MM-1241-ANALOG-B

Installation, Operation and Maintenance Instructions

METAL DETECTOR
MODEL 1241 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 1241 Analog 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 1241 Analog 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.

Table of Contents

ERIEZ MODEL 1241 ANALOG METAL DETECTOR

Table of Contents *(continued)*

ERIEZ MODEL 1241 ANALOG METAL DETECTOR

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.

The power cable should be routed so that it is not likely to be walked on or pinched by items placed upon or against it, paying particular attention to the point where it exists from the Detector.

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
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 1241 provides protection to downstream processing equipment by detecting the presence of potentially damaging metal objects. It is specifically designed for use on conveyor systems in the plastics, forest, agricultural, rubber, recycling and mining industries. The Detector will discriminate between these conveyed materials and tramp metal of any type: ferrous, nonferrous, magnetic or nonmagnetic.

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, the Detector, at the appropriate time, triggers solid state relays. These solid state relays in turn switch the line voltage to the Detector's output alarm terminals. Various combinations of alarm horns, belt stop relays, alarm beacons, and tramp metal marking devices can then be activated by the switched alarm outputs.

The Detector is influenced only by change. Therefore, stationary structural members, symmetrical idlers and other objects which do not represent a moving mass to the field are not detected. Metal belt repair clips are passed by the unit with an optional clip detector sensor and inhibitor circuit which is properly adjusted to the clip signal.

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 Electronic Module shown in Figure 2 and the Interface Module shown in Figure 3. 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 in the Interface Module. The modules are in place when the edge card connector on the Electronics Module 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 interconnecting circuit board. Visible on the face of the Interface Module are system fuses and two terminal blocks for external wiring; all the terminal block positions are clearly identified via silk screen on the top surface of the module.

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

Main Control Enclosure

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

ITM	DESCRIPTION
1	Power “ON” Indicator (Green) Lamp
2	Trip Indicator (Red) Lamp
3	On/Off Switch (Lever / Handle)
4	Reset Push Button

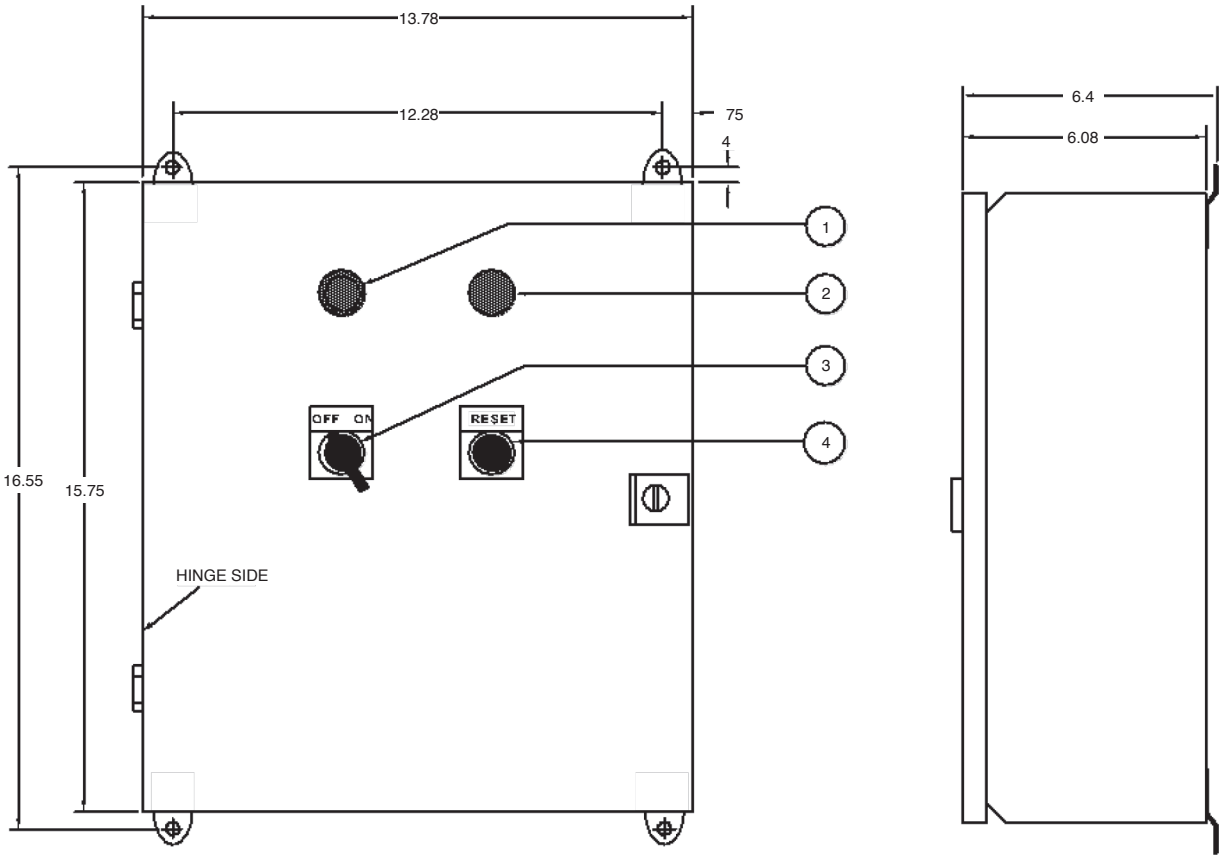


FIGURE 1

Electronic Module

Size: 10.5" x 8" x 1.5"
Weight: 2.5lbs.

