

Installation, Operation and Maintenance Instructions



METAL DETECTOR MODEL 1235 ANALOG

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

Introduction

This manual details the proper steps for installing, operating and maintaining the Eriez Model 1235 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 1235 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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Safety Warnings

THIS DETECTOR SHOULD BE INSTALLED BY QUALIFIED ELECTRICAL AND MECHANICAL PERSONNEL ONLY.

General

All standard safety procedures should be observed when working on electrically powered equipment.

Proper care should be taken when connecting or disconnecting the power source.

When connected to a power source, un-insulated, dangerous voltage is present within the Detector's electronics enclosure which may constitute a risk of electric shock.

Do not allow moisture to collect in the electronics enclosure or near the power connections. Always close the enclosure and secure the locking mechanism after working with the electronics.

The user should not attempt to service the Detector. All servicing should be referred to certified service personnel qualified to work on electrical equipment.

Installation

Do not install this Detector near heat sources such as radiators or air ducts.

Place the Detector in a location with adequate air circulation to prevent internal heat buildup.

Connections

As standard, this Detector is set for connection to 115 VAC or 220 VAC. Refer to Appendix A Control Connection Diagram for information about connections and color code hook-up instructions.

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 new metal detectors are warranted against defects in workmanship and materials for three years. 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; shipping costs will be paid by Eriez. 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 metal detectors have been designed for installation by qualified personnel with detailed instructions provided with each shipment. When required, a 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 Magnetics

2200 Asbury Road, Erie, PA 16506-1402 USA

Phone: 814-835-6000 • 800-345-4946

Email: eriez@eriez.com

Website: www.eriez.com



Description

General

The Model 1235 is specifically designed to differentiate between magnetic and nonmagnetic metals. This Detector is typically used in conjunction with a magnetic separator. The Detector monitors the conveyed material for potentially damaging non-magnetic metal, while magnetic metal is allowed to pass and is removed by the magnetic separator further downstream. In addition, the Model 1235 can be set to trigger on any metal (magnetic or nonmagnetic) too heavy for the magnetic separator to remove. Consequently, full metal protection is provided.

The Detector makes use of the latest in solid state technology. The design includes a number of innovative features: self-test circuits that monitor the performance of the detection circuitry using light emitting diodes (L.E.D.'s) which indicate the status of the test circuits; wide programming capability to custom tailor the Detector to suit specific application requirements; and solid state relays to provide reliable arc-free switching.

Method of Operation

During normal operation, the transmitter coil is energized to produce a pulsed electromagnetic signal. These signals produce a field that locally permeates the conveyed material. A piece of metal entering this field absorbs energy emitted from the transmitter coil. The metal particle then releases the energy and this change is detected by the receiver coil. This technique provides optimum discrimination between tramp metal and the conveyed material; product effect is non-existent or minimal.

Having detected metal by a waveform change, the signal generated is amplified and filtered. The signal is then compared to a threshold determined by the size of metal that must be detected. When the signal exceeds this threshold, a "metal signal" is generated. Once this metal signal is generated, a secondary circuit analyzes the metal for its magnetic properties.

If this secondary unit determines that the tramp metal is magnetic, it is allowed to pass the Detector with no alarm for subsequent removal by the magnetic separator. If the secondary circuit determines that the metal is non-magnetic, the metal signal triggers solid state relays which in turn switch the line voltage to the output alarm terminals. In addition, the Detector will activate the alarm terminals for metal too heavy for the magnetic separator to remove. Any metal larger than the preset oversize limit will trigger the alarm regardless of its magnetic properties. The Detector is influenced only by change. Therefore, stationary structural members, metal belt cords, symmetrical idlers and other objects which do not represent a moving mass to the field are not detected.



Physical Description

Main Control Enclosure

This enclosure houses and protects the Electronic and Interface Modules and also serves as a junction box for conduit and cables running to and from the Detector. As standard, the Detector is housed in a steel NEMA 4 enclosure. Other enclosures are available as options.

Visible and accessible on the front panel are: Power On/Off Switch, Green Power "ON" Indicator Lamp, Red Trip Indicator Lamp that lights when the unit has detected metal and a Reset Button. See Figure 1.

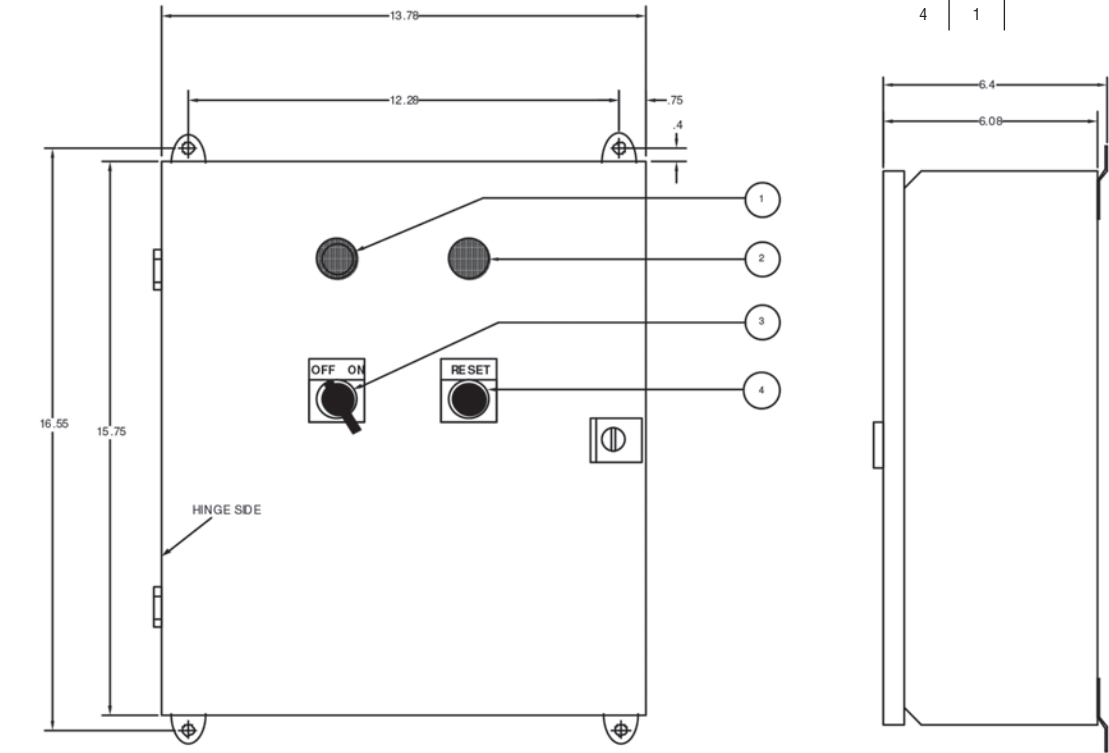
Electronic/ Interface Modules

All the electronics and controls for the Detector are contained in two modules, the Interface Module and the Electronic Module shown in Figure 2. The Electronic Module houses the electronic circuitry and components associated with metal signal processing and analysis. Visible on the front panel of the Electronic Module are the "Metal Sensitivity" control knob, "Clip Override" control knob and L.E.D. status indicators used to monitor the status of the Detector's self-test circuits. By removing the front panel of the module, all of the electronics are exposed for calibration and troubleshooting. All connections for the Electronic Module are made through a 36-pin connector located along the bottom edge of the module. When the modules are in place, this connector mates with a connector on the Interface Module.

The Interface Module interconnects all external signals and power to the Electronic Module. This module houses the power transformer, solid state relays and interface circuit board. Visible on the face of the Interface Module are system fuses and two terminal blocks for external wiring; all are clearly identified. The right terminal block, a 13-pin, 3/8" center screw type, connects the Detector's external transducers and signals. The left terminal block, a 7-pin, 7/16" center screw type, is used for all connections handling the A.C. line voltage.

Type: JIC NEMA
Size: 16" x 14" x 6"
Weight: 33 lbs. (includes all electronics)

ITM	QTY	DESCRIPTION
1	1	POWER "ON" INDICATOR (GREEN) LAMP
2	1	TRIP INDICATOR (RED) LAMP
3	1	ON/OFF SWITCH (LEVER HANDLE)
4	1	RESET PUSH BUTTON



- 4. DIMENSIONAL TOLERANCE ± 0.060
- 3. DETAIL DIMENSIONAL TOLERANCE ± 0.010
- 2. DETAIL IS HOFFMAN MINIATURE 4-WAY
- 1. MATERIAL: RITTAL ENCLOSURE FRONT DOOR JB161406HC

NOTE UNLESS OTHERWISE SPECIFIED

NOTE: REFBACK PANEL DRAWING 130-015

FIGURE 1



Electronic Module
Size: 10.5" x 8" x 1.5"
Weight: 2.5 lbs

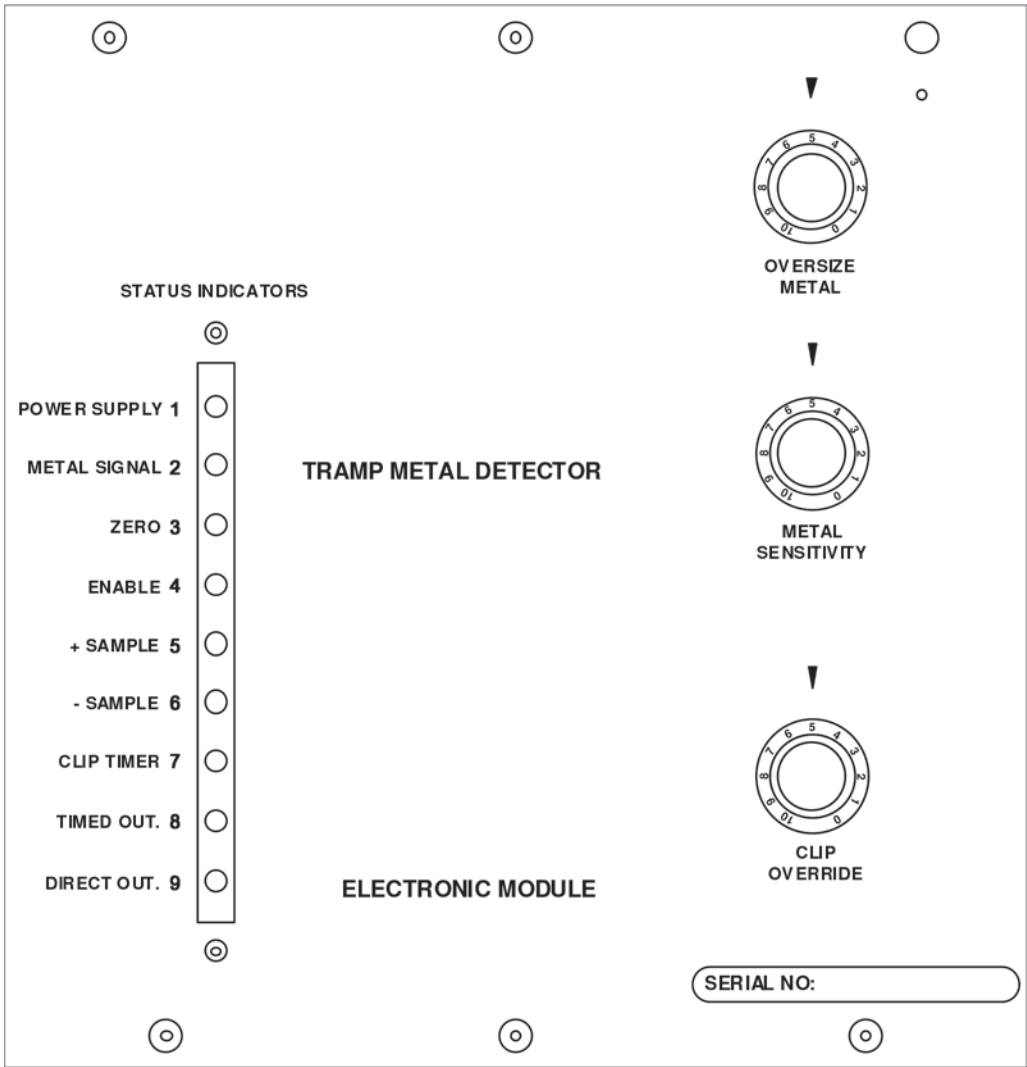


FIGURE 2A

Interface Module
Size: 11" x 2.5" x 4"
Weight: 4.75 lbs

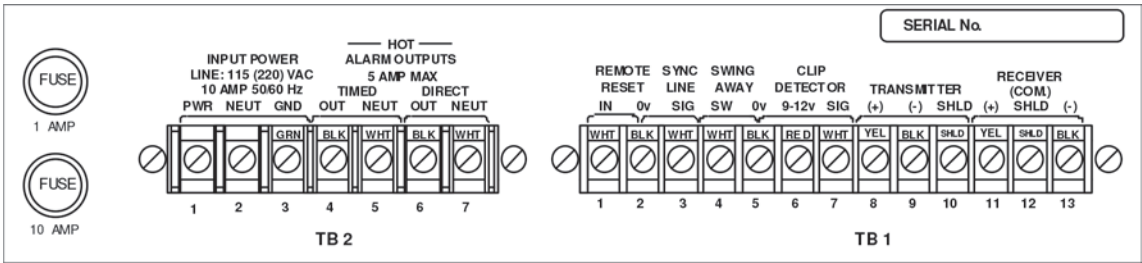


FIGURE 2B



Search Coil Assembly

The Search Coil Assembly includes receiver and transmitter antennas, mounting frame and interconnecting cables. Each assembly is custom designed to suit its particular application. Please refer to the Frame Assembly Diagram.

Receiver Coil

The receiver coil is typically located under the conveyed material within 2" of the loaded conveyor belt.

Transmitter Coil

The transmitter coil is located opposite and parallel to the receiver coil. The distance between the transmitter and receiver (aperture) is typically 4" greater than the maximum burden depth of the processed material.

Mounting Frame

The mounting frame supports the antennas on trough and slider bed conveyors. Special designs are available to accommodate other types of material handling systems. The swing-away assembly, shown in Figure 3, protects the transmitter from oversized conveyed materials.

Interconnecting Cables

Shielded cables connect the receiver and transmitter to the Main Control Enclosure. 25' of cable between the frame assembly and the control unit is supplied as standard. Optimum performance is assured with cable lengths of 25' or under. However, lengths of up to 100' are acceptable where Detector sensitivity requirements are minimal.

Clip Detector

(if applicable)

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.

Size: 3.5" x 3.5" x 2"

Weight: 1.25 lbs.

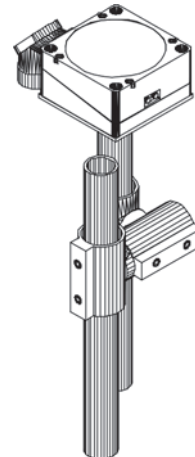


FIGURE 3

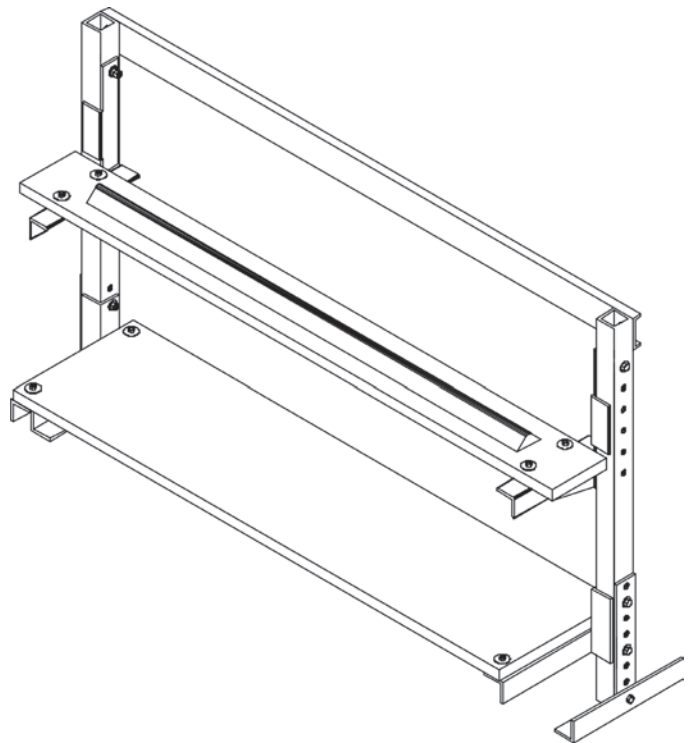


FIGURE 4

Installation

PLEASE READ THROUGH COMPLETELY BEFORE BEGINNING WORK!

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 the supplier immediately.

Site Selection & Preparation

While each application is unique, the guidelines listed below apply to most installations. Specific information concerning your installation can be found in the Frame Assembly and Control Connection Diagrams. Follow the steps listed below to choose the best location for the detector:

Choose a location for the detector so the material handling system has ample time to react to tramp metal. Locate the detector 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 system and speed of the conveyor belt.

Select a site with minimum vibration. High vibration areas may degrade detector sensitivity and shorten component life.

Locate the Search Coil Assembly away from sources of airborne electrical interference emitted from variable-speed drives, large motors, ballasts, FM radios, induction furnaces and other radio frequency (RF) sources. Because RF energy travels along a straight line (line-ofsight), position the receiver coil or relocate RF sources so they are out of the direct line-ofsight with the top and bottom of the receiver coil. 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.

Position the entire search coil assembly so that the bottom of the coil (usually the receiver) is equally spaced between the two adjacent idler rollers. Center the receiver coil. **Do not center the 2" x 2" uprights.**

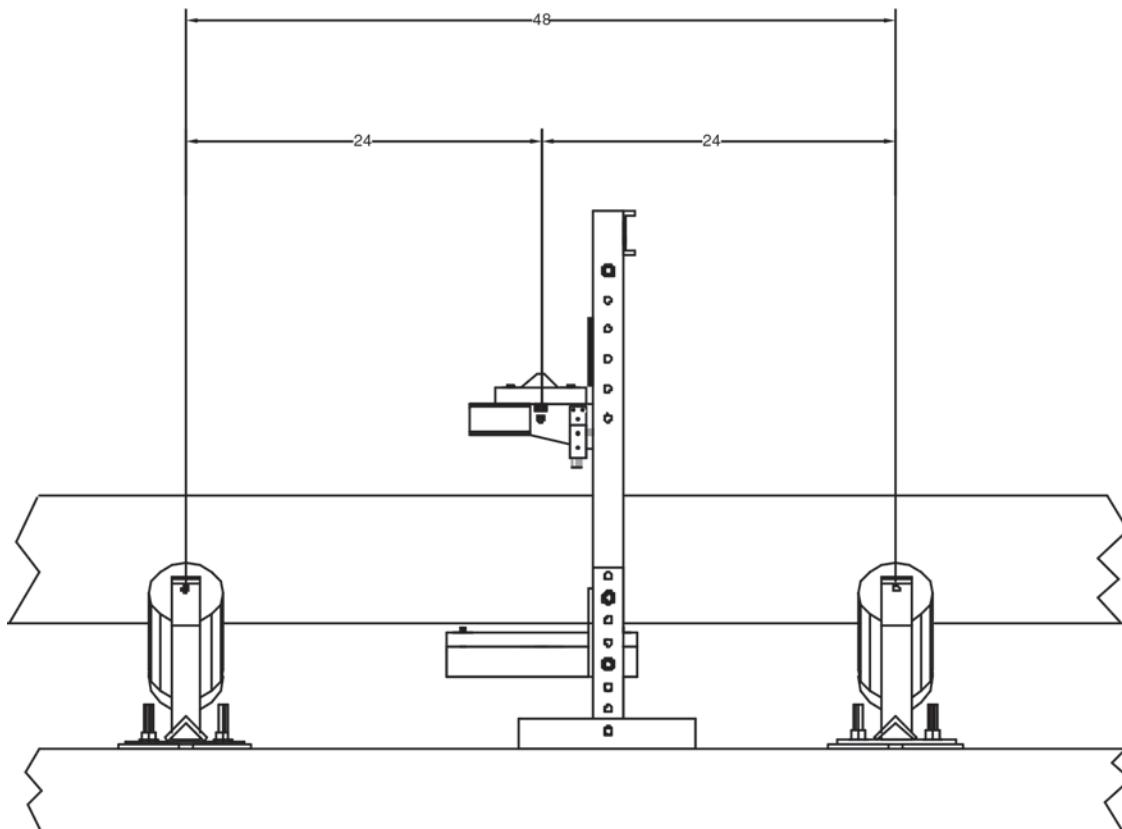


FIGURE 5

Idler Roller Isolation

The magnetic field generated by the transmitter coil induces eddy currents in nearby metal cross bracing, stairways, handrails and pipes. These eddy currents may cause false tripping if the current path intermittently makes contact. Eddy current loops can be broken by cutting the conductive paths in these structures. Use non-metallic hardware as required to restore structural support. If conveyor idlers are used in your application, the idlers adjacent to the Search Coil Assembly may require modification or isolation to break eddy current loops. Refer to the Conveyor Idler Modification Diagram for details.

