaches the right hand lamp marked T.P. (Trip point) This lamp is permanently illuminated. Normally none or perhaps the first 1 or 2 lamps may be flickering ON and OFF.

If the Metalarm is suffering from 'false alarms' fairly regularly, this indicator should be examined. It may show more than the first one or two indicators flickering indicating the presence of some interference which is either mains or air-borne. Rotating VR7 clockwise may reduce the effects of this. The signal level should now move to the left until only 1 or 2 indicators are on. Care should be taken to not rotate this control further than necessary, since it reduces the sensitivity of the unit. Refer to page 21 for further adjustment details.

Repairs & Adjustments

ELECTRONIC BOARD - MOUNTED SWITCHES
For the position of the switches, which control additional optional features, refer to Figure 16.

Note: Consult Eriez metal detector technical help before adjusting any of the following settings. Before changing any of the following adjustments, mark the original position with a marker, where applicable.

SW1 - Selection of voltage - 110V or 230V 50Hz or 60Hz.

SW2 Brown - Fail Safe Operation - With the switch down the 'Detect' relay is immediately energized when power is connected to the control unit rather than when metal is detected. When metal is detected or if the power to the unit fails the 'Detect' relay drops out, creating a fail safe mode.

SW4 - This separates the TX and RX coil connections when switched 'on' and is used when separate search coils are used for transmitting and receiving, such as to create an even search field or where magnetic ore is being processed.

SW5 - Test button.

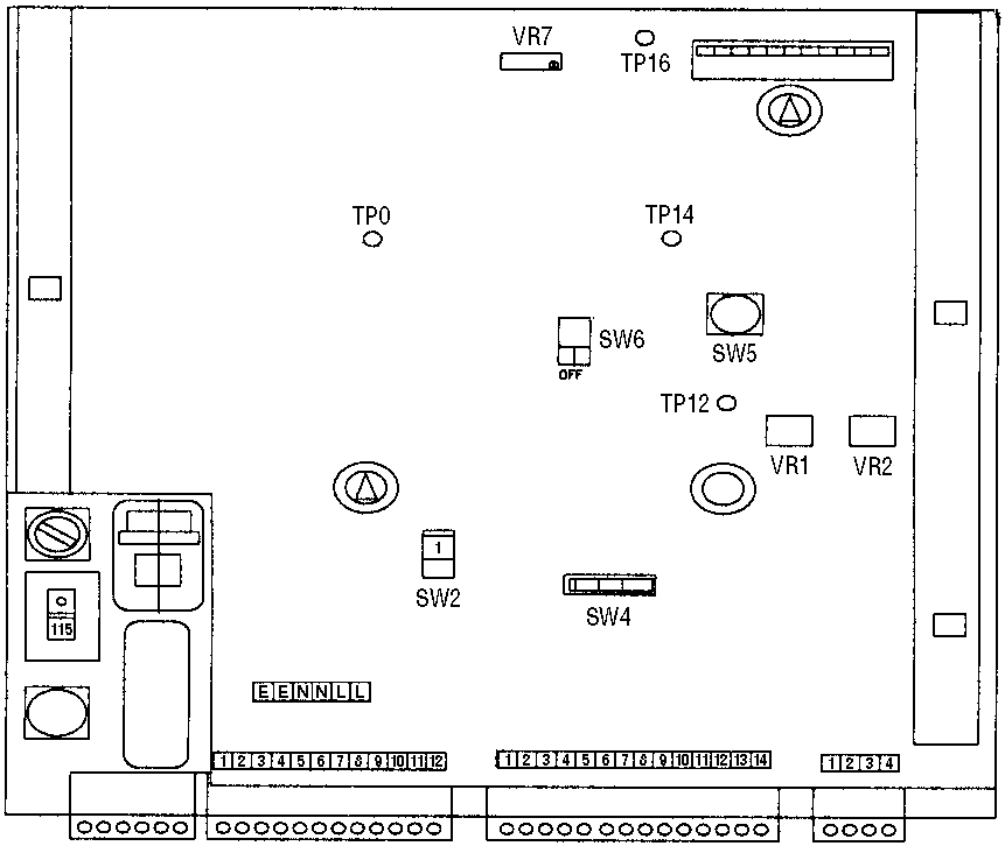


FIGURE 16

SW6 - When switched 'on' (to the 'up' position), this switch reduces the integrator speed. This facility is used where belt speeds are slow, such as in the Wood Industry and/or where noise levels are high.