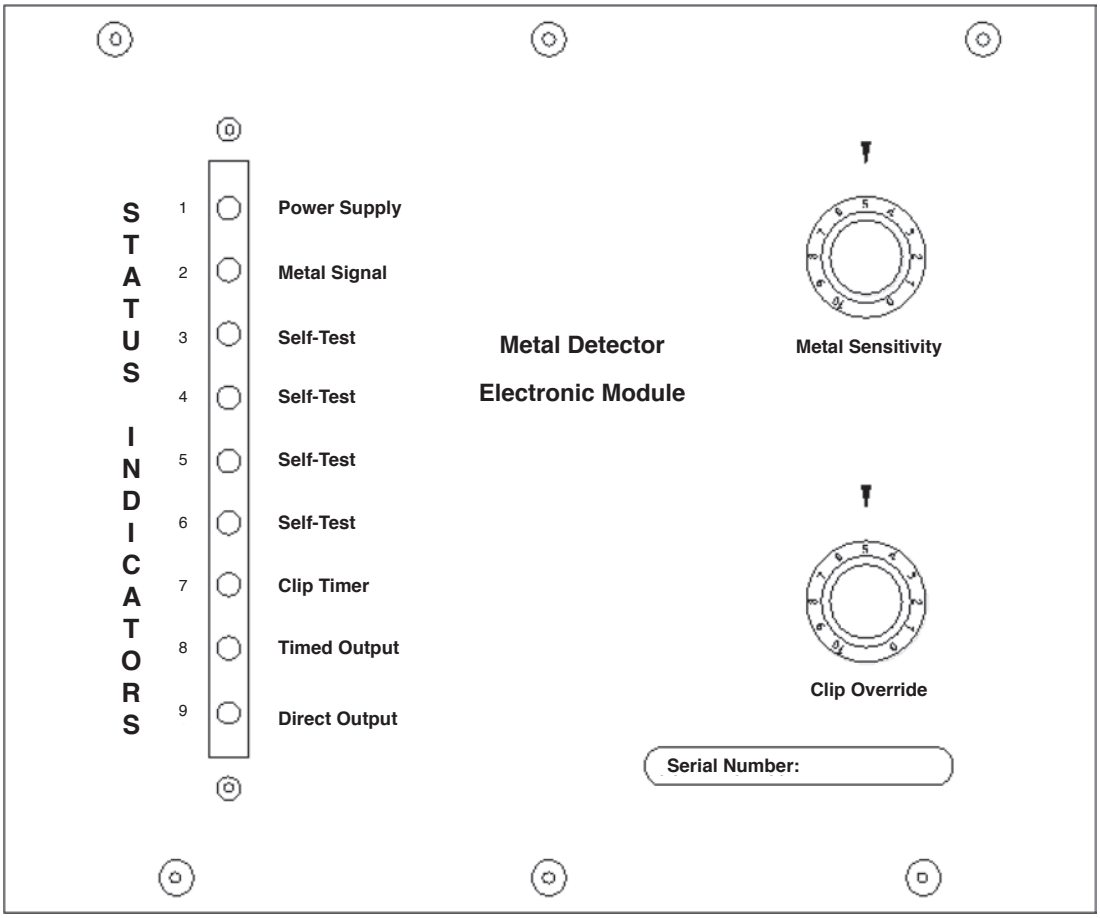


FIGURE 2

Electronic Module

Size: 11" x 2.5" x 4"
Weight: 4.75 lbs.

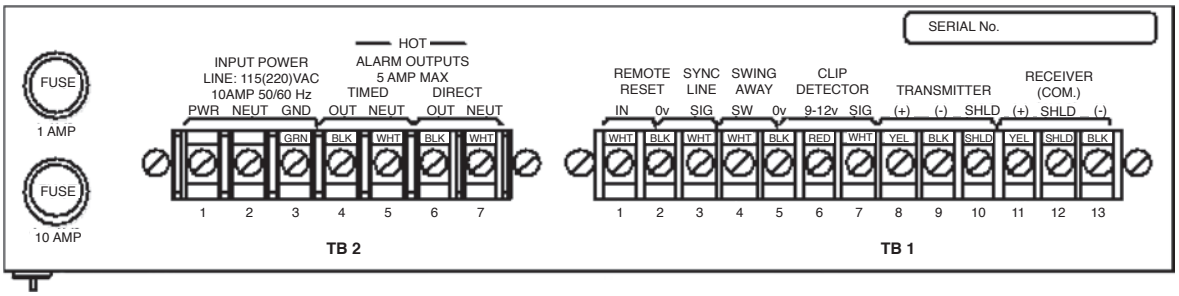


FIGURE 3

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. The model 1241 antennas are mounted on the sides of the conveyor to allow for clear space above the belt. This arrangement is ideal for log applications which may have highly variable burden heights on the belt due to branches and logs stacking. Because of the wide variety of conveyor designs, the model 1241 has many different mounting arrangements. Please consult with Eriez if you have any questions about installation.