If the Search Coil Assembly is located where a metal skirt passes through the coils, it must be replaced with a five-foot section of non-metallic material (i.e., wood or plastic).

Remove metallic decking, skirt boards, cross bracing and return idlers below and within 3' of the center line of the receiver coil (upstream and downstream). Relocate or tightly secure moving or vibrating pieces of metal such as cables, conduit and piping within 36" of the Search Coil Assembly.

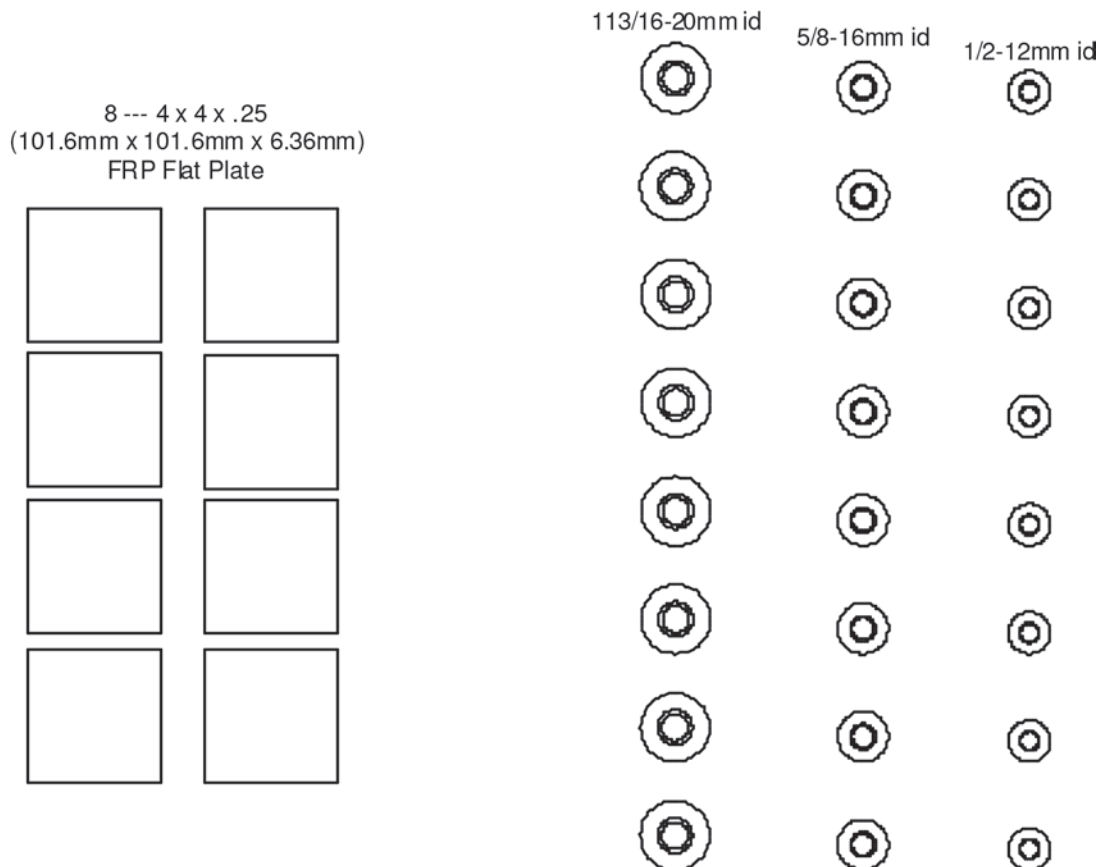
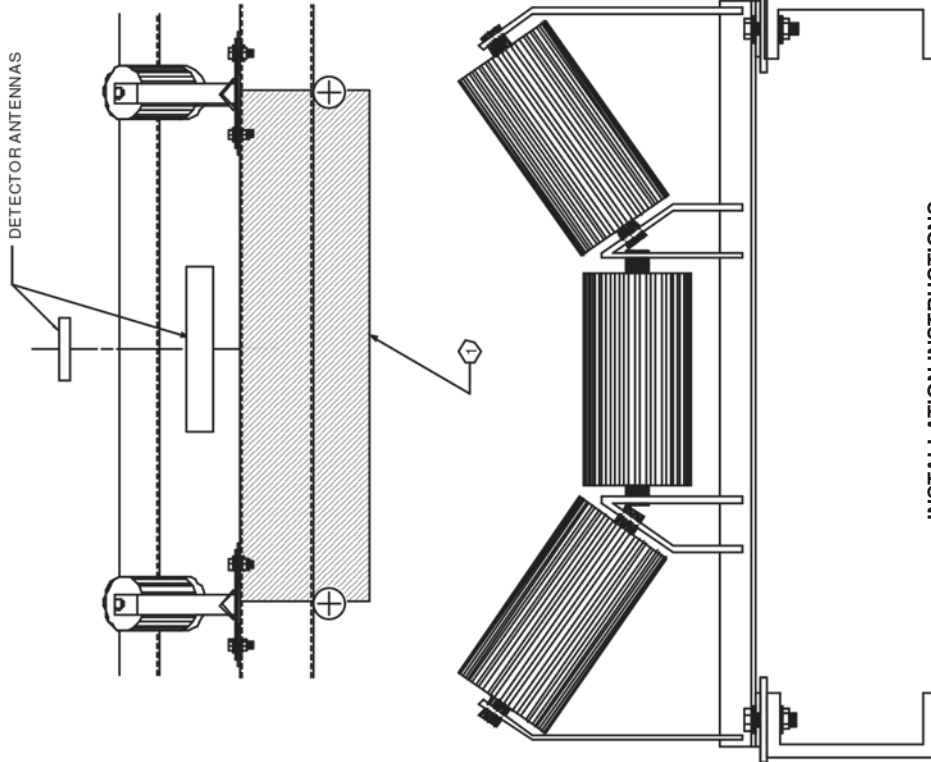


FIGURE 6

ITEM	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 (20MM)
4	2	ISOLATION PAD, FIBERGLASS 4 X 4 X 1/4 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 foot hole, drill a hole 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 washers 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.

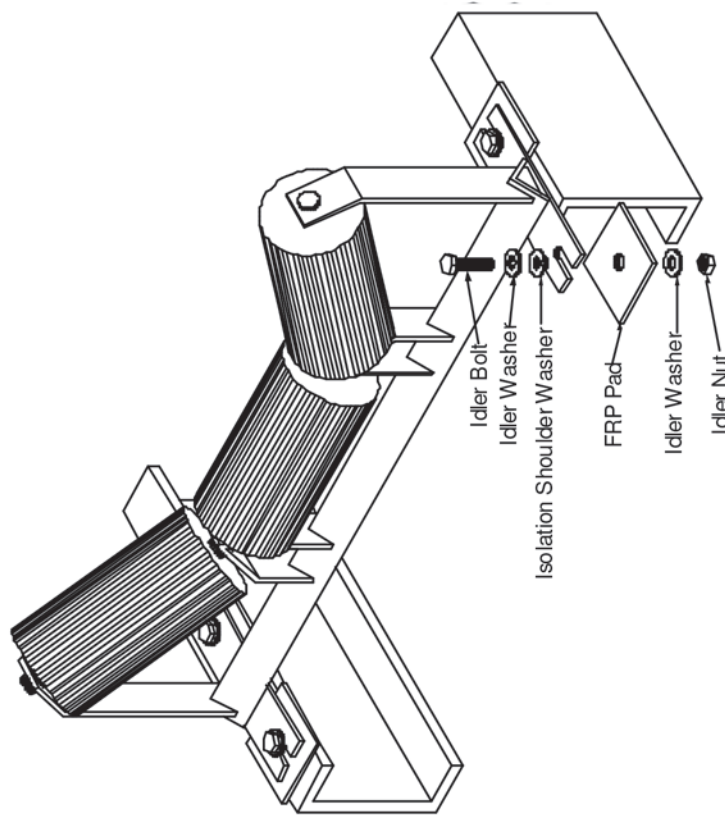


FIGURE 7

Mounting: Search Coil 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.

Assemble the top crossbar to the vertical upright supports using four 3/8" x 1" bolts with washers (provided). Be sure the crossbar is located on the upstream side of the upright supports and the base of the metal mounting feet point in toward the belt.

Assemble the top transmitter coil (with swing-away brackets attached) to the upright supports. The height of the transmitter coil should be as low as possible without being hit by overburden. The nominal height for the transmitter coil is indicated by dimension "S" on the Frame Assembly Diagram. 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. Hand tighten 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 over burden.

Position the upright assembly onto the conveyor frame with the arrow on the transmitter coil pointing in the direction of belt flow.

Assemble the receiver coil (mounting brackets attached) to the upright supports using four 3/8" x 3-1/2" bolts with washers (provided). Position the height of the receiver coil as close as possible to the belt. The nominal height for the receiver coil is indicated by dimension "R" on the Frame Assembly Diagram. Allow for belt sag under load. Bolt the brackets into place with nuts and washers facing in toward the belt.

Verify that the search coil assembly is square and all bolts installed are properly tightened.

Position the entire search coil assembly so the bottom receiver coil is equally spaced from the idler rollers on either side.

Weld or bolt the metal support feet to the conveyor frame. Be sure unwanted twists and torques in the frame assembly are corrected before you weld. A twist in the frame may cause the swing-away bracket to pull away from the upright support. This may cause the transmitter coil to bounce from vibration while in operation.

Mounting: Main Control Enclosure

After installing the Search Coil Assembly, select a place to mount the Main Control Enclosure for ease of operation. Avoid high vibration areas. Note the length of interconnecting cables and the location of the connectors on the receiver and transmitter coils. Locate the Control Enclosure on the same side of the conveyor frame as the connectors for ease in routing the cables.

The Enclosure should be positioned so the front panel hinge is on the left side and the indicators are on top.

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.

Familiarize yourself with the type of electrical connections required for this installation and any safety precautions before proceeding. Please refer to the Control Connection Diagram for information about connections and color code hook-up.

Use an electrician's conduit punch or drill to make either 1/2" or 3/4" conduit entries on the bottom of the Enclosure. The Control Connection Diagram shows where to position each entry. Remember to remove all metal shavings when you are finished. Use caution to not damage the electronics and to ensure that no metal particles enter the electronics. Do not run metal conduit along the sides or near the Search Coil Assembly.

The receiver and transmitter cables must be routed in a separate conduit. Do not run power wiring near the transmitter and receiver cables.

All line voltage connections terminate at TB2. Install line voltage cables between devices controlled by the Detector including diverters, auxiliary relays, marking devices, alarm horns or motor control equipment and TB2 in the Main Control Enclosure. The direct or timed outputs should not be connected to a Programmable Logic Controller (PLC) or other low voltage computer interface equipment that may require dry contact closures. The direct and timed output contacts are typically programmed as normally "OFF" at the Factory. They may be set to normally "ON" if required. Refer to the System Programming Section for details.

Connect a 115/220 VAC (50/60 Hz), single phase power line with at least 10 amp capacity to TB2. Make sure to connect an electrical ground to terminal #3. The power should be the "cleanest" available and free of significant voltage variations or spikes. Do not connect the Detector to a line which is used for operation of motors or motor controls. Proceed with the Start-Up & Calibration Section before applying power.

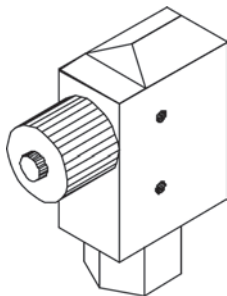
CAUTION

The Interface Module is preset at the Factory for 115 or 220 volt ($\pm 10\%$), 50/60 Hz, single phase operation. If the voltage source is different, contact the Factory for instructions to select the proper voltage source.

Swing-Away Switch

(if applicable)

The Swing-Away Cutout Switch (Optional) is a pre-wired 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. Refer to the Control Connection Diagram for hookup.



Clip Detector

(if applicable)

Refer to Control Connection and Frame Assembly Diagrams. If there are idlers adjacent to the search coils, position the Clip Detector Sensor approximately 1" to 3" 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 coil on the upstream side of the Search Coil 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 be installed in conduit. The same conduit that houses the transmitter coil cable may be used.

Feed the Clip Detector cable into the conduit from the Clip Detector end to the Main Control Enclosure.

Cut off excess cable. Connect wires to terminal block (TB1) using the supplied spade lugs. Refer to the Control Connection Diagram for color code hook-up. Be certain all wires are attached securely and connected to their proper terminals.

When metal repair clips are used, two or more clips close together must pass directly over the Clip Detector Sensor in order to activate it. If a small patch of clips is 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 when a small patch passes by. Numerous repair and reference clips on the belt will degrade the Detector's performance because it will frequently be in a desensitized mode.

Marking Device

(if applicable)

The Marking Device is a pressurized, solenoid activated liquid spray system which pinpoints the location of tramp metal to eliminate costly search and down time.

Specifications

Tank Pressure Rating: 150 psig (maximum working pressure)

Tank Capacity: 3 Gallons (liquid)

Operational Voltage: 115/220 VAC (50/60 Hz), 15 Watts

Air: Plant air or any source of 100 to 200 psig inert gas

Installation Instructions

Refer to the Frame Assembly Drawing for layout of the Marking Device on the belt.

Position the solenoid support upright and cross arm as shown. Distance from the coils should be 3' to 6'. Clamp in place temporarily.

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.

The solenoid control cable is connected to the Interface Module Timed Output (Terminal TB2, Pins 4 & 5). Route the cable accordingly.

Connect the hose between the tank outlet and the solenoid valve.

Connect the facility air source to the tank regulator inlet. Be sure the facility air source is shut off and no pressure is in the tank.

Remove the top of the spray tank.

The spray solution is supplied by the User. The recommended mixture is five (5) fluid ounces of colorant, Chrome Yellow (or other contrasting color) manufactured by Tenneco Chemical (or equivalent) 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.

Mix the solution and pour it into the holding tank. Replace the cap.

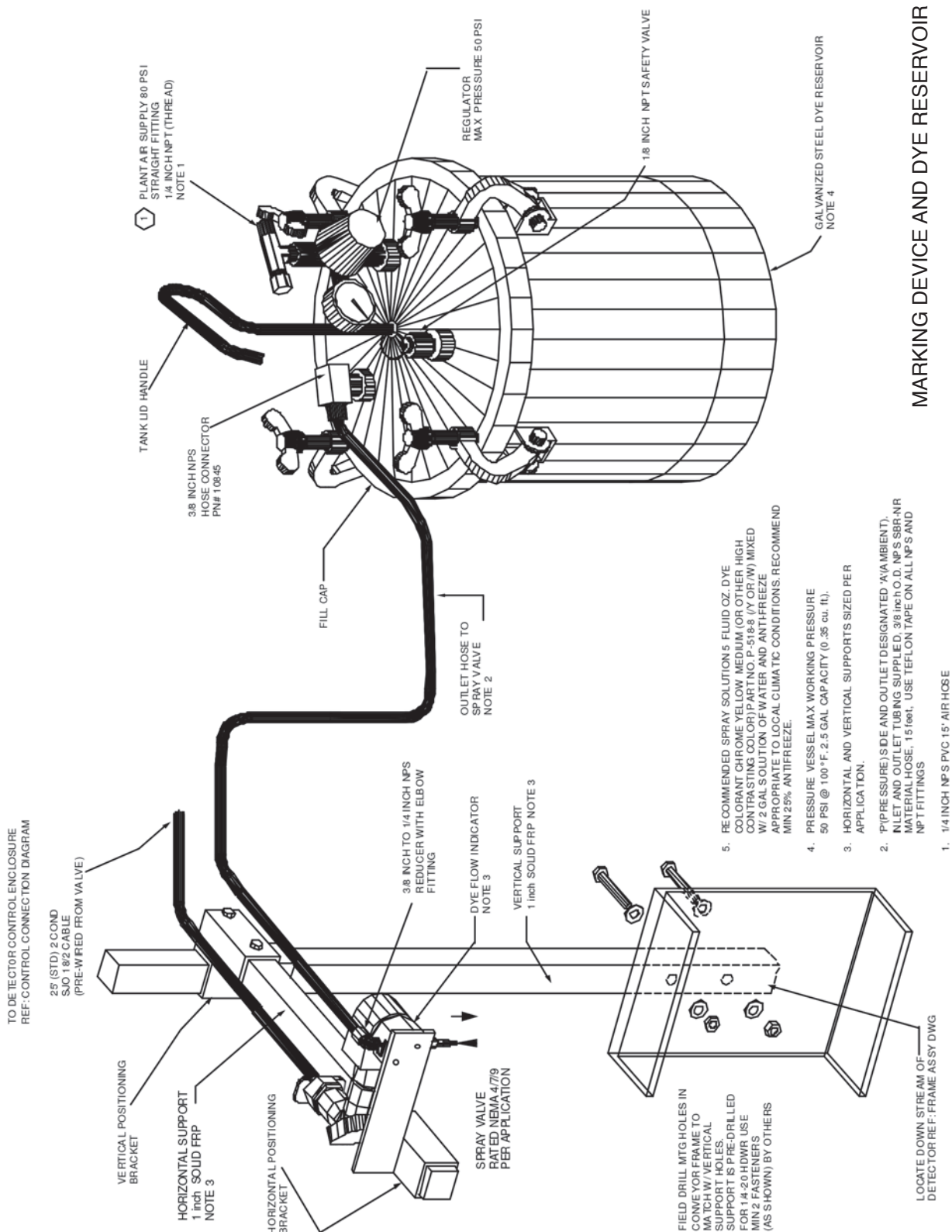
Verify that the pressure regulator valve is closed prior to turning on the facility air.

Apply the facility air and adjust the pressure regulator between 60 and 100 psig, as noted on the pressure gauge on top of the holding tank.

Calibration of Marking Device

Refer to the System Programming section "Delay Before Alarm" and "Time Alarm On" to set the desired timing for marking a predetermined location.

Using a sample piece of tramp metal, with the belt operating at normal load, adjust the Marking Device timing by trial and error.



Flag Drop Marker

(if applicable)

The Flag Drop Marker is device which drops a tag or flag onto the belt which pinpoints the location of tramp metal to eliminate costly search and down time.