VR-1 - This control adjusts the frequency of the system and is pre-set by the factory. A slight adjustment of this control can help reduce electrical interference. Counter-clockwise REDUCES the overall frequency of the system. If the control is turned counter-clockwise enough it will also REDUCE the overall system sensitivity. This control turns 270 degrees.

VR-2 - Primary course gain control. Clockwise REDUCES the overall gain of the system. For units that are too sensitive in that they detect smaller than desired metals, this control should be adjusted. This control turns 210 degrees.

VR-7 - Secondary course gain control, trip level threshold. This multi-turn trimmer should be used after reducing the overall gain via VR-2. Turning VR-7 clockwise will provide further REDUCTION in the unit's overall sensitivity. It is suggested to perform adjustment of this control using a half turn per each sensitivity test, until the desired level is achieved.

The actual threshold voltage level can be measured between TP-16 and TP-0 (GND) using a voltmeter set to a DC voltage scale. The typical voltage setting is 0.200 VDC. When VR-7 is turned clockwise this voltage level will increase thereby increasing the detection threshold of the system and making the system less sensitive to metal and false tripping. The maximum voltage level setting is about 1.5 VDC.

WIRING TO THE CONVEYOR MOTOR STARTER

To stop the conveyor drive motor when metal is detected, connect a Metalarm normally closed relay contact terminals C and N/C on (TB2) in series with the conveyor motor starter as in Figure 17.

When the Metalarm is wired as shown in Figure 17, the conveyor will not restart until after the metal is cleared, the Metalarm control unit is reset and the conveyor motor start switch is depressed.

If the conveyor is required to restart automatically when the metal is cleared and the Metalarm is reset, it will be necessary to 'replace the motor start/stop circuit with the normally closed relay contacts.

⚠ CAUTION

The motor will start when power is applied to the metal detector circuit.