Receiver Coil

The receiver coil is mounted inside an aluminum pan to shield the receiver coil from electromagnetic interference. Mounting tabs are located on the aluminum shield to attach it to the trough

Transmitter Coil

The transmitter coil is located opposite and parallel to the receiver coil. The transmitter is typically made of lightweight fiberglass however an alternate shielded transmitter coil may be recommended for applications have excessive electrical noise. The distance between the transmitter and receiver (aperture) is critical to the sensitivity of the detector. The larger the aperture; the lower the sensitivity

Non-Metallic Conveyor Section

Typically the non-metallic conveyor section 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 4), protects the transmitter from oversized conveyed materials. The fixed assembly, show in (Figure 5), is used for high sensitivity applications and the shielded transmitter in high electrical noise environments. If Eriez supplied the non-metallic trough, the antennas are generally either pre-mounted at the factory or at least the holes have been pre-drilled to mount the antennas. It is essential that the antennas are mounted the exact way shown in the drawings and as done by Eriez. If Eriez did not supply the non-metallic trough you will need a technician on site to help with balancing the antennas onto your trough. Please contact Eriez to schedule this.

Interconnecting Cables

Shielded cables connect the receiver and transmitter to the Main Control Enclosure. The cables are cut to a specified length at the factory. **Any alteration to the cable length will degrade the Detector's performance.** Consult the factory if other cable lengths are required.

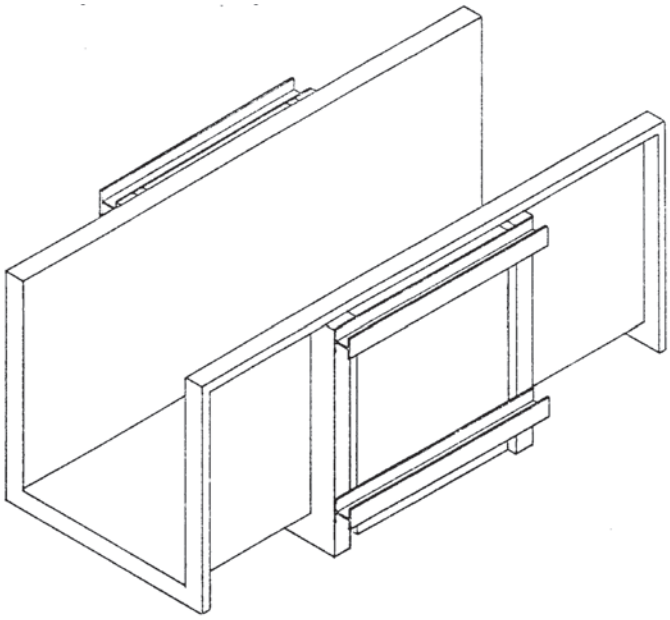


FIGURE 4
Detector Diagram

Spray Marking Device

(if applicable)

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

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.

Idler Isolation Kit

The idler isolation kit is used to reduce or eliminated unwanted electrical interference from the adjacent idler rollers. One kit included with unit order.

Multiple Unit Synchronization

(if applicable)

Synchronization is used when two metal detectors are used within 100' of each other and are within a line of sight. Exception is when there is a metal wall or other metal structure between the two metal detectors to absorb the signals from the metal detectors.

Installation

PLEASE READ THROUGH COMPLETELY BEFORE BEGINNING WORK!

Recommended Tools

9/16" Deep well socket & ratchet
7/16" Wrench
3/32" Flat head screwdriver
#2 Phillips and Flat head screwdriver
9/16" Wrench
Needle Nose Pliers
Crescent Wrench
Speed Square
Unpacking

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.

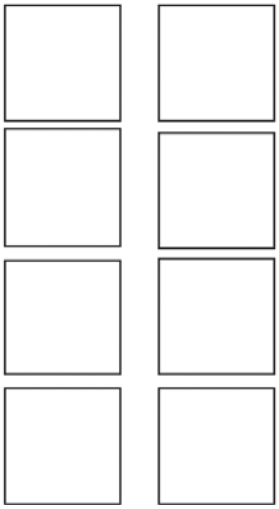
Locate the Search Coil Assembly away from sources of airborne electrical interference emitted from variable-speed drives, large motors, ballasts, FM radios, induction furnaces and other radio frequency (RF) sources. Because RF energy travels along a straight line (line-ofsight), position the receiver 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 coils.