Specifications

Plastic NEMA 4X box which holds the electronics and flag

One set of 3 flags

Operational Voltage: 115/220 VAC (50/60 Hz), 15 Watts

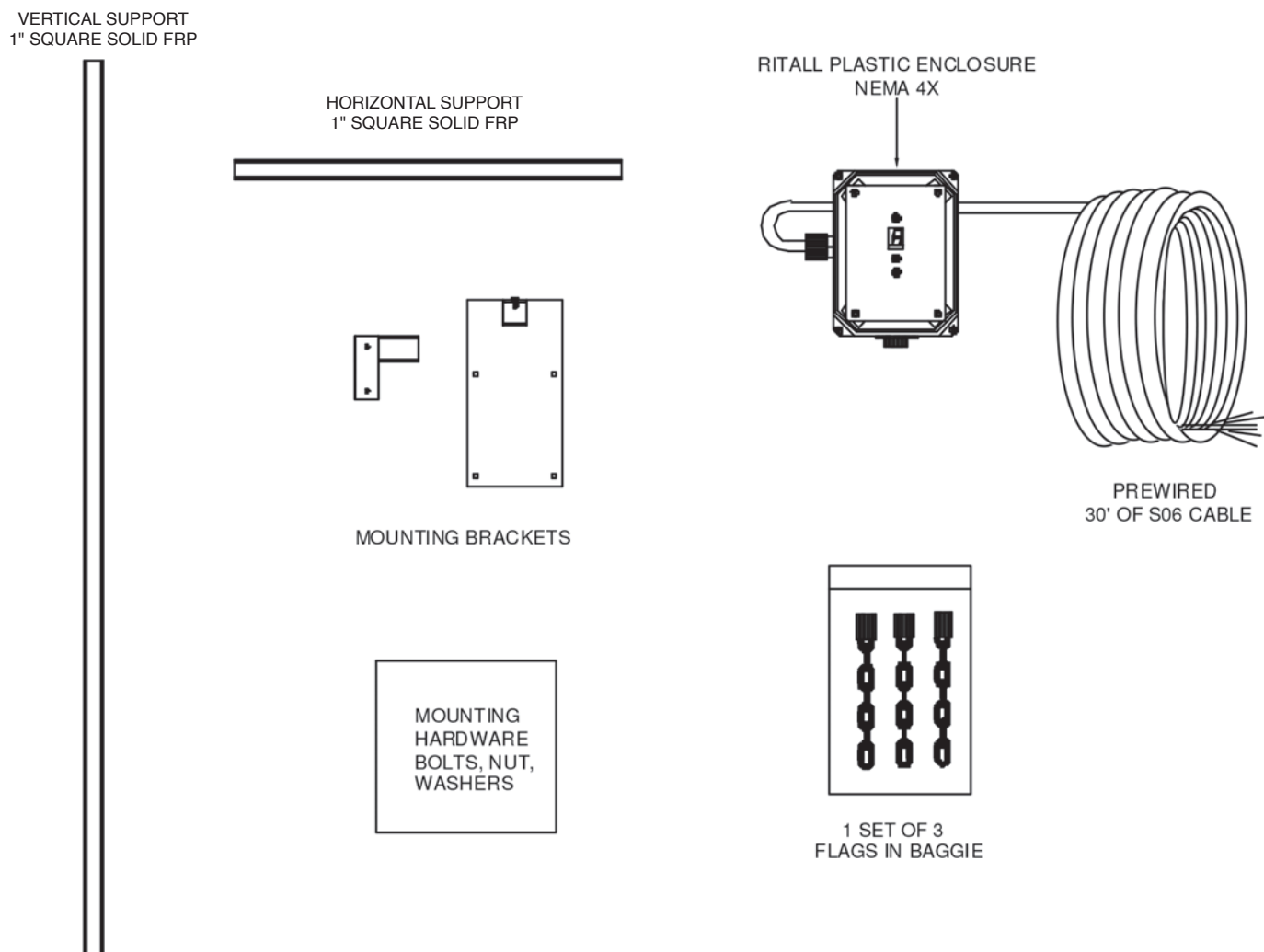


FIGURE 14

Installation Instructions

Refer to the Figure 15 for assembly and mounting and Figure 16 for positioning of the Flag Marking Device on the conveyor belt.

Attach the upright support to the upright. Position the frame upright in front of the first downstream idler roller. Lay the upright support on the top of the C channel and adjust the upright so that it is straight up and down. Clamp in place now drill the a hole in the side of the C channel to secure the bottom of the upright and drill a couple of holes through the upright support and top of C channel and secure the support to the conveyor C channel.

Attach the frame cross bar with gusset to the upright.

Mount the NEMA box to the 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).

Route the power cord across the cross bar and down the upright, secure cord with ty-raps. Make connections to the Metal Detector electronics Ref Appendix A Figure A12.

Calibration of Flag Drop Marker

Refer to System Programming section “Delay Before Alarm” and “Time Alarm On” to set the desired timing for marking a predetermined location.

The initial delay time that is set can be calculated using the belt speed and the distance between the center of the receiver antenna and the flag drop marker flag or use a stop watch to time a mark on the belt as it moves from the center of the receiver antenna to the flag drop maker flag. This is the Delay Before ON time. The ON Time is preset at the factory to about .05 second. It is easier to adjust the timing of the flag marker with an empty belt. Use a sample piece of tramp metal large enough to trigger the detector. With the belt up to full speed place the tramp metal on the belt far enough before the metal detector antennas that the metal has come to rest on the belt and is not moving relative to the belt. What should happen is when the piece of metal reaches the flag drop area the released and will fall to the belt. If the flag lands before the piece of metal then increase the Delay Before On time. If the flag lands after the metal then reduce the Delay Before On time. The flag should drop and hit the metal. The delay time for the flag will vary depending on the distance it has to fall. If the flag is dropped on the product the distance the flag has to travel between an empty belt and a full belt will cause the flag to be either in front of the metal or behind the metal, so when looking for metal look about 12" on either side of the flag if the metal is not visible and is buried in the product.



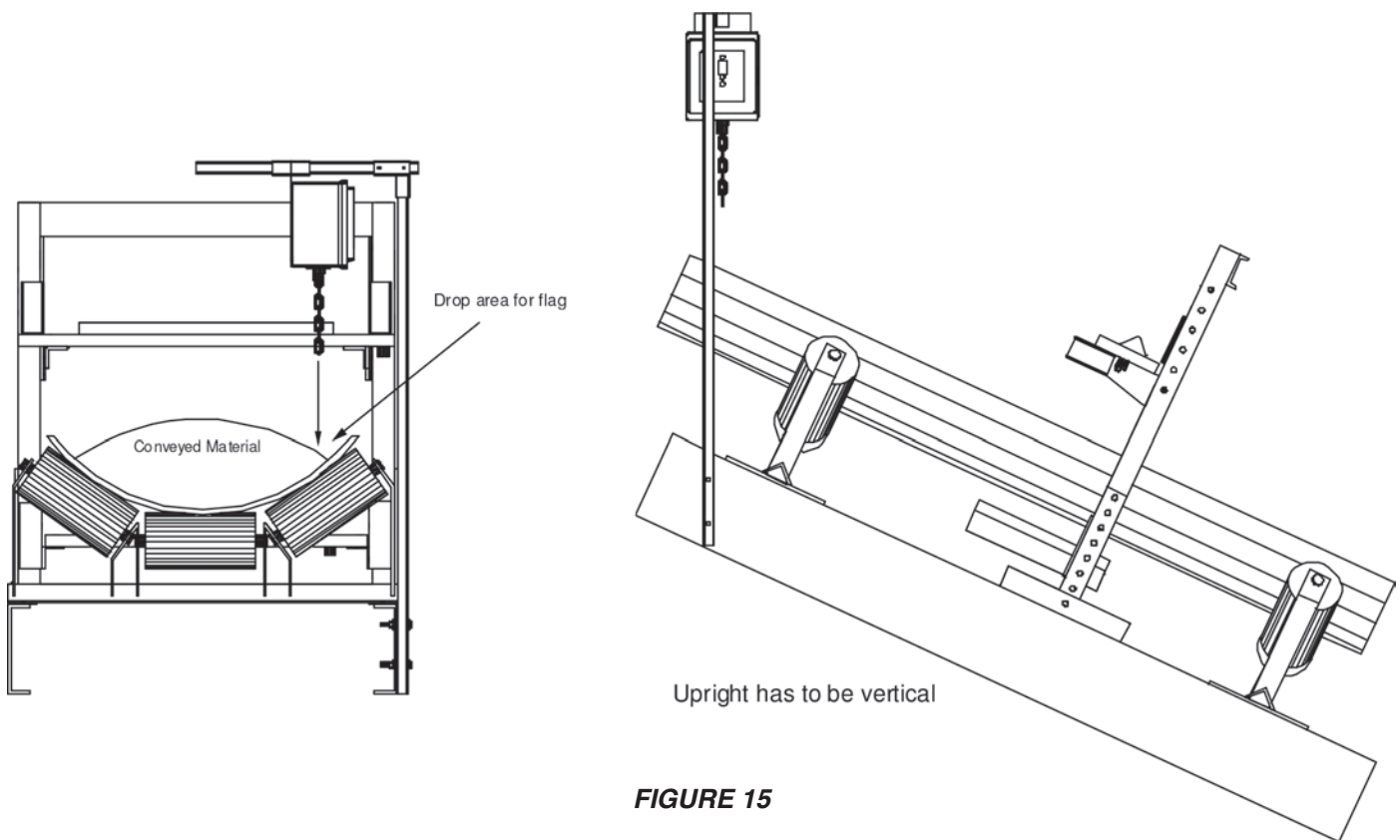


FIGURE 15

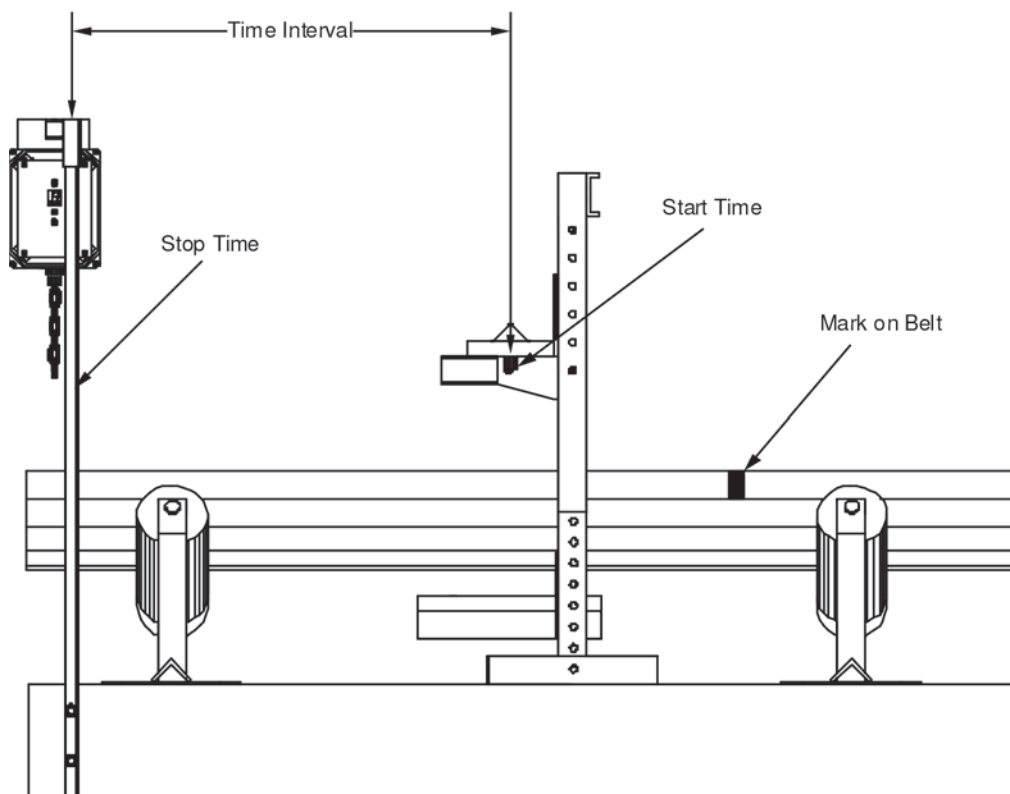


FIGURE 16

Start-up & Calibration

Start-up

Before turning on the system, locate the switches and lights on the door panel and the controls inside the cabinet.

The power switch is located on the lower left-hand corner of the door panel. Place it on the "ON" position. The green "ON" indicator should light at this time.

If the green "ON" does not come on, return the power switch to the "OFF" position and inspect the light bulb and fuses; also check the power and wiring for proper connections.

Approximately 5 seconds after power "ON", the No. 1 status indicator (power supply) located on the front panel of the Electronic Module will light (reference Figure 2). This indicates that the power supply is fully operational and all the electronics are enabled.

If the power supply L.E.D. status indicator or the "ON" indicator does not light, refer to Troubleshooting Flow Diagram #1 for instructions. Until the power supply L.E.D. is lit, calibration of the unit cannot begin.

Main Detector Unit: Metal Sensitivity Calibration

Before proceeding with the calibration procedure, obtain four samples of tramp metal as listed in the following reference table. These samples should represent the type of metal most likely found in the conveyed material. *The clip timer, L.E.D. No. 7, cannot be lit during calibration.* This results in erroneous data. During calibration, the test samples must be fully passed through the detection field. The samples must be traveling at a uniform rate through the area two feet ahead and two feet behind the receiver coil in order for the Detector to analyze the magnetic characteristics of the metal.

	Magnetic/ Nonmagnetic	Size	Example
1 Piece	Nonmagnetic	Smallest size that will damage crusher.	Aluminum, Brass, Manganese
1 Piece	Nonmagnetic	Largest size that will not damage crusher.	Aluminum, Brass, Manganese
1 Piece	Magnetic	Slightly smaller than the largest size the magnet can remove.	Steel
1 Piece	Magnetic	Larger than magnet can remove.	Steel

Oversize Threshold

This adjustment determines the size of metal that will trigger the alarm circuitry regardless of its magnetic properties. It has been preset at the factory for a size slightly smaller than the largest piece of magnetic metal that can be removed by the magnetic separator and should not be adjusted unless absolutely necessary. If the oversize threshold is not used, set the "Oversize Threshold" control on the front of the Electronics Module to a setting of "10". If the oversize threshold is used, calibration is as follows:

1. Pass the larger sample piece of magnetic metal between the coils at the height of the average burden and at a speed comparable to belt travel. If the Detector trips on the test sample, skip step 2 and proceed with 3. If the Detector does not trip continue with step 2.
2. Reduce the oversize threshold by turning the "Oversize Threshold" control knob on the face of the Electronic Module counter-clockwise to a smaller setting. Continue adjusting until the Detector picks up the larger test sample.
3. Pass the smaller sample piece of magnetic metal between the coils in the same manner as the larger piece. If the unit does not trip when the metal passes between the coils, the test is complete. If the unit trips, adjust the "Oversize Threshold" until it does not trip.
4. Repeat steps 2 and 3 until the system accepts the larger piece of metal and rejects the smaller. When the final setting is made, note the number on the "Oversize Threshold" control knob for future reference.
5. If the Detector does not respond properly to calibration, refer to the Troubleshooting Flow Diagrams at the end of this Manual.



Non-magnetic Metal Sensitivity Calibration

1. Set the "Metal Sensitivity" control knob, located on the front panel of the Electronic Module, to the middle of the dial (reading of 5).
2. Pass the larger sample piece of non-magnetic metal between the coils at the height of the average burden, at a speed comparable to belt travel and completely through the search coil assembly.

If the Detector does not trip on the test sample, turn the "Metal Sensitivity" control knob to a higher sensitivity (in direction of ascending numbers), so the Detector will trip just as the metal is passed between the coils.

In the event that the unit doesn't trip with the "Metal Sensitivity" control knob on 10, check to see if the metal signal L.E.D. No. 2 lights as the metal is passed through the field. If the L.E.D. does not light as the tramp metal is passed through the field, additional sensitivity may be required. In this case, please refer to the section System Programming "Metal Gain".

3. Pass the smaller sample piece of non-magnetic metal between the coils in the same manner as the larger piece. The unit should not trip when the smaller piece of metal passes between the coils. If the unit does trip, adjust the "Metal Sensitivity" control knob until it does not trip on the metal.
4. Repeat steps 2 and 3 until the system accepts the larger piece of metal and rejects the smaller. When the final setting is made, note the number on the "Metal Sensitivity" control knob for future reference. If this number is greater than 8, increase the gain of the Detector as described in the section System Programming "Metal Gain".
5. Pass the smaller sample of magnetic metal through the sensing area. L.E.D. No.2 should light, indicating the presence of metal. The Detector should not trip because the sample is magnetic. If the unit does trip, the "Oversize Threshold" may require recalibration. Refer to "Oversize Threshold".

Main Detector Unit: Clip Detector Calibration

(if applicable)

Turn the "Clip Override" control knob fully clockwise to position 10 on the dial. This knob is located on the front panel of the Electronic Module as shown in Figure 2.

Observe the reference clips to see if they are passing within 1" of the Clip Sensor Head when the belt is empty. Adjust the Clip Detector if it is not within this distance making sure that the clips or the belt do not hit the Clip Detector Sensor Head when the belt is fully loaded. If the clip is located properly, the Clip Timer, status indicator No. 7, located on the Electronic Module will light for approximately 1 second each time the clips pass over the Clip Detector Head.

NOTE

If the Clip Detector is spaced more than 1" from the passing clips, erratic performance may occur.

If the Detector is tripping on the clips with a "Clip Override" setting of 10, refer to the System Programming section "Clip Gain", Clip Gain.

Gradually turn the clip control knob counterclockwise to a lower setting until the unit trips on the largest set of repair clips on the belt.

Turn the clip control knob clockwise one number higher as a safety factor.

NOTE

This setting should be periodically checked to compensate for shifting of the conveyor belt. Turn the control knob to a "0" setting if the clip detector is not used.

Operation

The Detector may be programmed to operate in a manual or an automatic reset mode; the standard mode of operation is manual reset.

Manual Reset

In the manual reset mode, once the unit has tripped, the Detector's Direct Output provides a continuous alarm indication to alert the operator of detected metal and/or to stop the belt. To reset the unit, the reset button located on the front panel must be manually depressed.

Automatic Reset

The Detector may be converted to an "Automatic Reset Mode". In this mode the Detector will momentarily signal when tripped then self-reset according to the placement of the programming switches. For complete programming instructions, refer to the System Programming section "Manual/Auto Resets".

Remote Reset

Provisions have been made to externally reset the Detector from a remote location. Wire a normally open set of contacts across the remote reset terminals TB1 pins 1 & 2 located on the Interface Module. Upon closure of the contacts, the unit will reset.

Excessive Electrical Interference

The Metal Detector has a unique circuit that distinguishes electrical noise from a legitimate metal signal.

When this circuitry "sees" interference that lasts longer than .1 second or that interferes more than 25% of the time, the Detector will turn off L.E.D. status indicator No.4 each time the interference occurs. In addition, the incoming "noisy" signals are blocked from downstream circuitry to reduce the chance of any false tripping.

If an excessive amount of electrical interference occurs, the source of the interference must be found and corrected. Excessive interference will reduce the Detector's sensitivity and may false trigger the system. Such interference problems are usually associated with motor phase to ground shorts, severely arcing brushes on motors, poor ground conditions, etc.



System Programming

General

The Detector provides a wide range of programming capability. The Detector can be individually tailored to the customer's specific requirements; taking into account the type and size of metal to be detected, the type of material being conveyed and the mode and combination of alarm signals required.

Removing/Replacing Cover

To program the Electronic Module, the cover must be removed. Remove the control knobs with the 1/16" Allen wrench (provided). Unscrew the six screws securing the cover with the 5/64" Allen wrench (provided).