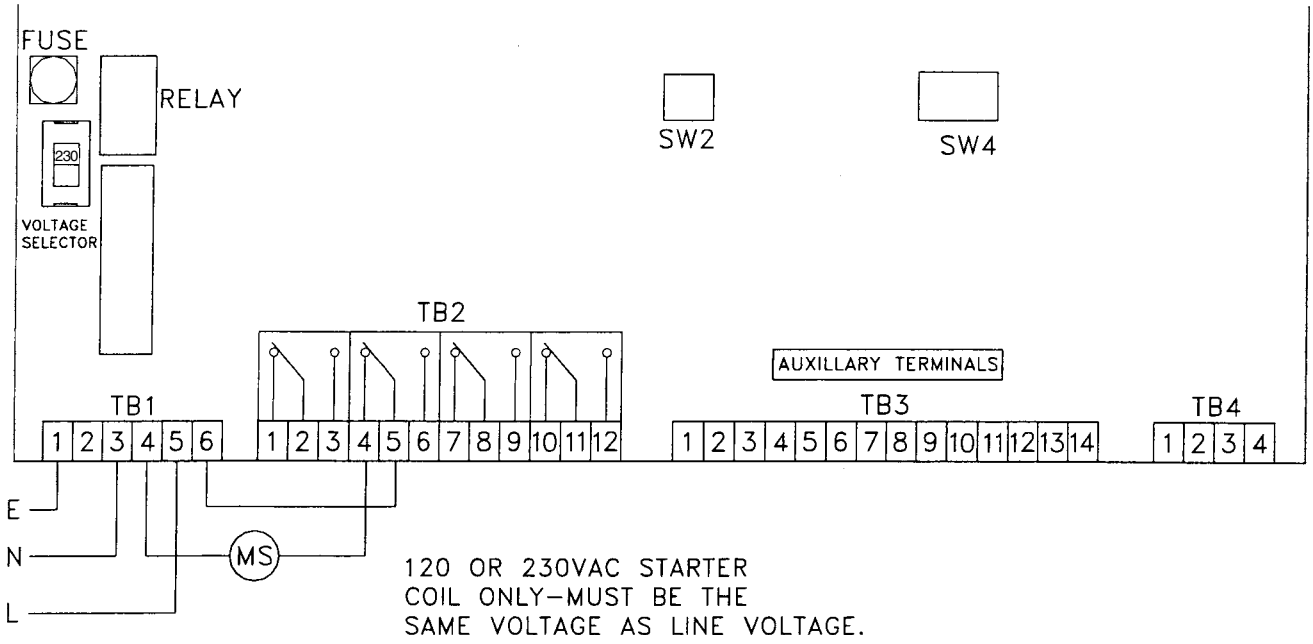


FIGURE 17

Repairs & Adjustments *(cont.)*

AUXILIARY RELAY

An auxiliary relay is necessary between the Metalarm Control Unit and a motor starter or contactor when the motor wiring system uses a device with a coil voltage other than 115 or 230 volts or a current rating greater than 5A. An auxiliary relay may be necessary when the plant switch gear is generating electrical interference or brushes are arcing, or when other electrical noise is being created.

This interference will propagate through the air and may also travel along the conductors in close proximity to the noise sources. When this occurs, interference will be fed into the Metalarm Control Unit along the interconnecting wires, and will cause false triggering.

An auxiliary relay in a separate enclosure, external to the Metalarm and separate from the main switch gear cabinet, will normally isolate the offending interference.