Position the antennas so they are centered in the non-metallic section. The centerline of the detector is noted by the location of the cable connectors. If Eriez supplied the nonmetallic trough, the antennas are generally either pre-mounted at the factory or at least the holes have been pre-drilled to mount the antennas. It is essential that the antennas are mounted the exact way shown in the drawings and as done by Eriez. If Eriez did not supply the non-metallic trough you will need a technician on site to help with balancing the antennas onto your trough. Please contact Eriez to schedule this.

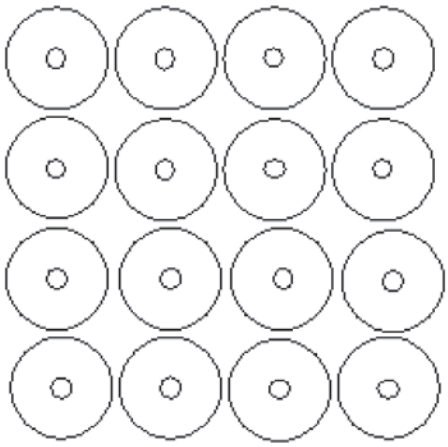
Isolation Kit

1 --- 48" (121.92mm) x 5/8" (15.89mm) Fiber Allthread Rod

8 --- 4 x 4 x 0.25
(101.6mm x 101.6 x 6.36mm)
FRP Flat Plate



16 --- OD 1(25.4mm) x ID 5/8 (15.89mm) Flat Washers



16 --- 5/8(15.89mm) Nuts

FIGURE 8

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). If decking is a safety requirement then replace it with wood, plastic, or FRP (fiberglass reinforced plastic) . If return idler can not be removed it then must be moved up or down stream of the top rollers on either side of the antennas by at least 24". Relocate or tightly secure moving or vibrating pieces of metal such as cables, conduit and piping within 36" of the Search Coil Assembly.

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 drawings from Eriez to mount the antennas. If Eriez supplied the non-metallic section the antennas are generally factory mounted already so all you have to do is install the non-metallic section into your conveyor. If the antenna or trough size/design makes it cumbersome to ship, it is possible the antennas are not factory mounted. If this is the case the holes should be pre-drilled and we recommend mounting the non-metallic section into your conveyor first, then attaching the antennas using the pre-drilled mounting holes.

If Eriez did not supply the non-metallic trough you will need a technician on site to help with balancing the antennas onto your trough. The receiver antenna should be mounted, but you may wait for the technician to arrive on site before mounting the transmitter antenna.

Fasten the receiver antenna to the non-metallic section. Shim the unit as necessary to provide a uniform and sturdy mounting surface and a distance of approximately 1/2" from the non-metallic section. Do not torque, twist or use excessive force when fastening the antenna to the structure. Do not drill or weld the antenna.
IMPORTANT: The receiver antenna **MUST** be electrically isolated from any metallic conveyor frame Failure to do so will result in excessive false detections!

2.3.2 Fasten the transmitter antenna to the frame assembly. The transmitter antenna cable connector should be directly parallel and even with the receiver antenna cable connector. If Eriez did not supply the non-metallic section the transmitter position may have to shift as much as 3/4" upstream or downstream to balance the transmitter and receiver antennas, so this must be taken into account. This is why you may consider waiting for the Eriez technician to mount the transmitter antenna.

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 (Appendix A) 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.

Pay close attention to the type of electrical wires routed in each conduit and the location of each connection on the Interface Module. **The receiver and transmitter cables must be routed in a separate conduit.** Do not run power wiring near the transmitter and receiver cables. Do not run power wiring connected to TB2 with low voltage signal wiring from TB1 in the same conduit.

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 (±10%), 50/60 Hz, and single phase operation. If the voltage source is different, contact the Factory for instructions to select the proper voltage source.

Spray 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. Refer to Figure 18 for kit parts, Figure 19 for assembly and Figure 20 for positioning.

Specifications

Tank Pressure Rating: 50 psig (max working pressure)
Tank Capacity: 2.5 Gallons (liquid)
Operational Voltage: 115/220 VAC (50/60 Hz), 15 Watts
Air: Plant air or any source of 100 to 200 psig inert gas