When replacing the cover, it is essential to re-index the control knobs. Before tightening the set screw, line it up with the flat of the shaft. The knob, when properly indexed, will indicate 10 in a full clockwise position and 0 in a full counterclockwise position.

Metal Gain

When a piece of tramp metal passes over the search coils, a change in the received signal occurs. This change is extremely small and must be amplified to produce a suitable signal to trigger the relay driver circuitry.

The amount of gain required in the receiver circuitry depends on the following factors:

- Coil Length
- Coil Aperture
- Belt Speed
- Type of Metal to be Detected
- Size, Shape and Orientation of the Metal to the Search Coil

The internal gain of the Detector is adjusted by a rotary switch, S4, located inside the Electronic Module (refer to Figure 4). Each step in gain represents an increase over the last step. Ideally, the gain is adjusted to pick up the desired piece of tramp metal with the "Metal Sensitivity" control knob located on the outside of the Electronic Module set to 5.

If the gain must be changed, use a sample of tramp metal the same size as the piece to be detected and follow the procedures listed below:

1. Remove the control knobs and cover of the Electronic Module as indicated in the "General" section.
2. Set the "Metal Sensitivity": control knob (R70) to its rotational midpoint (if the cover was not removed, the "Metal Sensitivity" would be 5)

3. Check that the clip timer, status indicator No. 7, is not lit during any portion of this test. If the clip timer is lit, the data will be incorrect.
4. Pass the sample piece of tramp metal completely through the coils at a height midway between the transmitter and receiver coils and at a speed near that of the conveyed material under normal operating conditions. Increase or decrease the gain of the system with the rotary switch as needed until the Detector will trip just as the sample metal is passed between the coils. The larger numbers on the gain setting switch correlate to a higher gain, the lowest gain being 1 and the highest 0 (representing 10). If the unit never trips, refer to Troubleshooting Flow Diagram #1.
5. If all other functions are properly programmed, replace the cover and knobs. Re-index the control knobs as indicated in the "General" section.
6. Recalibrate the "Metal Sensitivity" control knob as instructed in the Start-up & Calibration section "Non-Magnetic Metal Sensitivity Calibration".

Clip Gain

When belt repair clips are used on a conveyor belt, the repair clips may represent a stronger metal signal than the tramp metal. In this situation, it is necessary to reduce the gain of the system to allow the clips to pass. Rotary Switch S5, shown in Figure 4, establishes the gain whenever the clip detector circuit is energized. In the event that Switch S5 is set higher than S4, the system will choose the smaller gain setting of the two for the clip gain.

For calibration of the clip gain, follow these steps:

1. Run the belt at normal running speed and maximum belt load.
2. Verify that the clip timer, status indicator No. 7, lights each time a clip passes the sensor head. If it does not, adjust the clip sensor head as described in the "Clip Detector" Installation section.
3. Record the settings for the "Metal Sensitivity" control knob and the Clip Override control knob. Adjust the "Clip Override" control knob, shown in Figure 2, to a setting of 5.
4. Remove the cover as described in the "General" section without changing the setting on the "Clip Override" control knob.

5. Adjust the Clip Gain, Switch S5 shown in Figure 4, to the highest gain that does not trip the Detector when the clips pass. If the unit continues tripping even at the minimum clip gain of 1, the desensitized length of the belt may be too short. In other words, the system is switched back to full sensitivity before the clips are completely out of the Detector's field. To correct, increase the clip detector time delay as described in the "Clip Detector Time Delay" section.
6. If all other functions are properly programmed, replace the cover as described in the "General" section. Return the controls to recorded settings.
7. Calibrate the "Clip Override" as described in Section Start-up & Calibration section "Clip Detector Calibration".

As the repair splice passes through the sensing coils, the magnetic properties of the clips override the signal from any small sample of metal riding on the splice. Consequently, the Detector is designed to trip if the clip threshold is exceeded, regardless of the magnetic properties of the detected metal. When properly calibrated, it takes approximately 20% more metal signal than is represented by the largest set of repair clips to trigger the Detector during the desensitized mode.

Clip Detector Time Delay

If the clip detector is used, the length of belt desensitized to permit the clips to pass can be adjusted by properly programming the clip detector time delay switches S1-5, 6 & 7. The locations of these switches are shown in Figure 5. The range of delay times is from .28 seconds to 2.10 seconds as tabulated in Table 1. These switches are set at the factory according to customer requirements and should not be adjusted unless absolutely necessary. As long as the Detector is desensitized, the clip timer, status indicator No. 7, will remain lit.

Delay Before Alarm

The timed output alarm can be accurately programmed with a time delay before turn on. This allows the conveyed material to travel for a programmed period before the timed output alarm signal is energized. Typically this feature is used in conjunction with a marking device or diverter gate to delay the system until the detected tramp metal has reached the auxiliary equipment. Switches S2-1 through S2-5 control this time delay from .01 to 22.0 seconds. Refer to Table 2 for tabulation of the delay time versus switch settings and Figure 4 for the switch locations.

Time Alarm On

The timed output can be accurately programmed to remain energized for a timed period once it is switched on. This feature can activate a diverter gate, sound an alarm for a given period, command a marking device to spray a given length of the belt, etc. Switches S3-1 through S3-5 control this time delay from .01 to 22.0 seconds. Refer to Table 2 for a tabulation of the delay time versus switch settings and Figure 4 for the switch locations.

Position			Time sec ± 20%
5	6	7	
C	C	C	.28
O	C	C	.56
C	O	C	.77
O	O	C	1.06
C	C	O	1.33
O	C	O	1.61
C	O	O	1.82
O	O	O	2.10




TABLE 1
Clip Time Delay
(Switch S1)

Position					Time sec ±20%
1	2	3	4	5	
C	C	C	C	O	.01
O	C	C	C	O	.14
C	O	C	C	O	.30
O	O	C	C	O	.44
C	C	O	C	O	.52
O	C	O	C	O	.65
C	O	O	C	O	.81
O	O	O	C	O	.94
C	C	C	O	O	1.10
O	C	C	O	O	1.20
C	O	C	O	O	1.40
O	O	C	O	O	1.50
C	C	O	O	O	1.60
O	C	O	O	O	1.70
C	O	O	O	O	1.90
O	O	O	O	O	2.00
C	C	C	C	C	.14
O	C	C	C	C	1.60
C	O	C	C	C	3.30
O	O	C	C	C	4.90
C	C	O	C	C	5.70
O	C	O	C	C	7.10
C	O	O	C	C	8.90
O	O	O	C	C	10.00
C	C	C	O	C	12.00
O	C	C	O	C	13.00
C	O	C	O	C	15.00
O	O	C	O	C	16.00
C	C	O	O	C	17.00
O	C	O	O	C	19.00
C	O	O	O	C	21.00
O	O	O	O	C	22.00

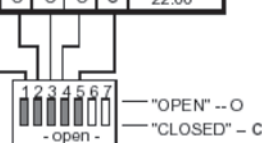


TABLE 2
S2 - Delay Before Alarm
S3 - Time Alarm On



Standard or Fail – Safe Output Operation

As standard, the alarm outputs of the Detector will energize when tramp metal is detected. In this mode, the solid state relay is programmed to operate in a Normally “OFF” condition. The outputs will not energize until metal is detected.

Provisions have been made to program the Detector to operate in a fail-safe mode. In this mode, the outputs of the Detector are always energized and de-energize when tramp metal is detected or when power to the Detector is turned off. In the fail-safe mode, the solid state relay is programmed to operate in a Normally “ON” condition. Both outputs can be independently programmed. The direct output (status indicator No. 9) and timed output (status indicator No. 8) will monitor the alarm's output condition. If the status indicator is lit, its associated output is energized. Switch S2-6 controls the direct output and S3-6, the timed output as shown in Table 3. To operate the solid state relay condition in a Normally “OFF” condition, open the appropriate switch. Conversely, to operate the relay in a Normally “ON” condition, close the switch.

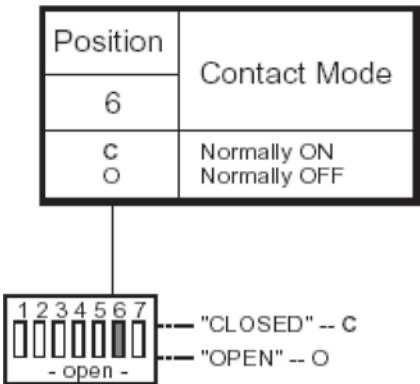


TABLE 3
 S2 - Direct Output Normally On/Off Select
 S3 - Timed Output Normally On/Off Select

Manual/Auto Resets

Manual Reset

In the manual reset mode, once the unit has tripped, the Detector’s Direct Output provides a continuous alarm indication to alert the operator of detected metal and/or to stop the belt. To reset the unit, the reset button located on the front panel must be manually depressed.

Automatic Reset

The Detector may be converted to an “Automatic Reset Mode”. In this mode, the Detector will momentarily signal when tripped then self-reset.

The *direct output* can be programmed to automatically reset by shorting the remote reset terminals TB1 pins 1 & 2, located on the front of the Interface Module. To “short”, install a jumper from pin 1 to pin 2. Open Switch S2-7.

The operating mode of the *timed output* is governed by the position of Switch S3-7 as shown in Table 4. With the switch in the open position, the timed output operates in the Automatic Reset Mode. When the switch is closed, the timed output will follow the mode programmed on the direct output.

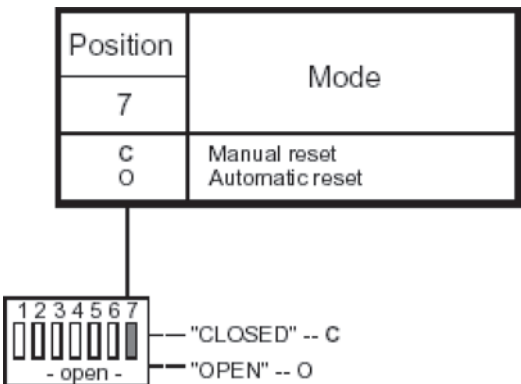


TABLE 4
 Timed Output Reset Mode
 Switch (S3)

Reset Override

If required, the Detector can be programmed so the system is disabled during the reset period. This means the Detector is prevented from tripping as long as a reset signal is provided, either manually on the front panel or remotely through a set of external contacts.

With S2-7 in the open position, the reset signal does not disable the Detector. Closing S2-7 will program the Detector so it is disabled while a reset signal is applied. Refer to Table 5.

Sampling

The Detector Sampling Mode is set at the factory to make the Detector sensitivity selective between various materials as required for each particular application.

Switches S1-1 through S1-4 inclusive are preset and are not to be adjusted by the user.

Trip Register

The “Trip Register” is used with the Detector’s timed output. The Trip Register accurately tracks up to 128 metal particles concurrently. Each particle’s signal is released to the timed output terminals consistent with the programmed “Delay Before Alarm”. This standard feature is automatically activated when the timed output is used for delayed operation of any device.

Fine Frequency Select

The Detector is calibrated to operate at an optimally selected transmitting frequency when using a 50 or 60 Hz line frequency. This frequency can be fine-tuned over a 5% range by adjusting potentiometer R90, shown in Figure 4. However, this is not usually necessary as all units are calibrated at the factory prior to shipment. The operating frequency of the Detector can best be measured at the zero gate test point “Z”, shown in Figure 4. The signal switches between 0V and +15V as referenced to 0V of the system (Test Point 0V). If viewed on an oscilloscope, this signal would be high one pulse width and low for seven.

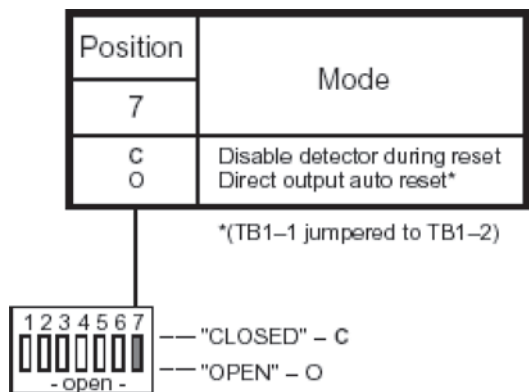


TABLE 5
Belt Reset Override
(Switch S2)



Control	Position	Function	Comment
S1	1	Sampling Mode	Allows the detector to detect metal and ignore conveyed product. Factory pre-set; <u>do not adjust</u> .
	2		
	3		
	4		
	5	Clip Time Delay	Selects how long the detector remains desensitized to metallic repair clips. Refer to Table 1 for position settings and times.
	6		
	7		
S2	1	Delay Before Alarm	Controls timed output. Selects the time from when metal is detected until timed output is energized. Refer to Table 2 for position settings and times.
	2		
	3		
	4		
	5		
	6	Direct Output Normally On/Off Select	Sets direct output contacts as normally “ON” or “OFF”. Refer to Table 3 for settings. Be aware of downstream circuit effect before operating this switch.
	7	Belt Reset Override	Used to disable metal detection as reset signal is applied. Refer to Table 5 for settings.
S3	1	Time Alarm On	Controls timed output. Selects how long the output remains energized. Refer to Table 2 for position settings and times.
	2		
	3		
	4		
	5		
	6	Timed Output Normally On/Off Select	Sets timed output contacts as normally “ON” or “OFF”. Refer to Table 3 for settings. Be aware of downstream circuit effect before operating this switch.
	7	Timed Output Reset Mode	Determines if timed output will reset manually or automatically. Refer to Table 4 for settings.
S4		Metal Gain	Selects metal signal amplification (gain) without repair clips in sensing zone. “1” least gain; “0” most gain.
S5		Clip Gain	Attenuates metal signal amplification (gain) when repair clips are in sensing zone. “1” most attenuation; “0” least.
R70		Metal Sensitivity	Sets metal “trip” threshold level. “10” most sensitive, “1” least sensitive
R46		Clip Override	Attenuates (reduces) metal sensitivity to allow repair clips to pass through detector. “10” most attenuation, “1” least.
R90		Fine Frequency Adjust	Permits fine adjustment of detectors operating frequency.
R86		Oversize Threshold	Determines the size of metal (magnetic or not) that will trigger the alarm circuitry.

TABLE 6
Programming Controls Summary

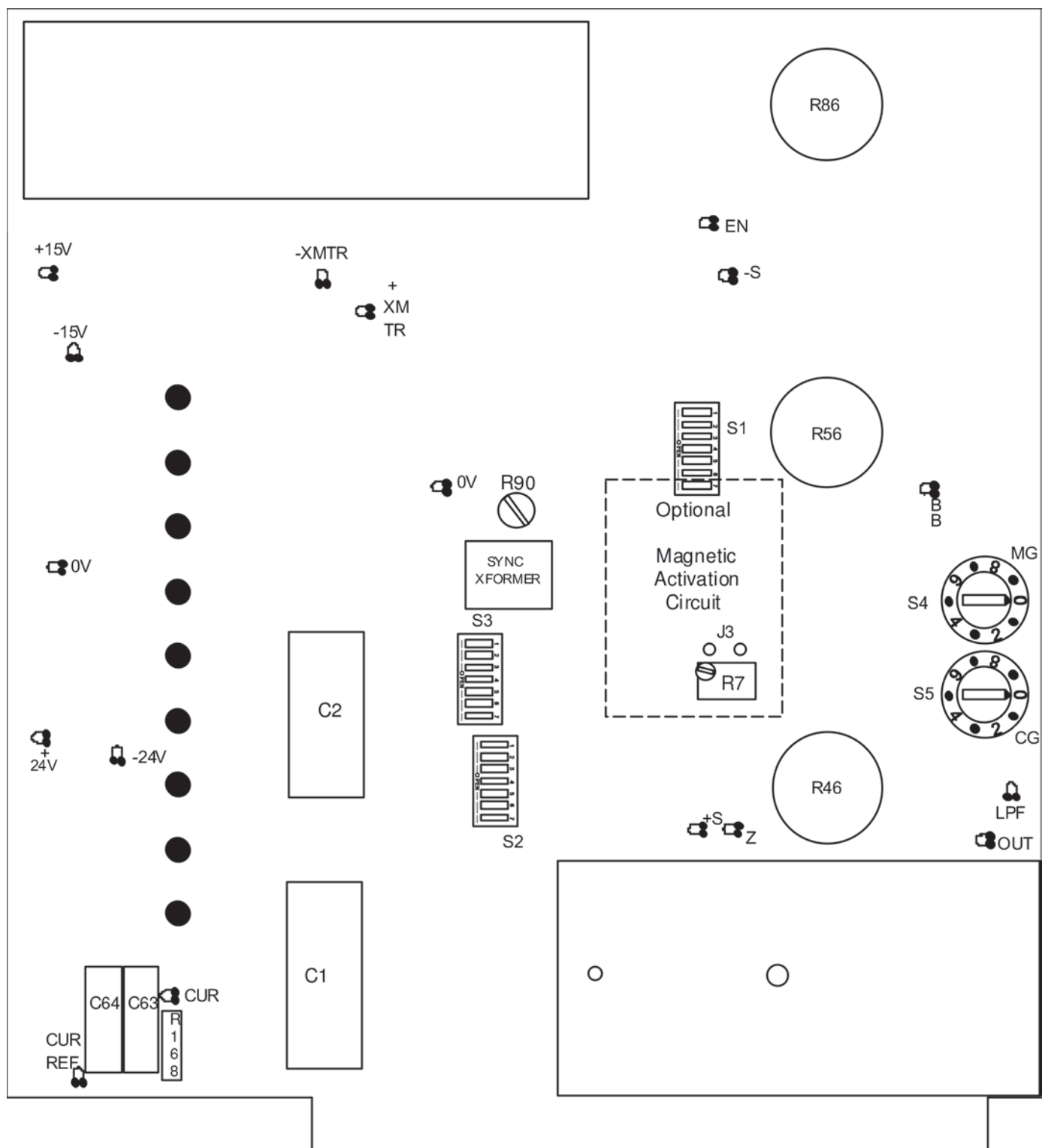


FIGURE 4
Programming Controls & Test Point Locations

Troubleshooting

Status Indicators

In order to facilitate troubleshooting of the Detector, a number of self-test circuits have been designed to monitor the condition of the detection circuitry. The results of these test circuits are visible to the operator through L.E.D.'s on the front panel of the Electronic Module (refer to Figure 2). These L.E.D.'s are referred to as Status Indicators. For a description of all L.E.D. monitors and their normal operating condition, refer to the Status Indicator Summary (Table 7) on the following page.

Troubleshooting Flow Diagrams

NOTE

Before working with Troubleshooting Diagrams, check all terminals, connectors and cables for open circuits and correct as required.

To aid in troubleshooting the Detector, two easy to follow, step-by-step, flow diagrams were designed. Troubleshooting Flow Diagram #1 deals with insufficient metal sensitivity. This diagram is used if the unit detects metal, but is not sensitive enough for the required application or if the Detector does not respond to metal at all. Refer to Troubleshooting Flow Diagram #2, if the unit continually false trips (triggers with no metal in the field). When the Detector cannot discriminate between magnetic and nonmagnetic metal, refer to Troubleshooting Flow Diagram #3.

Electronic Module Troubleshooting

In the event that the unit does not operate and the trouble has been traced to the Electronic Module, further troubleshooting of the Module is possible using the test points provided on the circuit board. Monitoring these points requires a VOM, oscilloscope and frequency counter. If this equipment is available, schematics can be obtained from the factory.

Maintenance Kit

Prior to shipment, a maintenance kit is packed in the Main Control Enclosure.