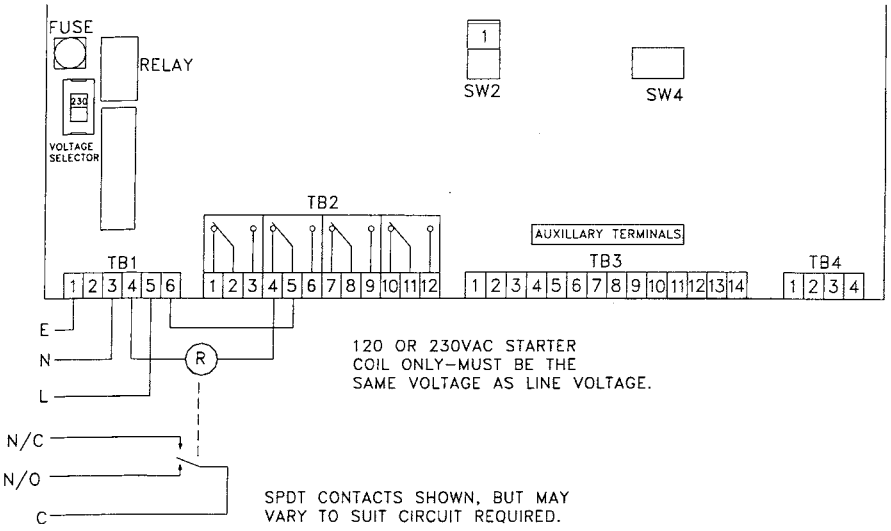


FIGURE 18
Auxiliary relay wiring diagram

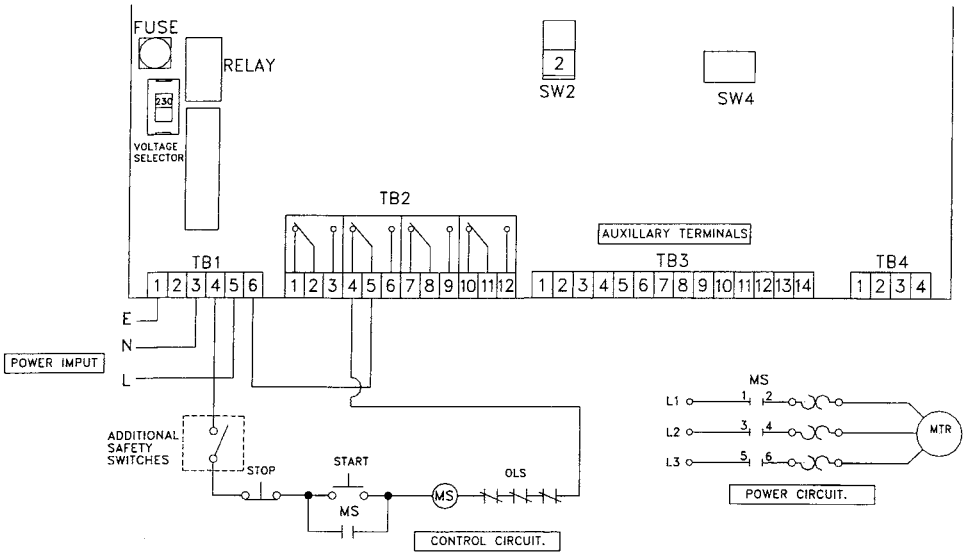


FIGURE 19
Conveyor motor starter wiring variation

AUXILIARY RELAY WIRING
Figure 18 shows an auxiliary 230V AC relay connected to C of (TB1) and drawing its power from the same power supply as the Metalarm's power supply.

Figure 19 is variation of Figure 18 wired so that the conveyor cannot operate when the power supply to the Metalarm is interrupted. SW2 should be in the down position "2" for this "failsafe" operation.

Troubleshooting

SUGGESTIONS FOR TROUBLE SHOOTING ENVIRONMENTAL INTERFERENCE
The Metalarm Control Unit generates a high frequency alternating field within and near the sensor coil. While the field is strongest on the sensor coil face or in the throat of the sensor coil, it is inherent in the sensor coil design that a certain amount of the field exists outside of the sensor coil. Certain environmental conditions may sometimes affect this alternating field causing false and erratic signals.

If after installation the unit does not work properly, check for compliance with the following hook-up and installation details before proceeding to the specific causes of interference.

All cable connections should be tight on the terminal blocks in the control unit.

The power source cables should be isolated from varying inductive loads and should be run in a separate conduit.

The control unit should have a good electrical ground connection.

In certain locations more than one problem may exist and the problems may be interrelated.

Observing the installation site and the operation of the metal detector for repeating symptoms is very helpful in isolating the causes of the problems.

Correlating malfunctioning occurrences is invaluable for environmental interference trouble shooting. Observe whether interference occurs at certain specific times and in conjunction with a specific activity.

Observe whether interference occurs when operated by certain personnel or only after physical change of the environment.

Use the following to help diagnose problems and problem sources and to implement corrective measures.

Basically environmental interference may be of four types:

- Movement of Metal
- Intermittent Loops of Metal surrounding the Sensor Coil
- Excessive Line Voltage Fluctuations
- Proximity to Severe RF Radiation Sources

MOVEMENT OF METAL
Large masses of metal such as shaker screens, metal deflection plates, vehicles etc. may affect metal detector operation even when at a considerable distance from the sensor coil. Other smaller masses of moving metal when sufficiently close to the search unit may also cause false trips. Interference may exist outside of the room or building and be hidden from operators' view, such as vehicular traffic in an alley next to the building wall or a chain conveyor below or above the floor, or moving metal objects in an adjacent room.

CORRECTIVE MEASURES
- Secure moving metal objects or remove them altogether if possible, or replace with a non-metallic material. Re-route vehicular traffic.
- Place a metal shield securely fastened and stationary between the sensor and the source of interference. Place a shield as close to moving object as possible. The size of the shield will depend on the size of the moving object.
- Install the metal detector in another location free from interference sources.

INTERMITTENT LOOPS OF METAL SURROUNDING THE SENSOR (SHORTED TURNS)

A source of interference, which is difficult to recognize is that of the shorted turn. A shorted turn is formed by metal pieces forming a complete path in some plane around or near the sensor.

If this is intermittent, as in the case of two pieces of conduit occasionally touching together, the detector will trip each time the conduits make or break connections. The intermittence may be caused by physical deflection or vibration of equipment, and by expansion or contraction of metal due to temperature changes.

The affect of the 'shorted turn' is that of a secondary 'coil' or 'turn' coupled to the metal detector sensor coil. The varying load of this secondary 'coil' when it makes or breaks is reflected to the sensor coil tripping the control unit.

The following metal objects may be part of or form a 'shorted turn' by themselves: metal framework, pipes, conduit, flexible conduit, guard railing, metal catwalks, conveyor rolls, etc.