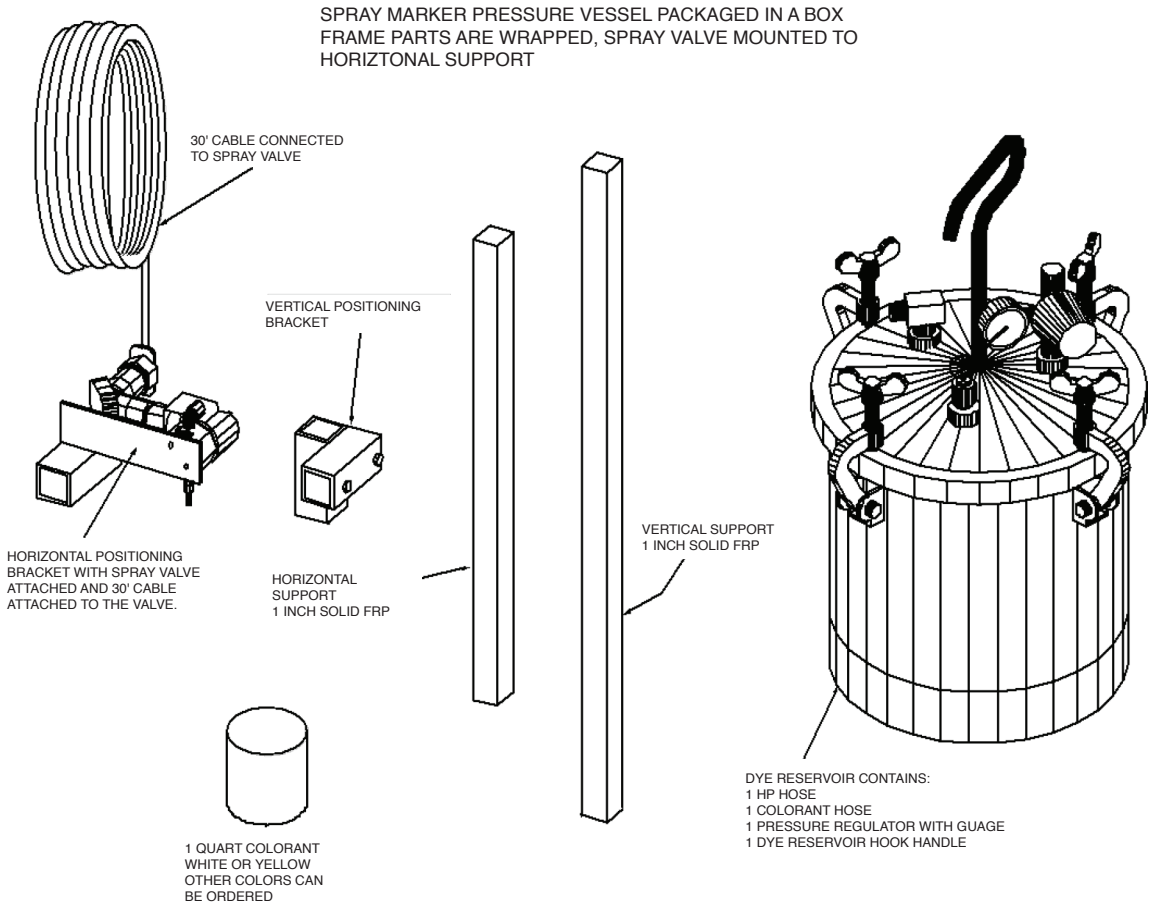


FIGURE 18
Marking Device Kit

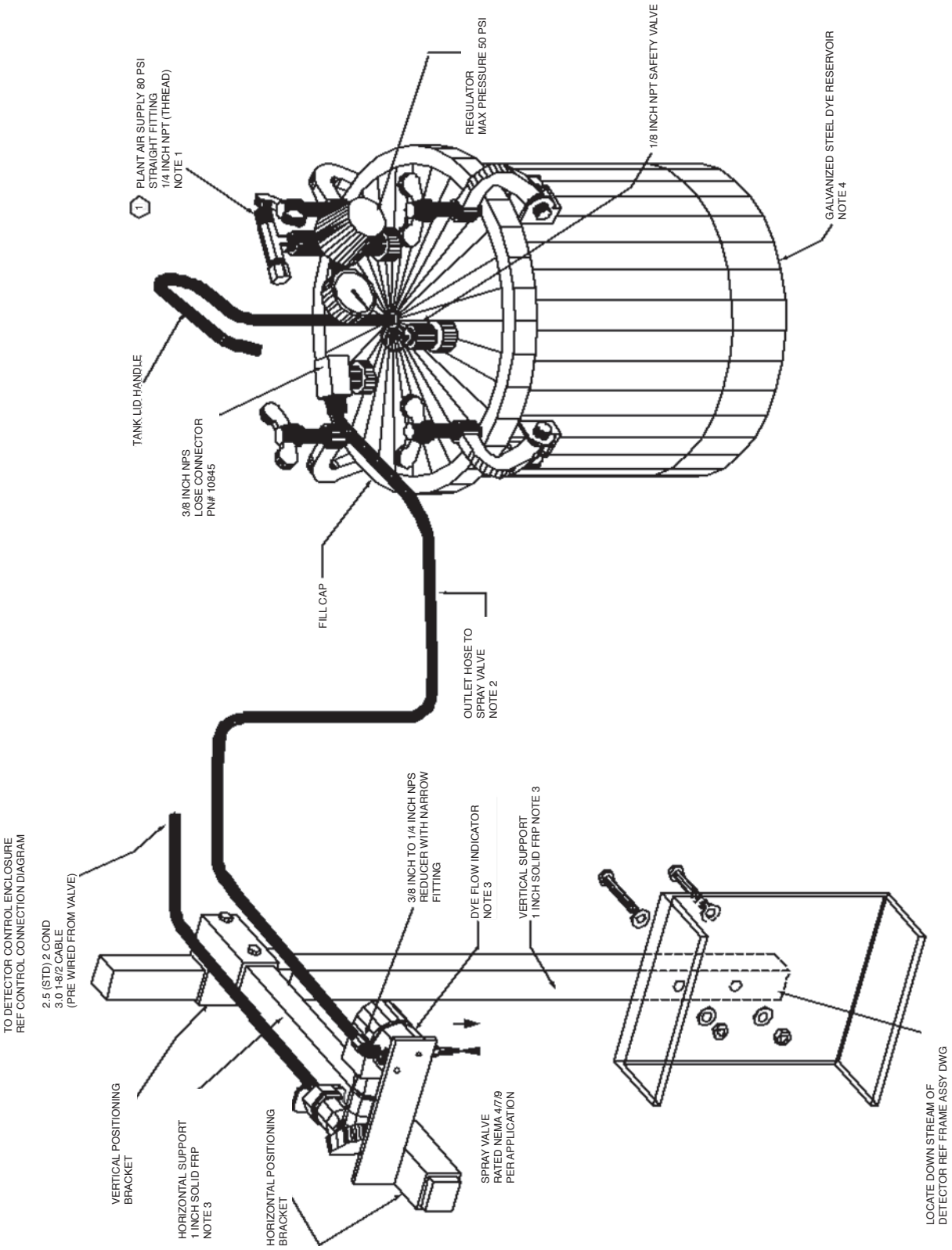


FIGURE 19
Spray Marker Tank Assembly

Installation Instructions

Refer to the Figure 20 for positioning of the Marking Device on the conveyor.

Position the solenoid support upright and cross arm as shown. Distance from the coils should be 3' to 6'. Clamp in place temporarily. NOTE: The 1" x 1" *support structure is a fiberglass bar*.

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 spray tank top.

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 20 and 50 psig, as noted on the pressure gauge on top of the holding tank.

Calibration of Marking Device

Refer to System Programming sections “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 spray nozzle or use a stop watch to time a mark on the