This kit contains all parts necessary for basic maintenance. The items included are as follows:

- (1) 1 Amp Fuse
- (1) 10 Amp Fuse
- (2) Spare Bulbs
- (1) 1/16" Allen Key Wrench
- (1) 5/64" Allen Key Wrench

LED #	Identification	Normal Condition	Comment
1	Power Supply	ON	Indicates detector power supply operational; must be lit for unit to detect metal. Will not light when power supply malfunctions, low line voltage is presents, or optional transmitter swing-away switch is activated. LED lights approximately 5 seconds after power is turned on.
2	Metal Signal	OFF	Indicates metal is detected in the sensing zone, regardless of its magnetic properties.
3	Zero	ON	Indicates specified internal Electronics Module circuits are functioning normally. Must be lit for unit to detect metal.
4	Enable		
5	- Sample		
6	+ Sample		
7	Clip Timer	ON	Indicates repair clip is in proximity of clip detector head. LED remains lit for the period detector was programmed to allow clip to clear sensing zone.
8	Timed Out	OFF*	Indicates the condition of the timed alarm output. If the LED is lit, the timed alarm outputs are energized with the line voltage.
9	Direct Out	OFF*	Indicates the condition of the timed alarm output. If the LED is lit, the direct alarm outputs are energized with the line voltage.

* When programmed to operate in a fail-safe mode (output normally "ON"), the LED's will be normally lit.

TABLE 7
Electronics Module Status Indicator Summary

Addendum

Metal Activation Circuit for Model 1235

The odel 1235 has the ability to discriminate between magnetic and non magnetic metals. When a nonmagnetic metal is detected the Direct and Timed Outputs are activated to send a signal to conveyor control to stop the belt. Once the belt is stopped an operator removes the nonmagnetic metal and starts the conveyor once again.

If magnetic metal is passed between the antennas the detector will show that the metal was sensed by the detector but **the outputs are not activated and the belt is not stopped.**

A high power electro magnet can remove the magnetic metal from the belt but keeping the magnet at high power is not recommended because the magnet will get hot and as the temperature of the magnet increases the magnetic pulling force is reduced. There is also an increased cost of operating the magnet at high powered, reduced life of the magnet and higher maintenance costs. Also when conveying magnetic ore the magnet can not be at high power because too much product would be removed from the belt.

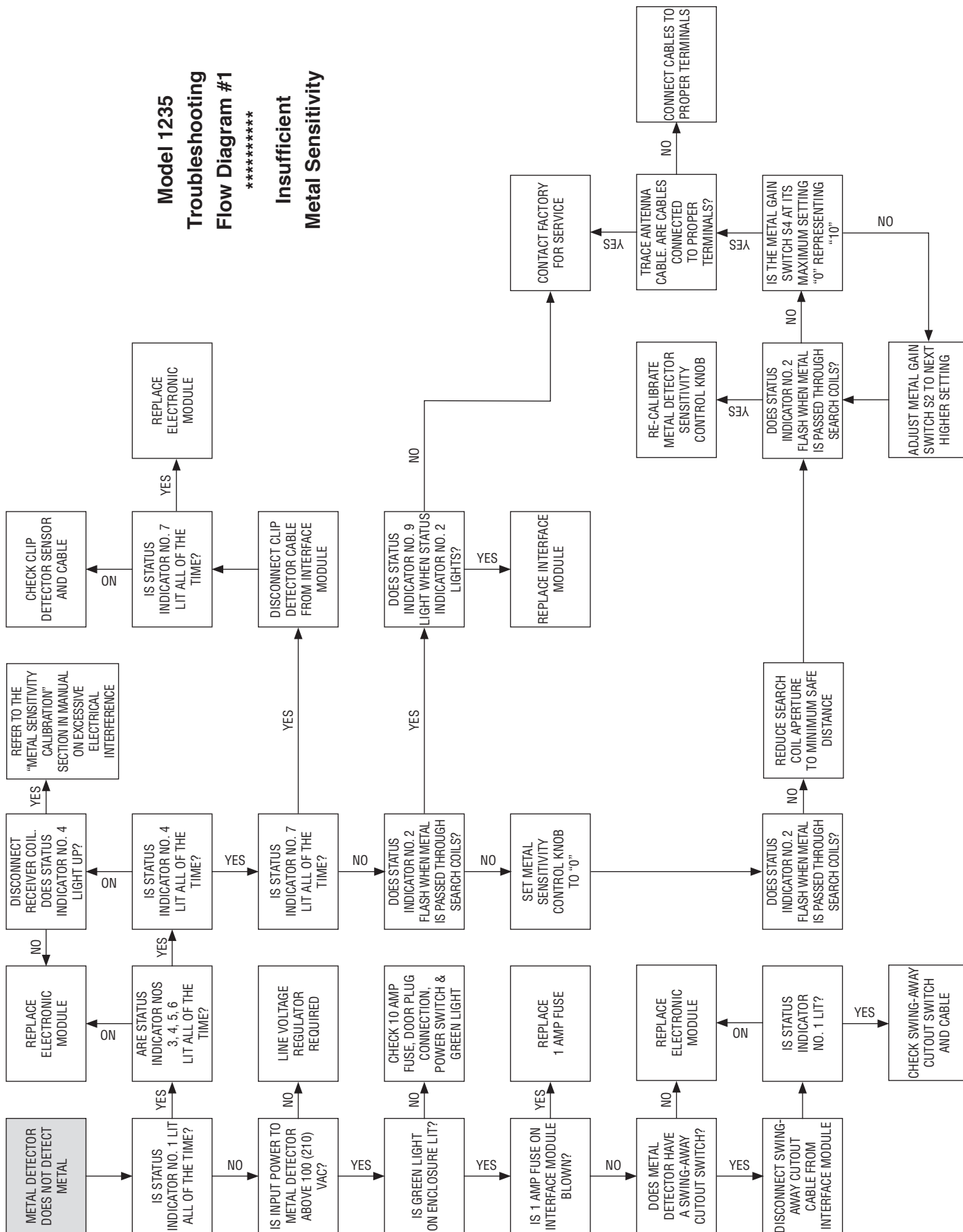
The Magnetic Activation Circuit was developed addressed to problem of removing magnetic metal without stopping the conveyor belt. When magnetic metal is detected by the metal detector the signal is sent to the MAC circuit. The magnetic metal signal is then processed and the MAC output is activated using a KRPA relay mounted on the white plate under the Interface Module. The relay provides the output from the metal detector to the electromagnet magnet control circuitry. This can be 120vac, 220vac or any level of DC voltage as long as the contact current of the relay is not exceeded.

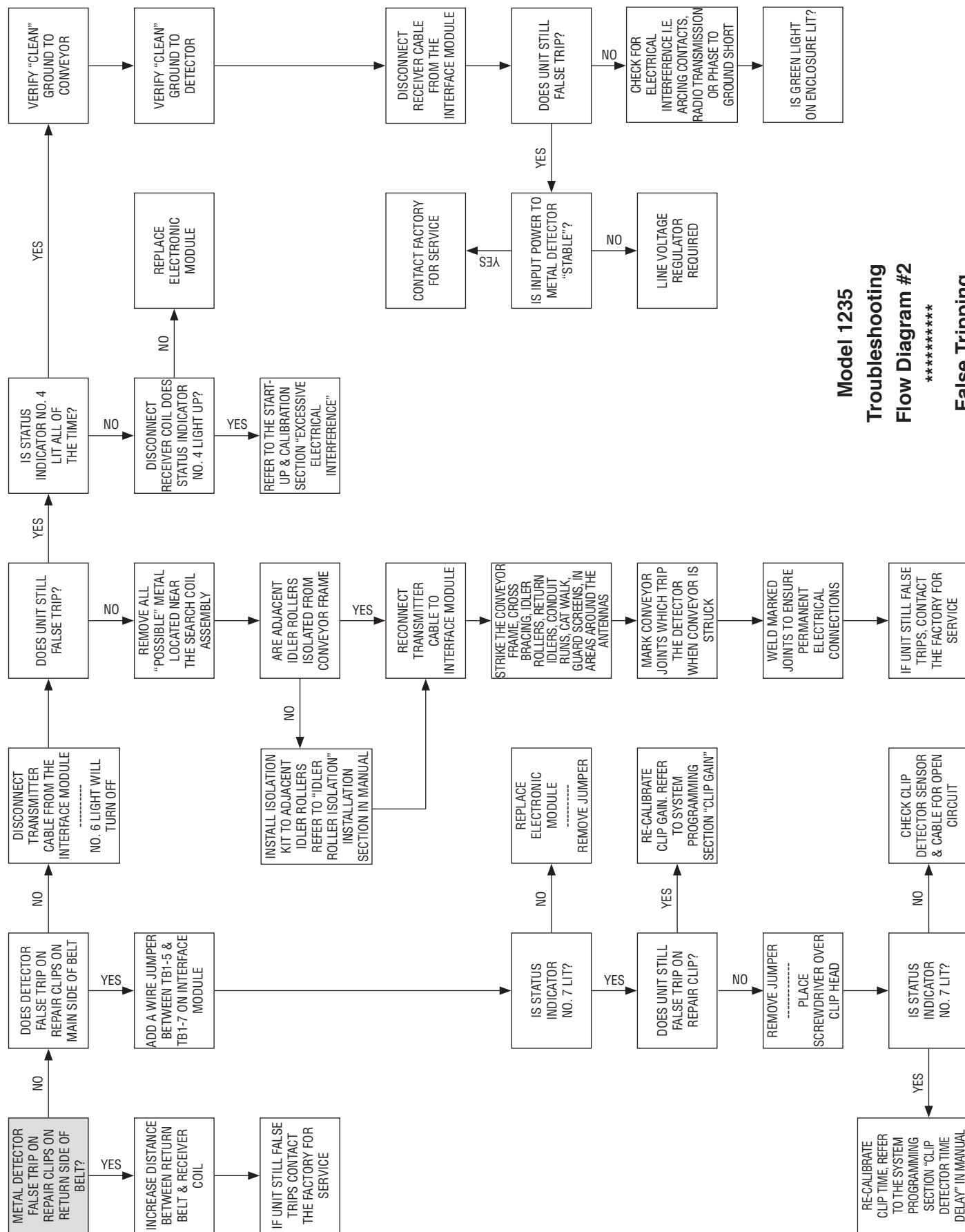
The magnet can be run at low idle current which keeps the magnet cool allowing maximum flux energy when it is switched to high current.

The MAC circuit board has one variable potentiometer that controls how long the output is on. The on time range can be set between 2.5 seconds and 15 seconds. If J3 jumper is connected the on time range is reduced to 1.3 seconds to 7.5 second.



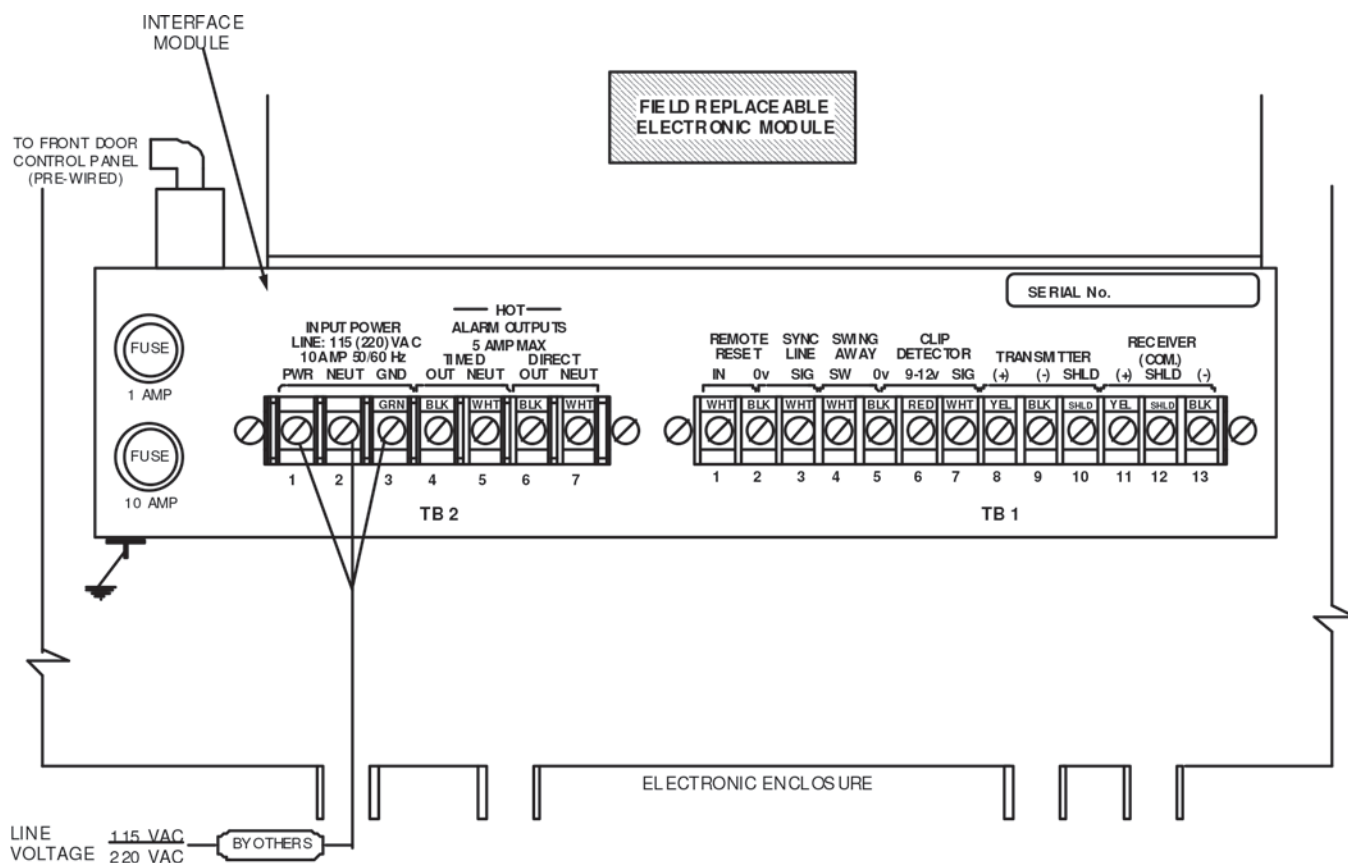
Model 1235 Troubleshooting Flow Diagram #1 ***** Insufficient Metal Sensitivity





APPENDIX A

Control Connection Diagrams



POWER INPUT CONNECTION

TB 2-1 115 OR 220 VAC

TB 2-2 NEUT OR 220 VAC

TB 2-3 GROUND

NOTE: WIRE COLOR WILL VARY WITH LOCAL ORDINANCES,
POWER CABLES NOT SUPPLIED.