To determine the existence of a 'shorted turn': switch the metal detector off and disconnect the sensor lead at the terminal block. This will disconnect the sensor from the control instrument and there will be no metal detection.

Now, turn the control instrument on again and set gain control to maximum. Run operation under normal conditions and observe the signal level indicator. If the indicator is stable at this time, it is most likely that a 'shorted turn' is being picked up by the sensor. However, the problem may also be a break on the sensor cable.

Check for breaks at this time and replace the cable if necessary.

If the cable is in good condition search for a 'shorted turn' as described in the following paragraph. If the level indicator is not stable at this time, the problem is likely to be due to excessive line voltage fluctuation.

To isolate and correct the 'shorted turn' problem, reconnect the sensor coil and turn off all surrounding equipment in order to eliminate any vibration.

The level indicator should settle down at this time or at least reduce the number of false trips.

Proceed by tapping on all metal objects, starting near the sensor coil and working out from there, in order to find where the break point is located. It is suggested that one person watch the level indicator on the control unit in order to observe any movement while another person is tapping on metal objects around and near the sensor coil.

In some cases, this may be several feet from the sensor coil. Sudden level indication movement when a metal object is tapped will indicated the intermittent connection. It may be possible to fix the problem by insulating or permanently securing this metal to metal connection. For example, in the case of broken weld, re-weld or in the case of a loose pipe or conduit, re-secure the holders.

EXCESSIVE LINE VOLTAGE FLUCTUATIONS

Electrical interference may be in the form of line voltage 'spikes' caused on-off varying inductive loads of electrical equipment on the same power line as the metal detector, or other power lines in close proximity to the supply line for the metal detector.

CORRECTIVE MEASURES

- Use another power line, (without the varying inductive loads) for the metal detector.
- Disconnect electrical equipment causing the large inductive loads.
- Connect interfering electrical equipment to another power source.
- Re-route the power line to the metal detector.
- Install a constant voltage transformer (120 VA minimum) between metal detector and power source.

PROXIMITY OF SEVERE RF RADIATION SOURCES

Electrical or electronic interference can be radiated into the sensor coil or introduced into the metal detector from other energy emitting devices such as arcing motors, arc welders, and arcing relay points.

CORRECTIVE MEASURES

- Remove or replace equipment causing the interference.
- Operate welding equipment only at times when metal detector is not required to operate.

Call the factory service department if unable to arrive at a satisfactory solution.

ELECTRONIC CIRCUIT BOARD REPLACEMENT

Normally, access to the electronics is not required but if the circuit board requires replacement, the following procedures must be used.

Turn off the main supply to the control unit and disconnect all terminal blocks connected to the base of circuit board by pulling downwards.

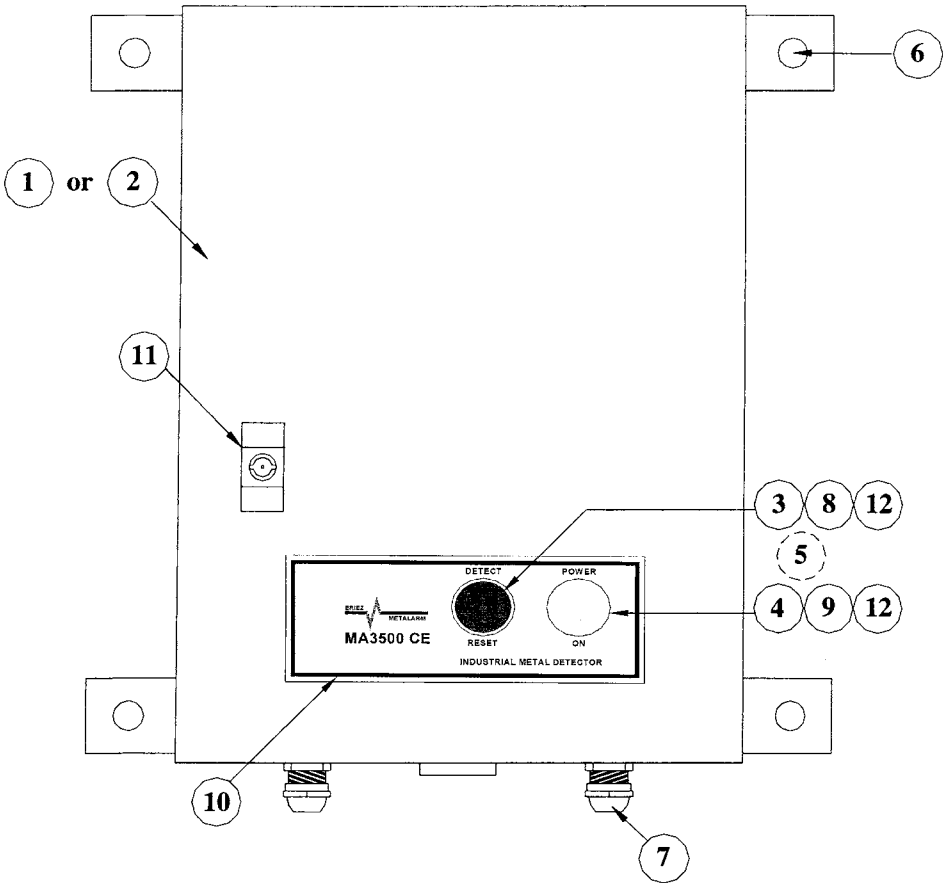
Undo the three panel attachment clips by turning them 1/4 turn counter-clockwise.