belt as it moves from the center of the receiver antenna to the spray nozzle. This is the Delay Before ON time. Set the ON Time to 1 second. It is easier to adjust the timing of the spray 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 spray area the first time is the spray will be just after the piece of metal if it is shorten the Delay Time a few 10th of a second and try it again. The metal should be centered in the in the marked area. Once the metal is centered repeat the procedure with a full belt to see if the metal is still in the marked area. If not adjust the timing so the metal is centered in the marked area.

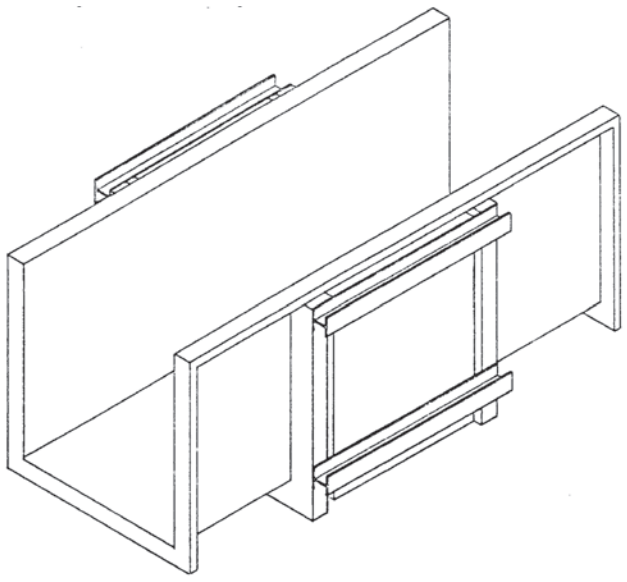


FIGURE 20

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. Refer to Figure 21 for kit parts, Figure 22 for assembly and Figure 23 for positioning.