FIGURE A1
Power Input

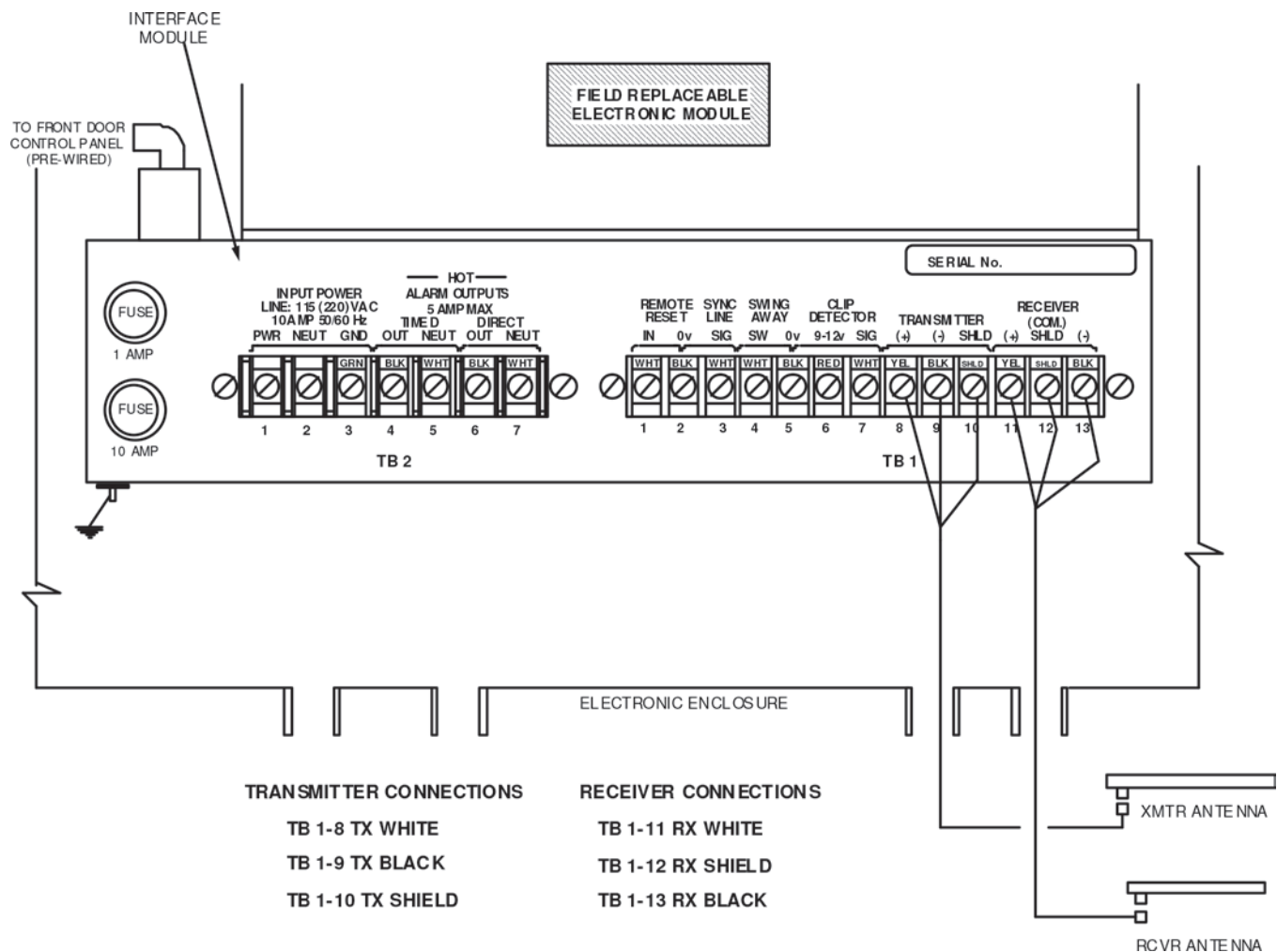


FIGURE A2
Transmitter and Receiver Antenna

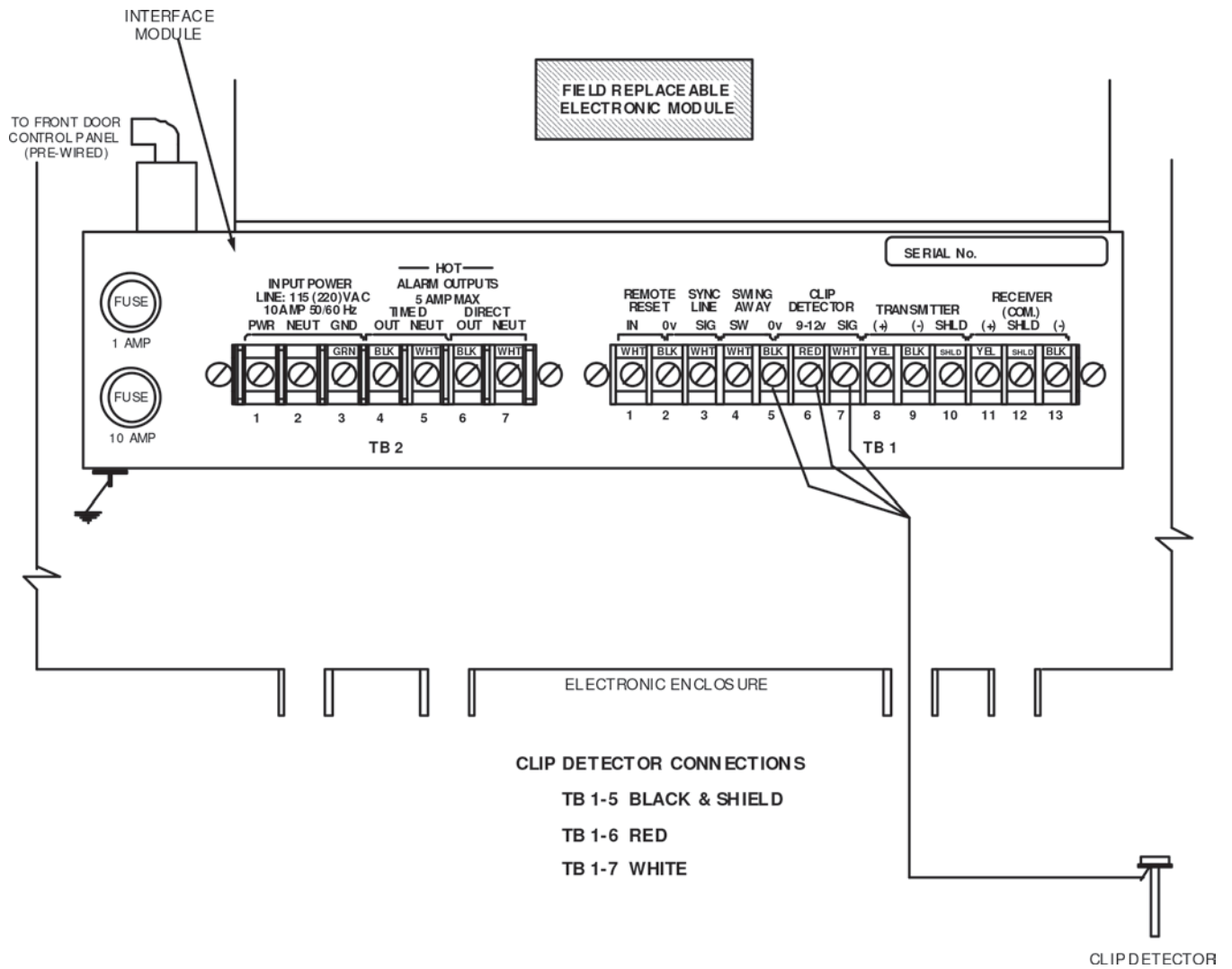


FIGURE A3
Clip Detector

Used on variable speed conveyors

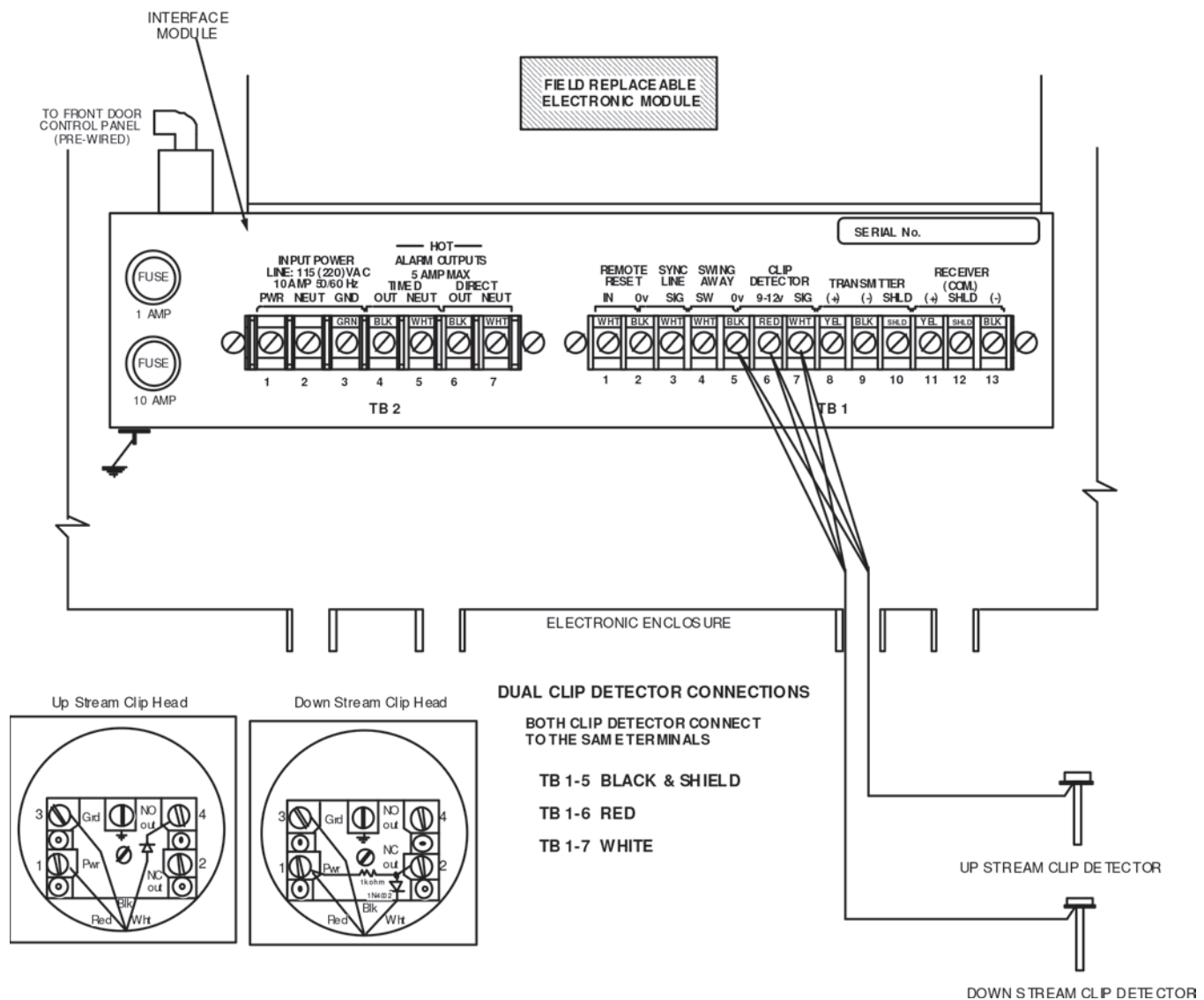


FIGURE A4
Dual Clip Detector

Clip heads need to be modified as shown above. Also J6 & J8 on the electronics Module must be made. Normally Jumpers J5 and J7 are made for single clip operation. Refer to Figure 16 Programming Controls and Test Point Locations.