Undo the five screws holding the two mounting brackets and remove.

Undo the five standoffs and three mounting screws. Remove the circuit board and inspect the enclosure. Remove any foreign material such as loose pieces of metal filings or wire cutting etc.

Install the new circuit board in the reverse of the above procedure. Refer to the section for testing and operation.

Parts List

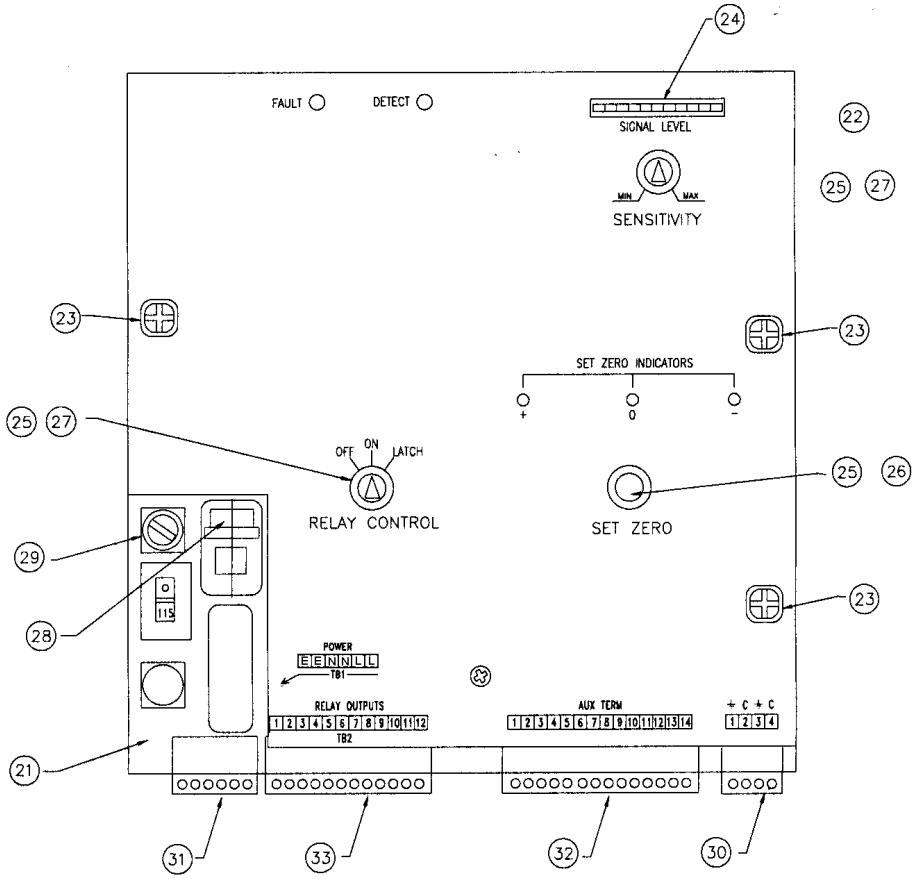


ITEM NUMBER	DESCRIPTION	PART NUMBER	QUANTITY
1	Case fully fitted	816510	1
2	Case Himel Box CRN43/150	816511	1
3	Momentary Illuminated Switch Assembly	816512	1
4	Indicator Assembly	816513	1
5	Front Door Wiring Loom	816514	1
6	Insulated Mounting Kit	816515	1
7	Cable Gland PG 1 Brass	816516	As Req'd
8	LED's MBC Red	816517	1
9	LED's MBC Yellow	816518*	1
10	Front Label MA3500 CE	816519	1
11	Door Key	816520	1
12	Lamp 12V MBC	818594	2

SEARCH COIL CABLES

DESCRIPTION	ITEM NUMBER	QUANTITY
Cable Search Coil - 3m	816210	1
Cable Search Coil - 5m	816211	1
Cable Search Coil - 10m	816212	1
Cable Search Coil - 20m	816213	1
Metalarm Male Cable connector	818213	1

***NOTE:** Certain controls use item numbers 8 & 9, while other controls use item number 12



ITEM NUMBER	DESCRIPTION	PART NUMBER	QUANTITY
1	Case fully fitted	816510	1
*	Electronic Unit Complete	816531	1
21	A PTL 153 Issue 2 Printed Circuit Board	816204	1
21	B PTL 147A printed Circuit Board	816203	1
22	Front Panel MA3500 CE	816521	1
23	Push Latch Arrow 2001	816522	3
24	Bargraph Module with Plug	816523	1
25	Control Knob	816524	3
26	Plain Cap for Control Knob	816525	1
27	Pointer Cap for Control Knob	816526	2
28	Relay 4p C/O	816200	1
29	Fuse T500mA 20mm	816201	1
30	Combicon Plug 4 Way	816527	1
31	Combicon Plug 6 Way	816528	1
32	Combicon Plug 14 way	821015	1
33	Combicon Plug 12 Way	816530	1