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

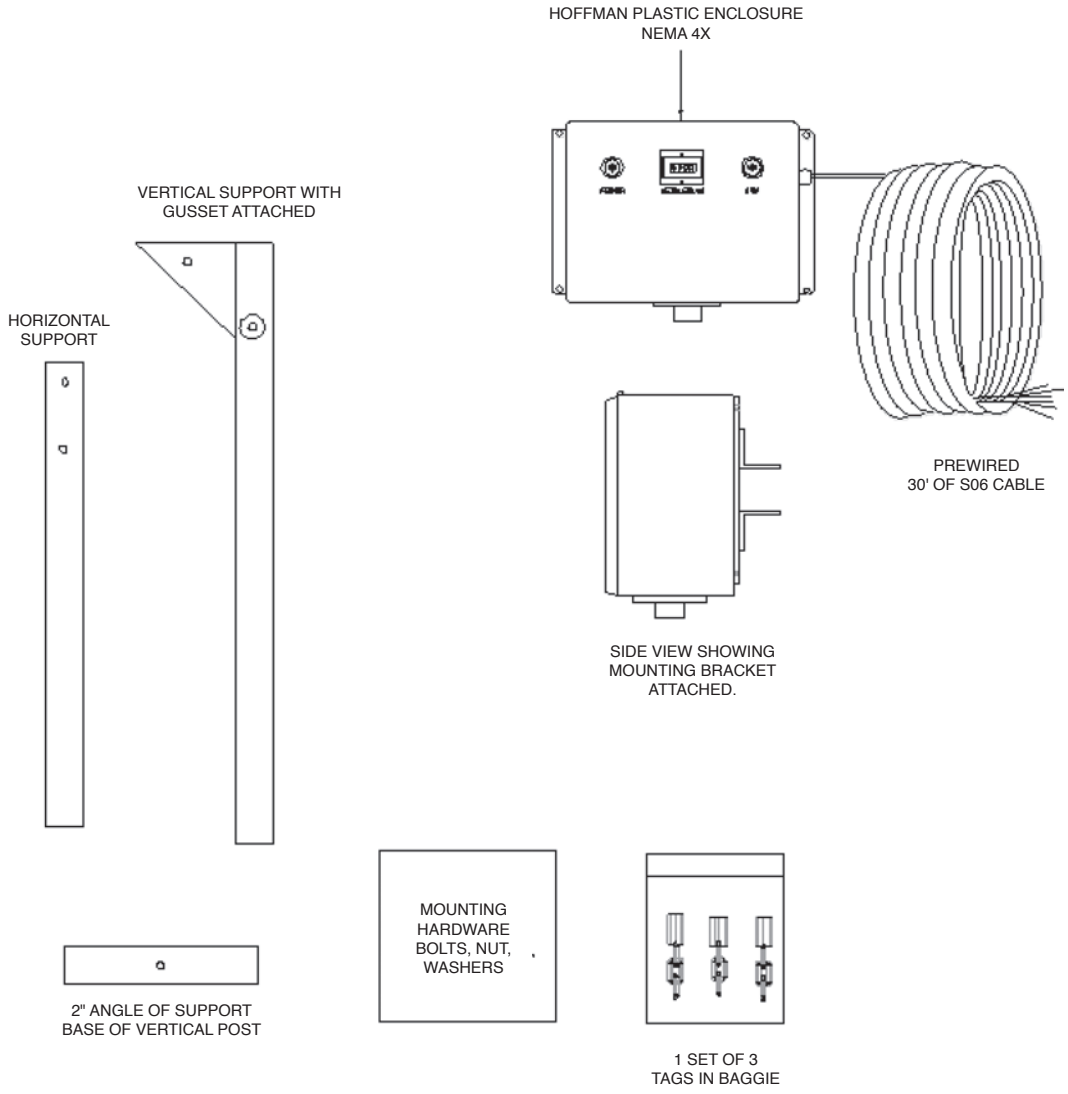


FIGURE 21

Installation Instructions

Refer to the Figure 22 for mounting and Figure 23 for positioning of the Flag Marking Device.

Attach the upright support to the upright. Position the frame upright in front of the first down stream 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 A13.

Calibration of Flag Drop Marker

Refer to System Programming sections “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 1/2 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 first time is the flag will be just after the piece of metal if it is shorten the Delay Time a few 10th of a second and try it again. The flag should drop and hit the metal. The delay time for the flag will vary depending on the distance it has to fall. On an empty belt the flag will have to travel farther before it hits the metal than on a full belt. Because of 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.