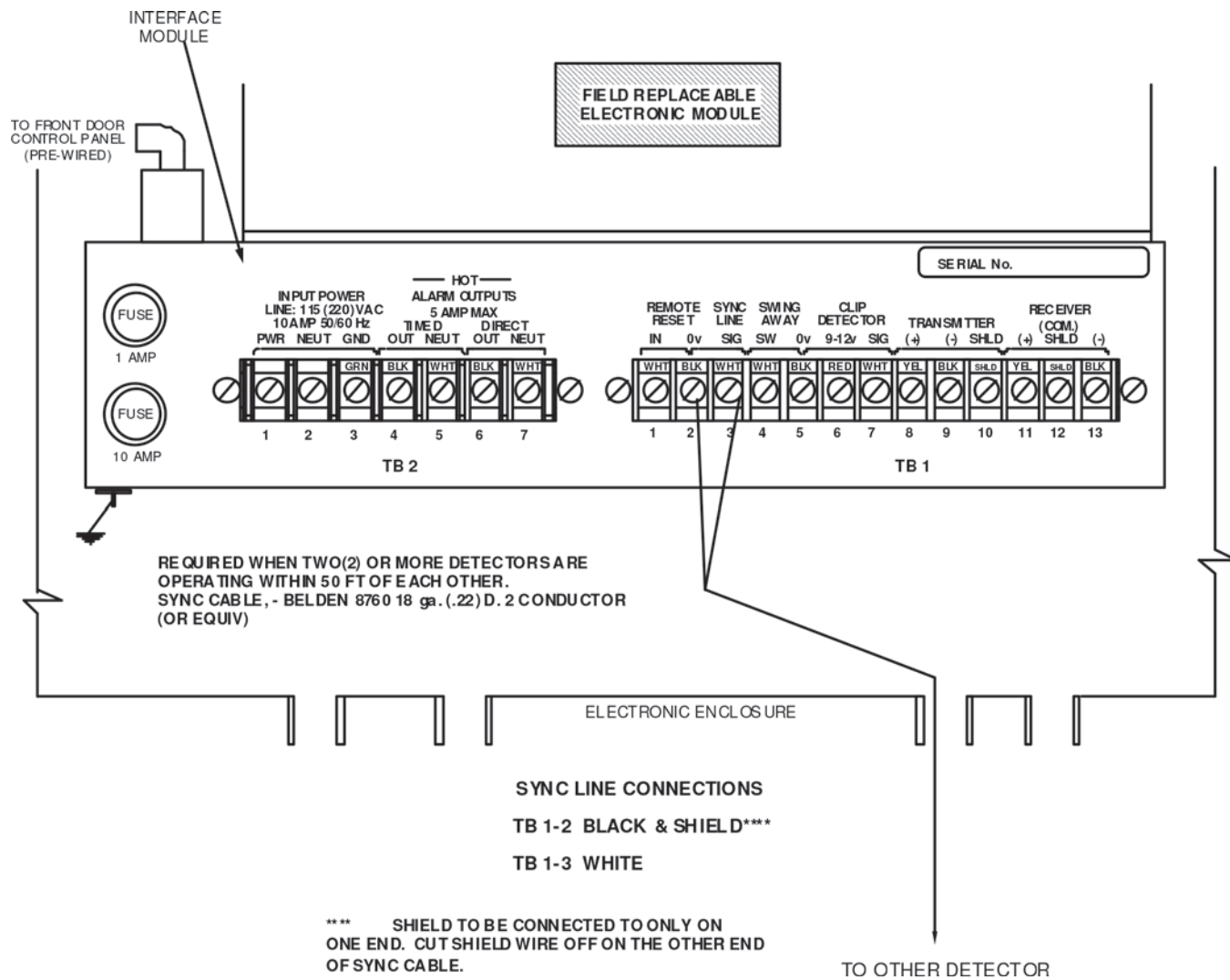


FIGURE A5
Synchronization

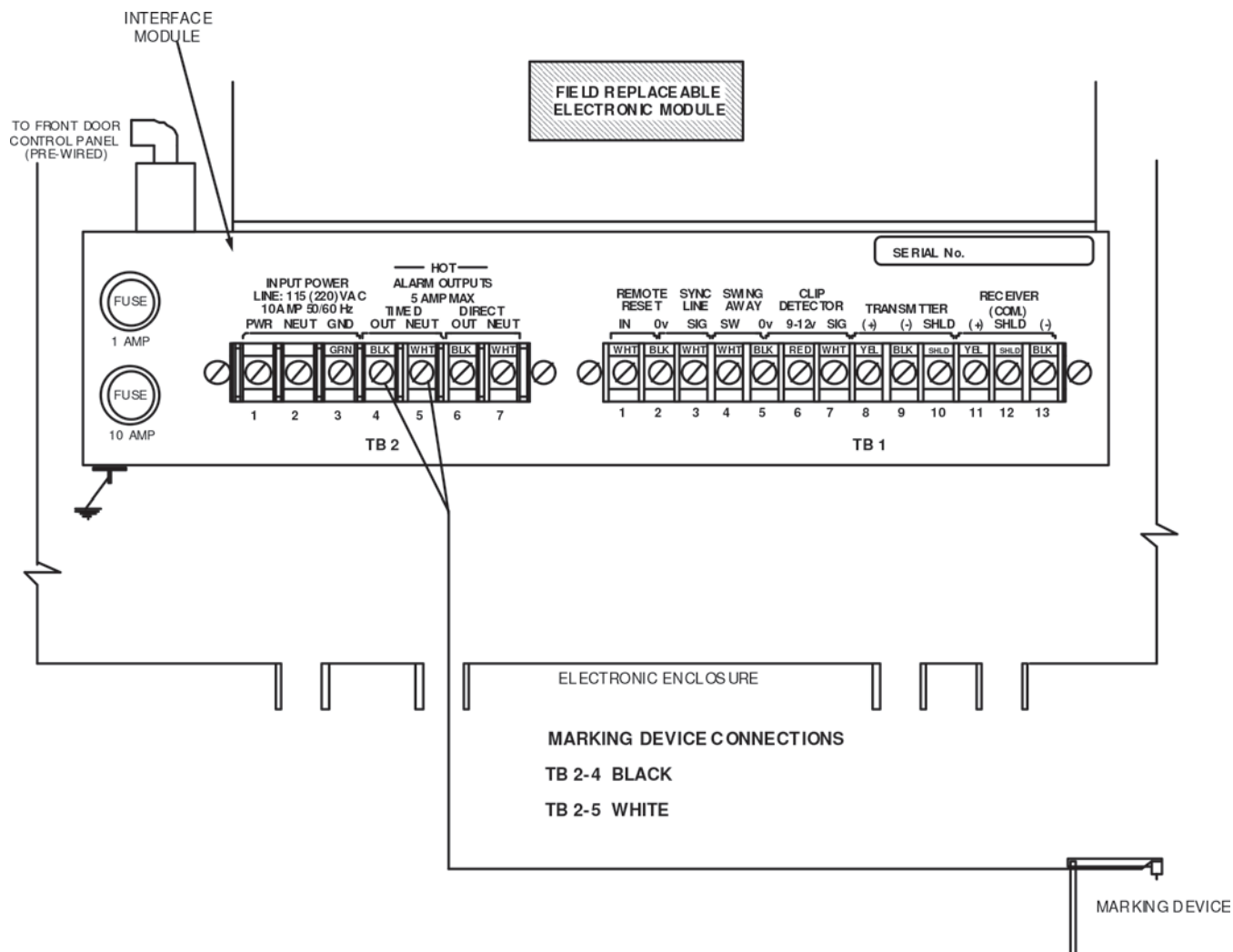


FIGURE A6
Spray Marker

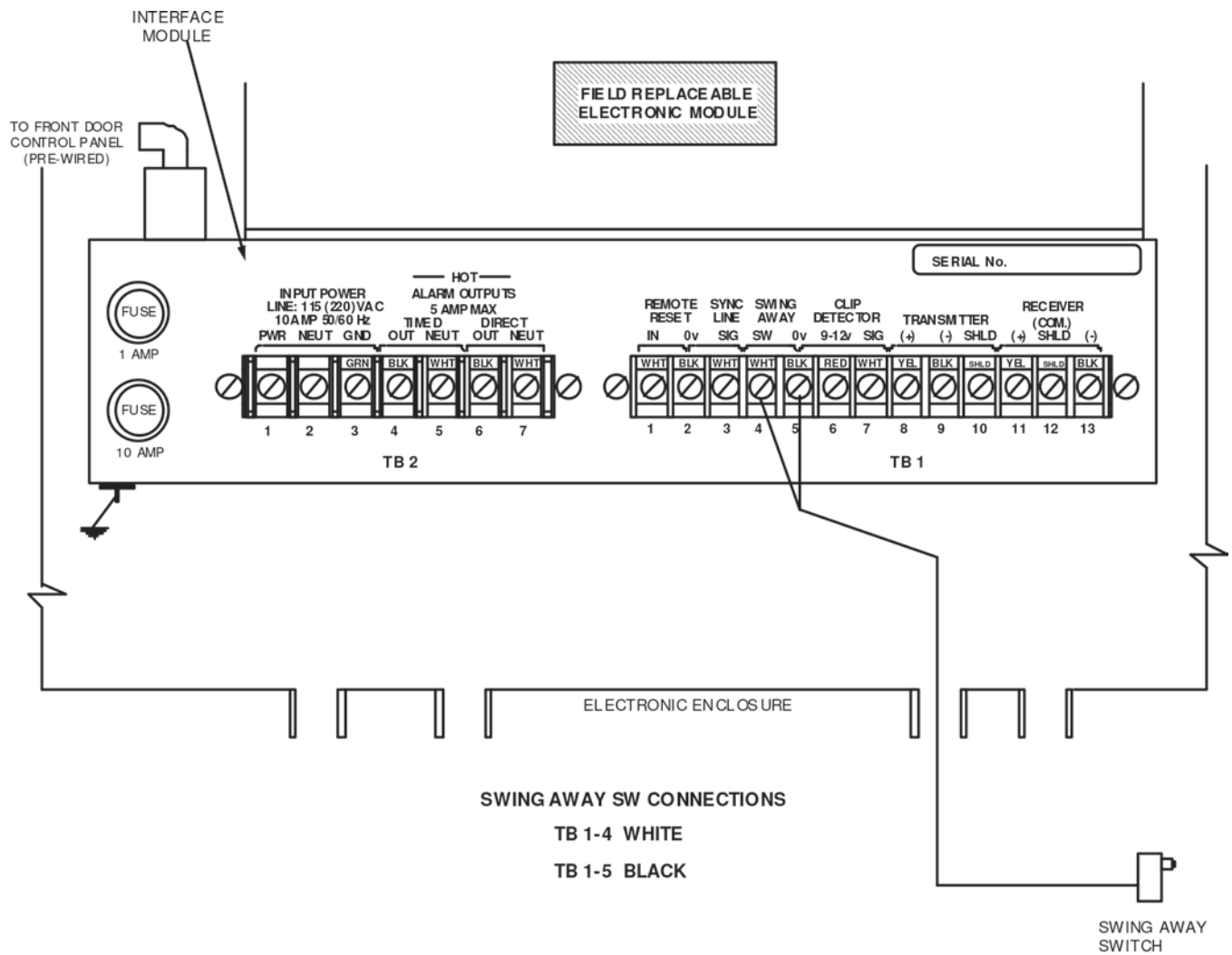


FIGURE A7
Swing Away Switch

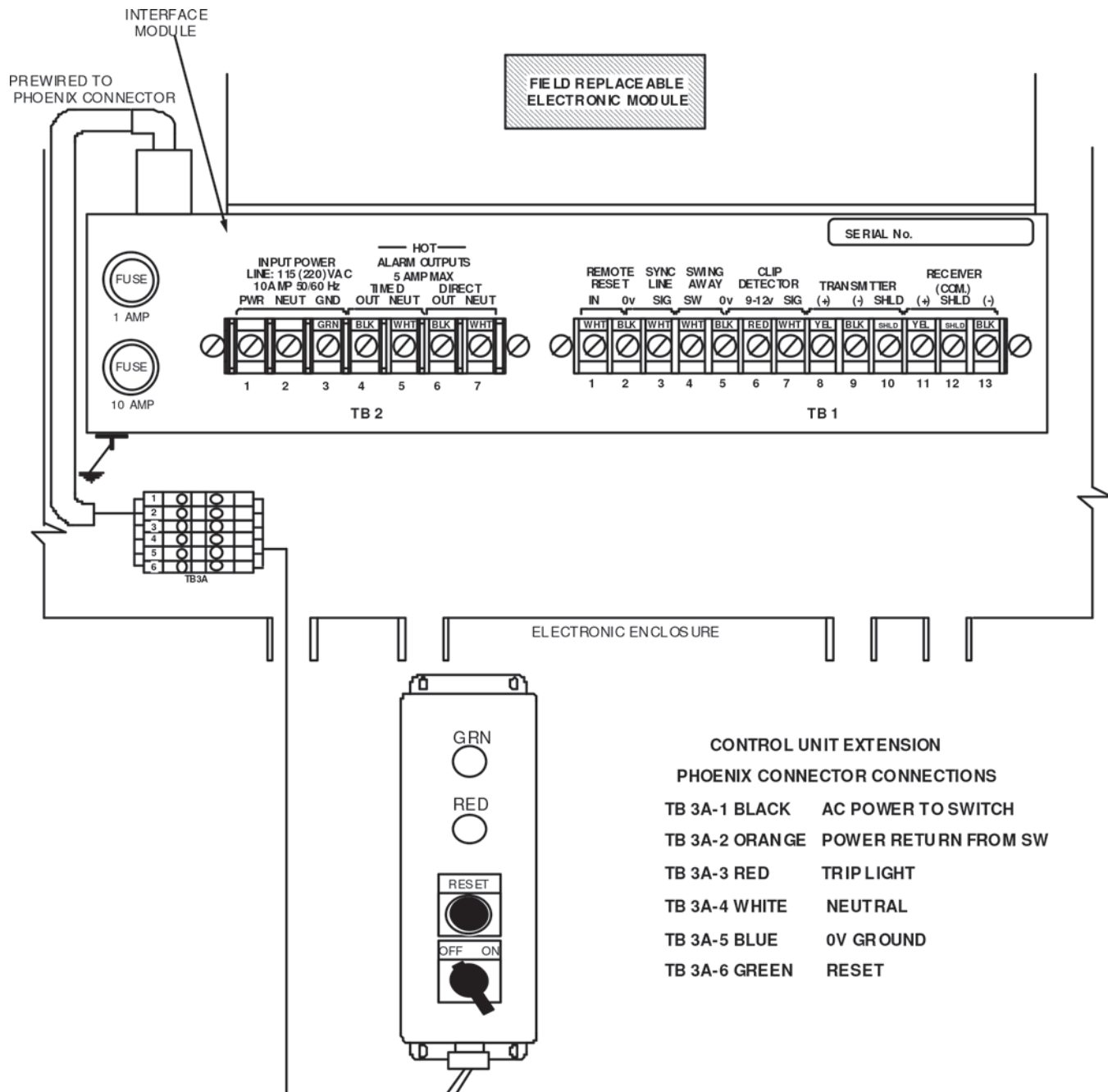


FIGURE A8
Control Unit Extension

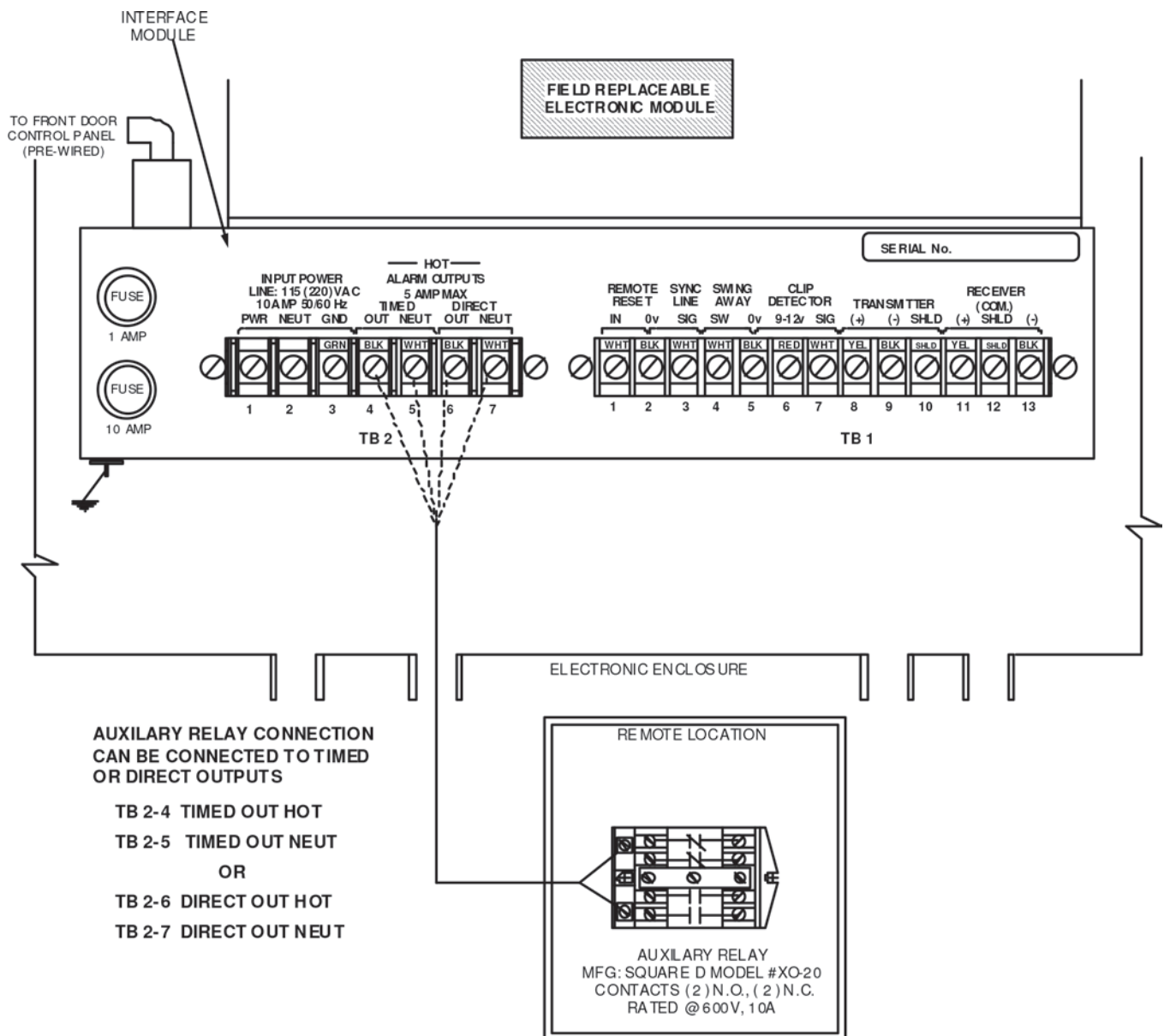
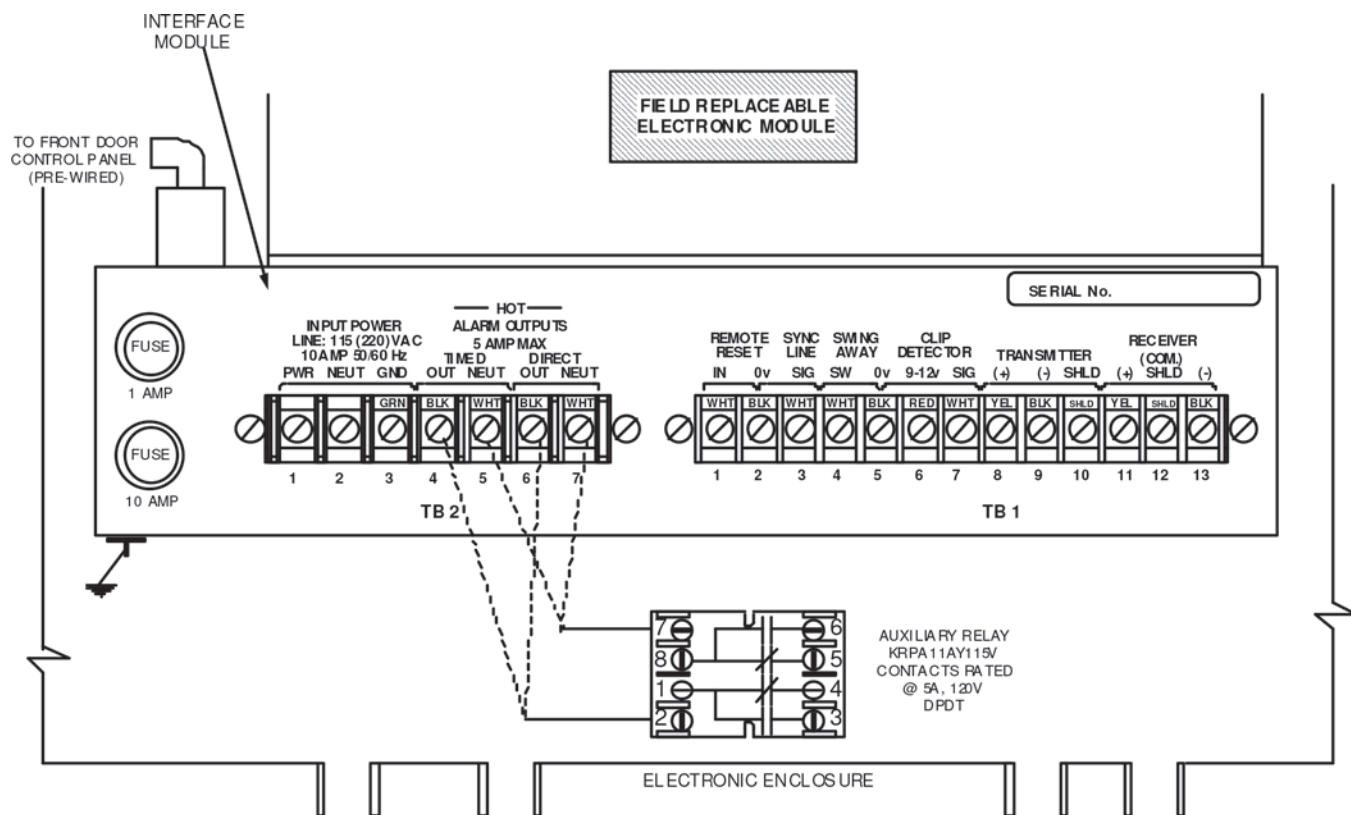