*Electronic unit comprises - printed circuit board, bargraph module, front panel etc. all mounted on back plate.

Metal Detector Equipment
Eriez Magnetics Europe Ltd – Pulse Technology Division
EC Declaration of Conformity

We hereby declare that the following equipment complies with the essential requirements at the Electromagnetic Compatibility Directive (89/336, 91/263 and 92/31).

This equipment should not be modified without our approval, as this declaration will lose its authority.

Equipment description : **Industrial Metal Detector**

Model : **Metalarm 3500 CE**

Manufacturer : Eriez Magnetics Europe Ltd - Pulse Technology Division
Bedwas House Industrial Estate
Bedwas
Caerphilly
CF83 8YG
United Kingdom

Applicable Directives :

EN 50011	General Emission Standard Class A Group 1
EN 50082	Generic Immunity Standard Part 2
	Machinery Directive 89/932/EEC (Amended 91/368,93/44 and 93/68).
	Low Voltage Directive (LV) 73/23/EEC
	BS EN 60335:2002 Household and similar electrical appliances – Safety

A technical construction file for this equipment is retained at the above address.

Signed : ..... **Name : D W Harverson**

Position : General Manager **Date : 1 January 2000**

Eriez Magnetics Europe Ltd
Bedwas House Industrial Estate, Bedwas, Caerphilly, CF83 8YG, United Kingdom
Tel : ++44 (0)2920 868501; Fax : ++44 (0)2920 851314; e-mail : eriez@eriezeurope.co.uk

World Authority in Separation Technologies
Headquarters: 2200 Asbury Road, Erie, PA 16506-1402 U.S.A.
Telephone: 814/835-6000 • 800/345-4946 • Fax: 814/838-4960 • International Fax: 814/833-3348
Web Site: http://www.eriez.com e-mail: eriez@eriez.com
Manufacturing Facilities: AUSTRALIA • BRAZIL • CANADA • CHINA • INDIA • JAPAN • MEXICO • SOUTH AFRICA • UNITED KINGDOM • UNITED STATES