FIGURE A9
Auxiliary 2 or 4 Relay Sq D 115 vac or 220 vac



AUXILIARY RELAY CONNECTION
CAN BE CONNECTED TO TIMED
OR DIRECT OUTPUTS

TB 2-4 TIMED OUT HOT
TB 2-5 TIMED OUT NEUT
OR
TB 2-6 DIRECT OUT HOT
TB 2-7 DIRECT OUT NEUT

FIGURE A10

Auxiliary Relay KRPA 115 vac or 220 vac

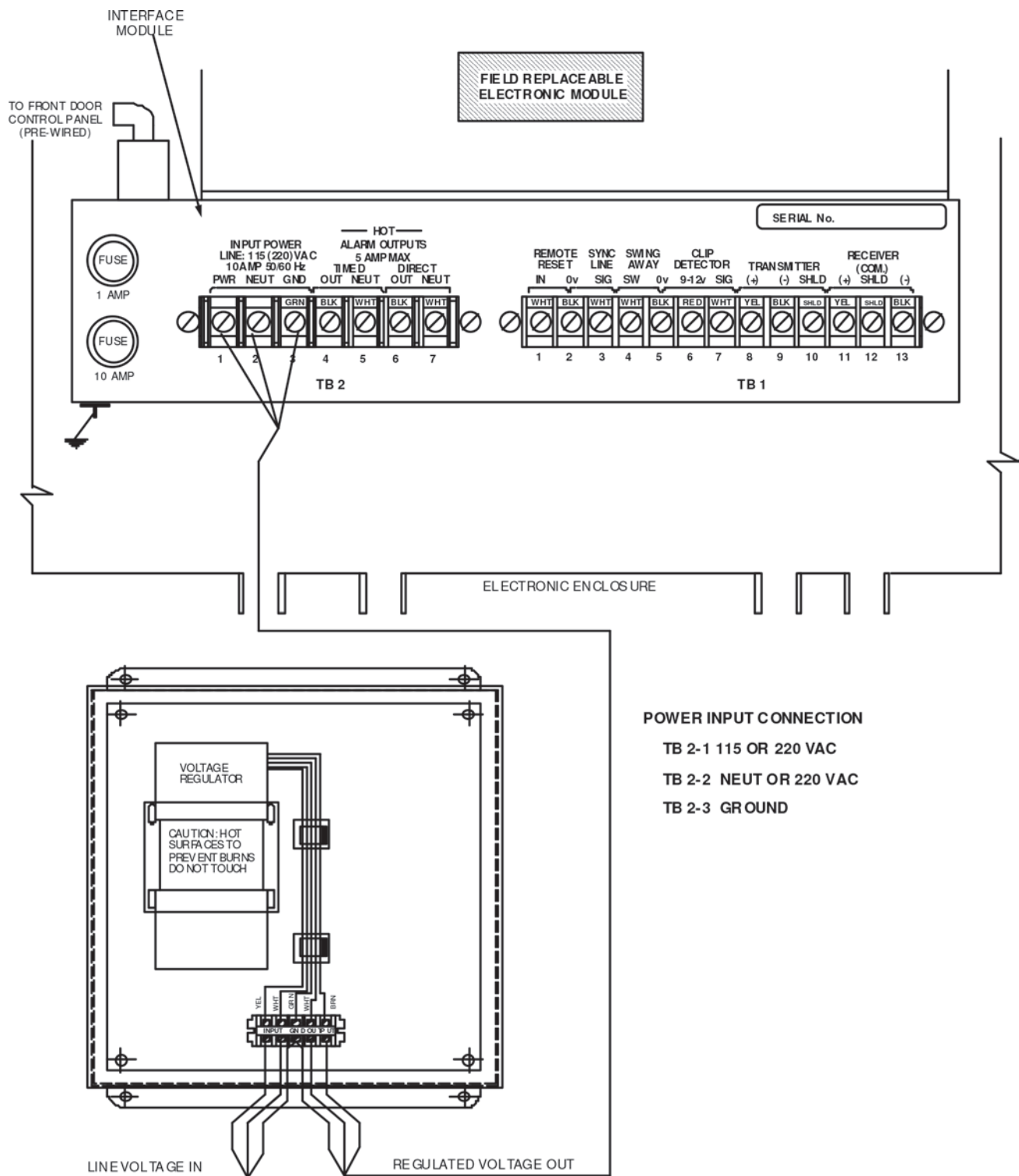


FIGURE A11
Voltage Regulator

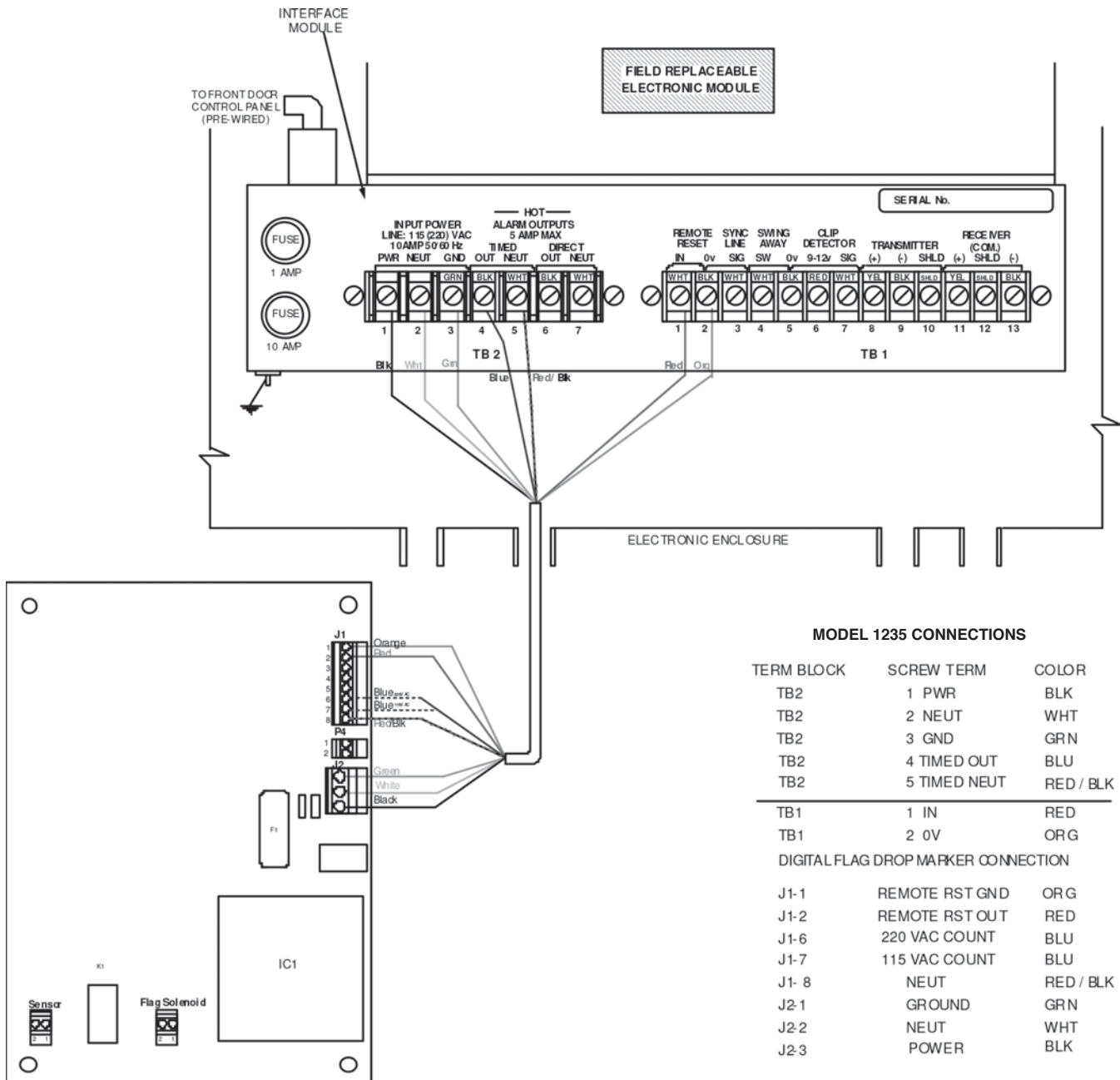


FIGURE A12
Flag Drop Marker

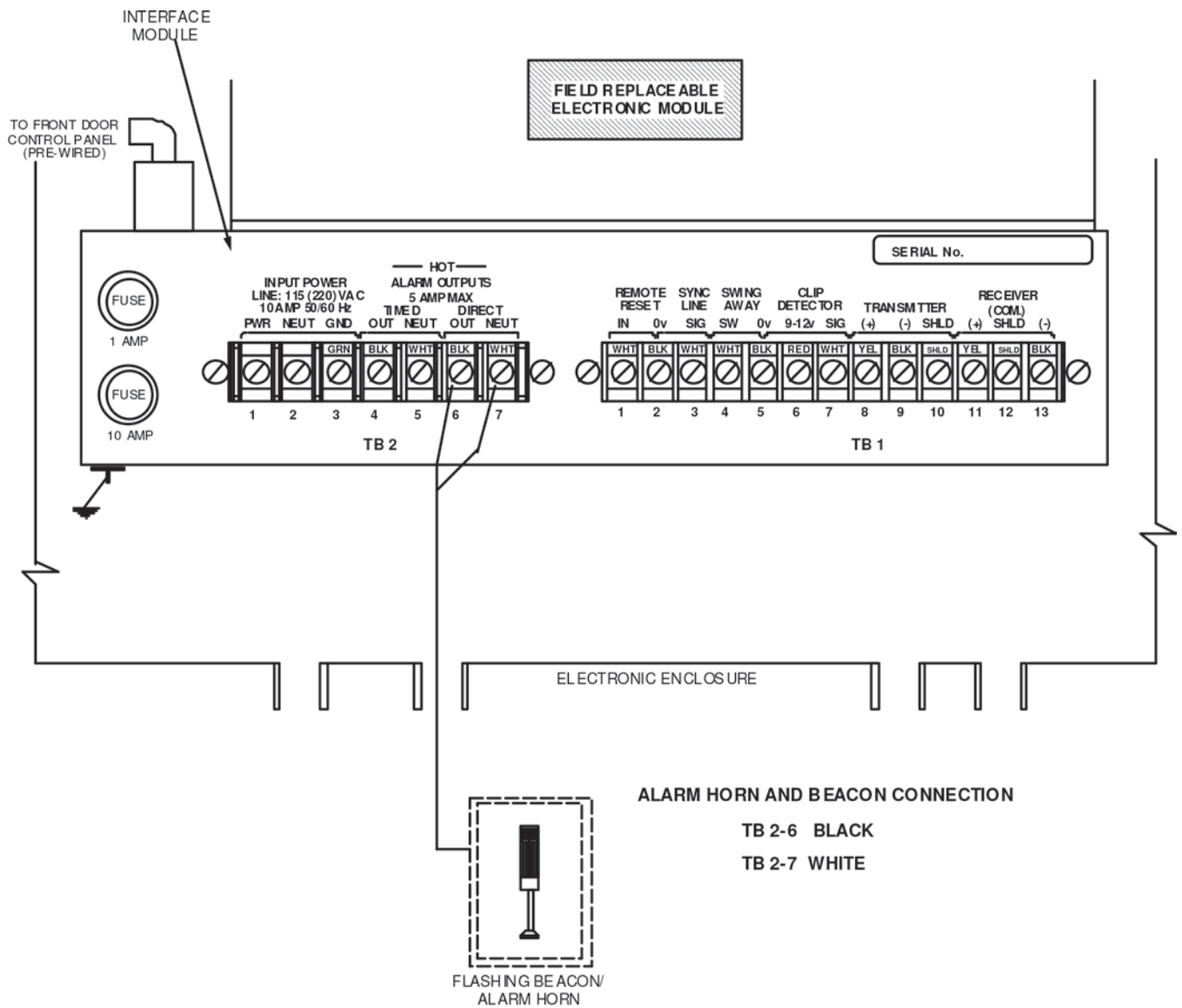


FIGURE A13
Alarm Horn & Flashing Beacon



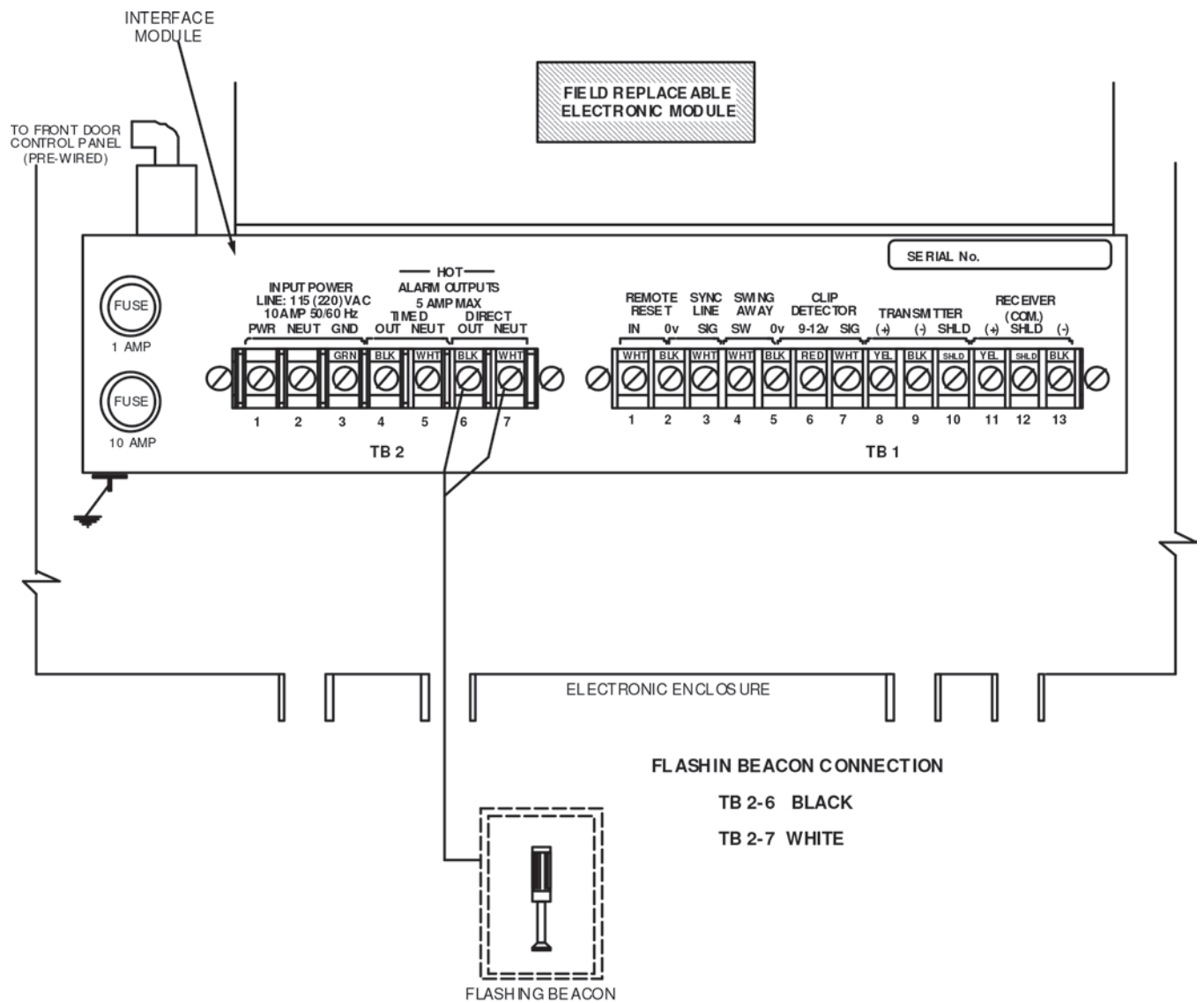


FIGURE A15
Flashing Beacon

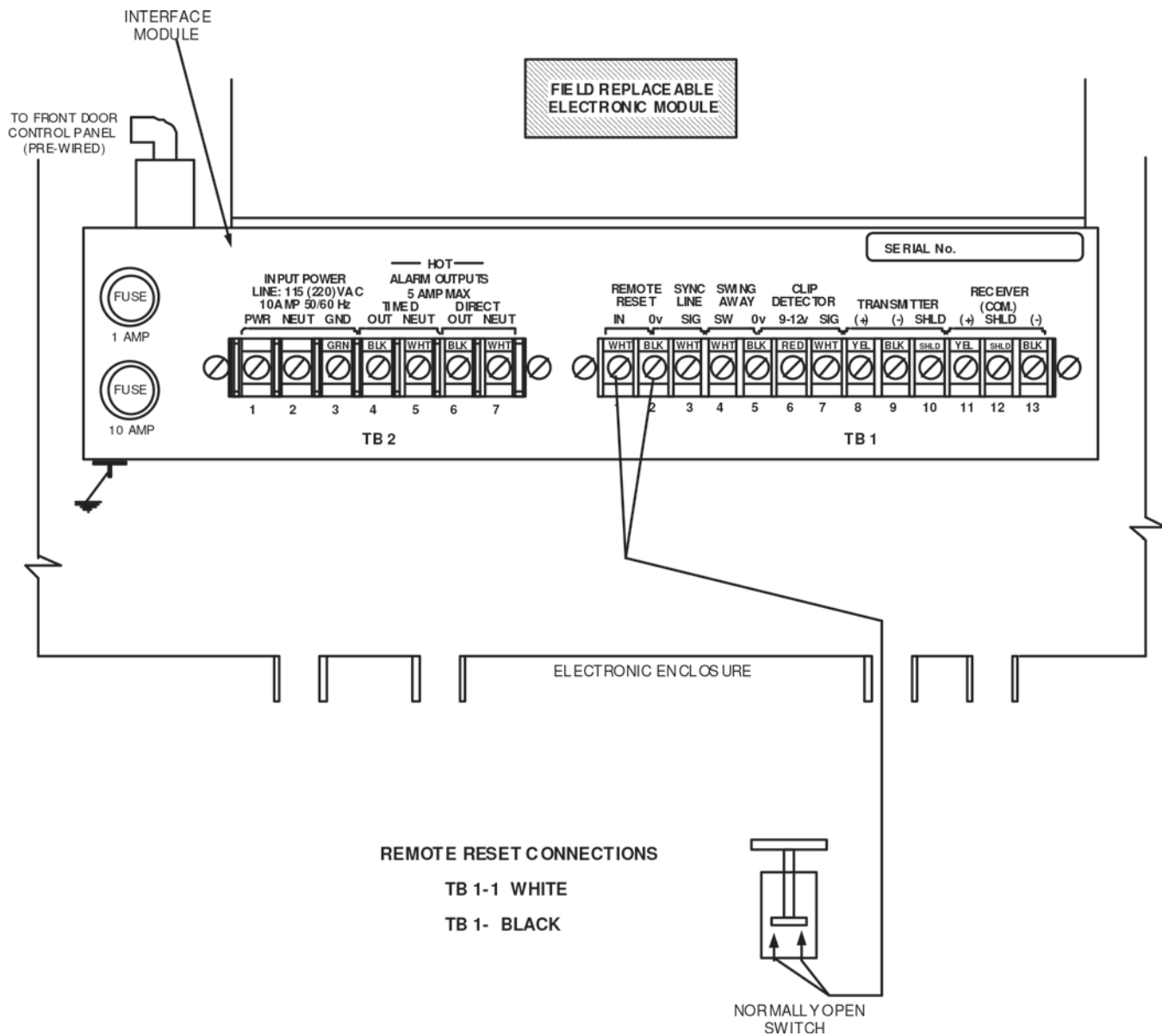
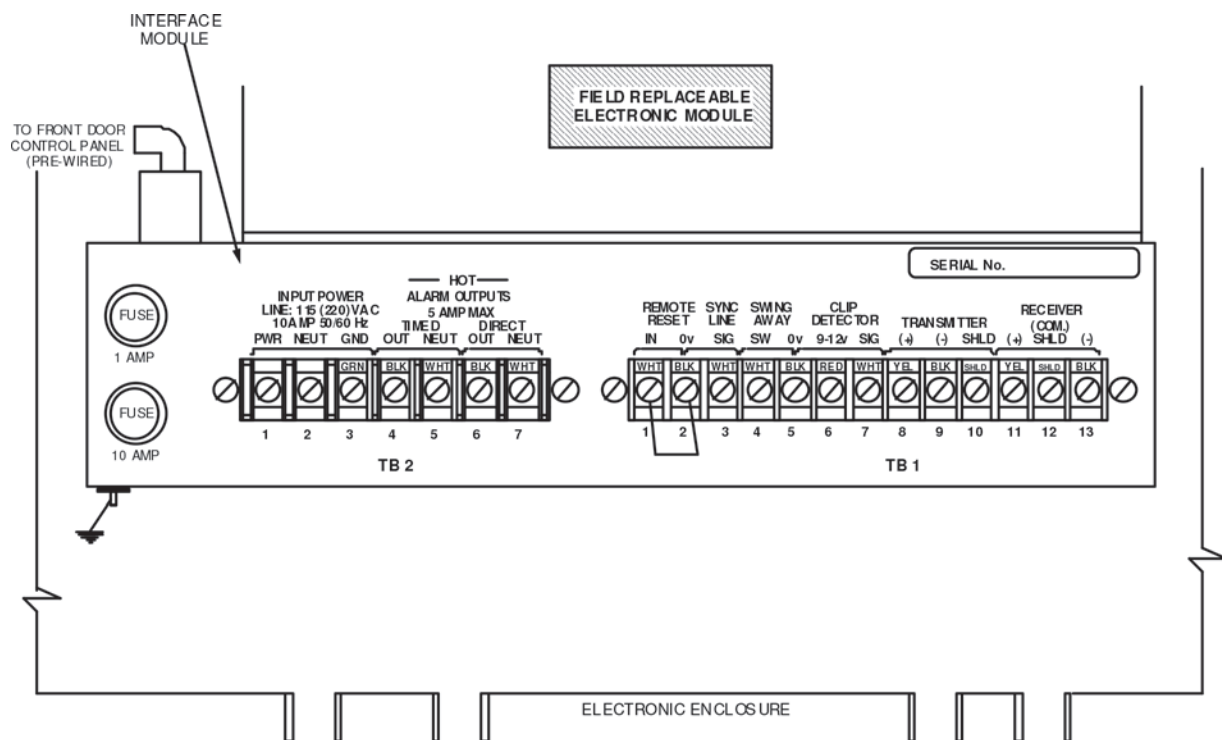


FIGURE A16
Remote Reset Switch



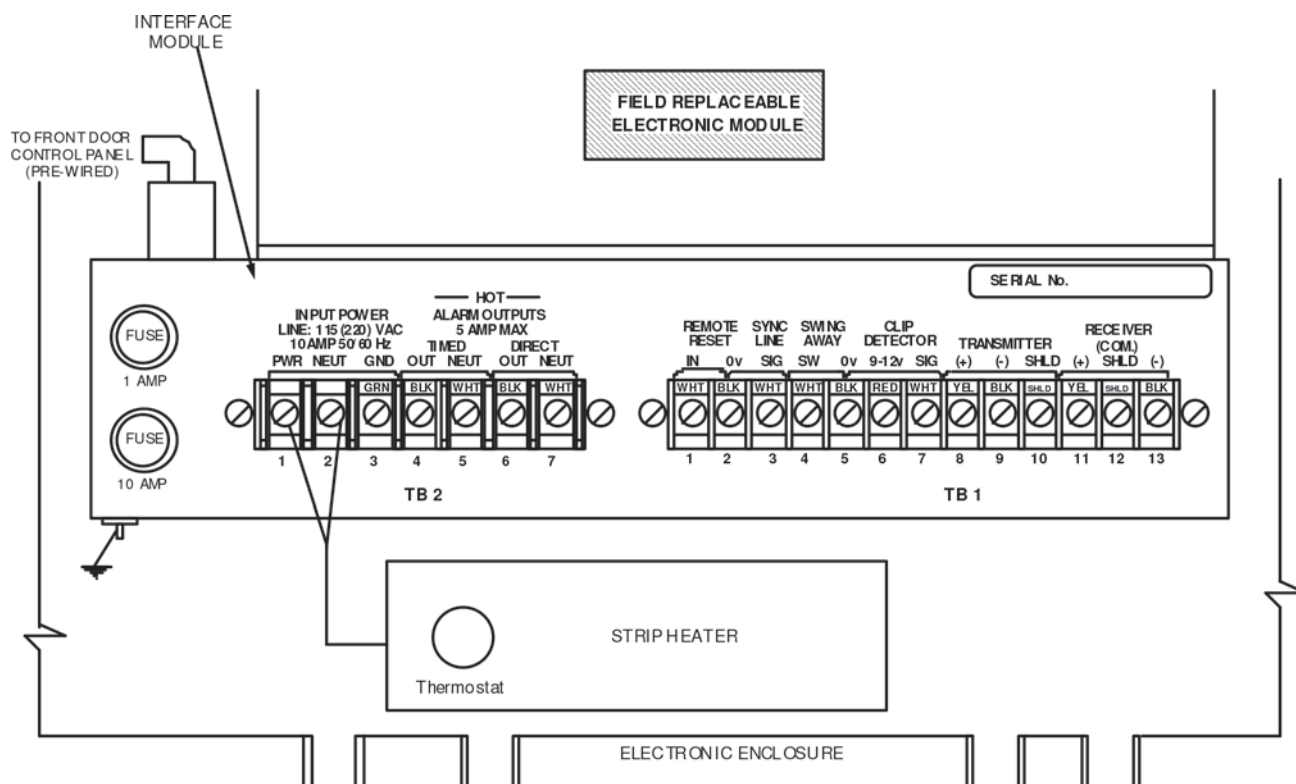
NOTE: SWITCH S2-7 MUST BE OPEN.
IF S2-7 IS CLOSED THEN THE DETECTOR
WILL NOT TRIP. REFER TO SECTION 4.9
RESET OVERRIDE.

REMOTE RESET CONNECTIONS

TB 1-1 WHITE

TB 1-2 BLACK

FIGURE A17
Automatic Reset



HEATER MAY BE ATTACHED TO THE WHITE PLATE, OR SIDES OR BOTTOM THE NEMA BOX. THERMOSTAT WILL ACTIVATE THE HEATER ONCE THE AMBIENT AIR TEMPERATURE IN THE NEMA BOX DROPS BELOW 40°F OR 4.5°C.

STRIP HEATER CONNECTION

TB 2-1 115 OR 220 VAC

TB 2-2 NEUT OR 220 VAC

FIGURE A18

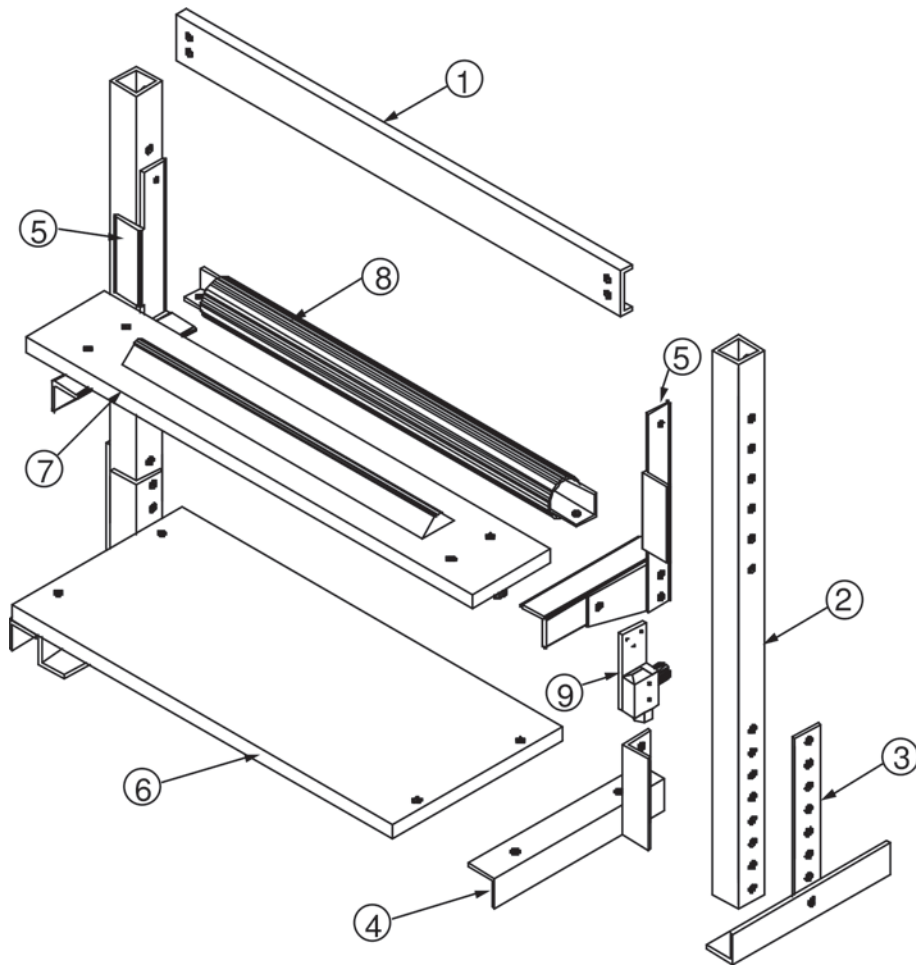
Strip Heater 115 VAC or 220 VAC

APPENDIX B

Service, Parts, Repairs

Model 1235 Frame Assembly

Num.	Name
1	Crossbar
2	Upright Pair
3	Mounting Feet Carbon Steel
4	Receiver Bracket Pair
5	Transmitter Bracket Pair
6	Receiver Antenna
7	Transmitter Antenna
8	Roughing Guard
9	Swing-Away Switch



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