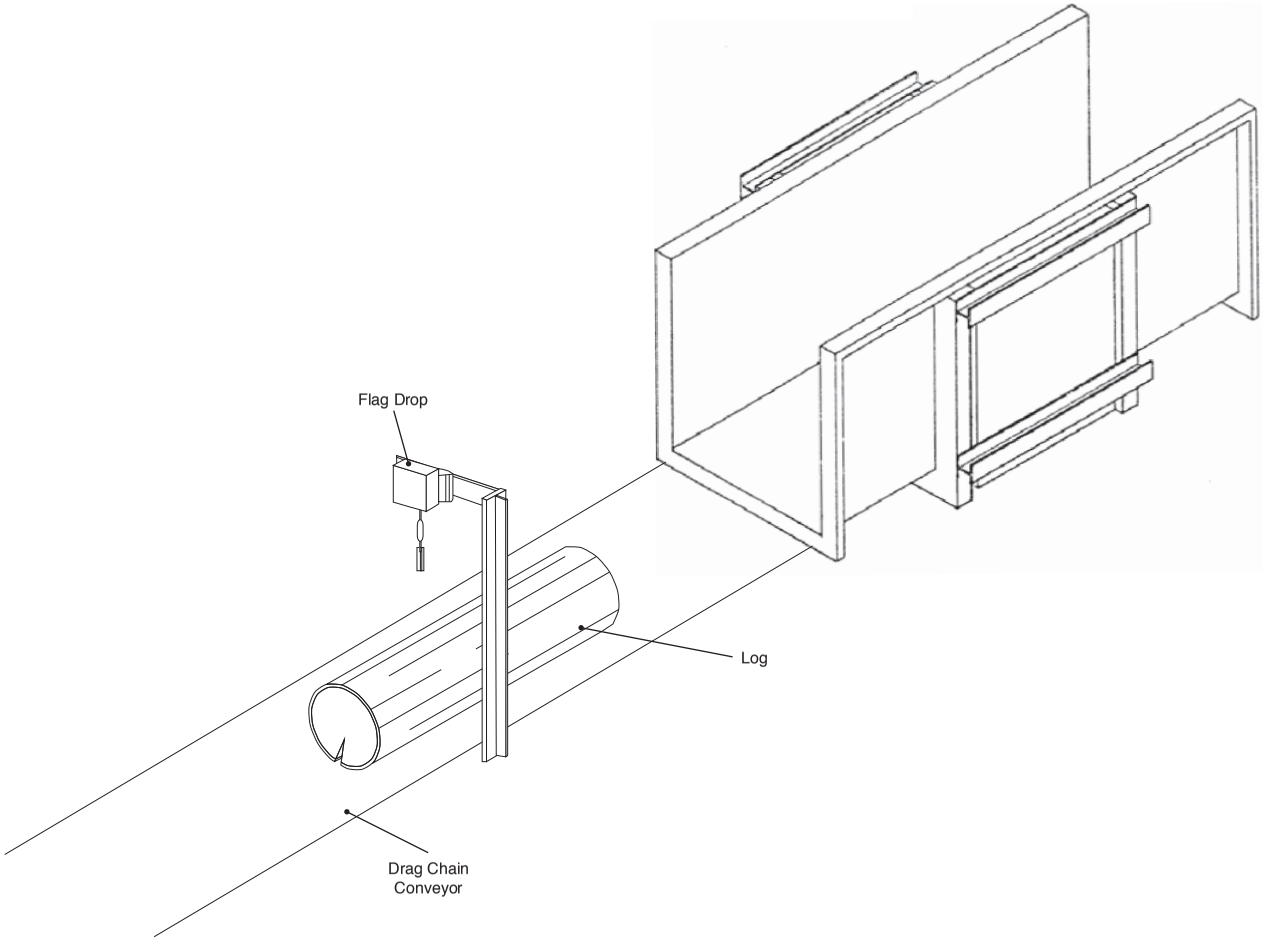
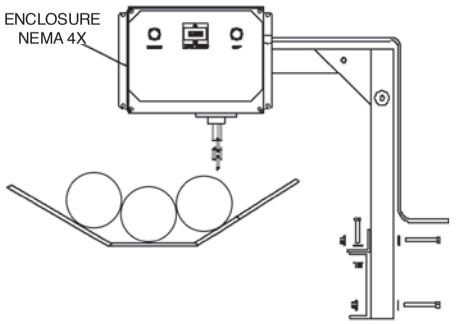


FIGURE 23
Positioning the Flag Marker



INSTALLATION:

1. Attach the Upright Support ⑧ to Upright ④.
2. Place Upright and Support on conveyor frame.
3. Adjust Upright so it is vertical. Allow the Support to pivot so it is laying flat on top of the conveyor frame.
4. Temporarily clap the Support to the conveyor frame.
5. Use the holes in the Upright and Supports drill hole templates. Drill holes in the conveyor frame and using supplied bolts, washer and nuts. Secure the assembly.
6. Mount the cross bar ⑤ to the Upright.
7. Mount the Enclosure Back plate ⑨ to the Cross bar.
8. Mount the Carbon Enclosure to the Enclosure Back plate.
9. Route control cable through the cross bar square tube and through the upright square tube to the Electronics Enclosure.

FIGURE 22
Mounting of the Flag Drop Marker

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

1. Before proceeding with the calibration procedure, obtain a sample of tramp metal to be used during calibration. The piece should be the minimum size to be detected. The clip timer, L.E.D. No. 7, cannot be lit during calibration. This results in erroneous data. Calibration adjustments are to be performed using the controls on the Electronic Module in the following manner:

2. Set the “Metal Sensitivity” control knob, located on the front panel of the Electronic Module, to the middle of the dial (reading of 5).

3. The Detector discriminates between interference and a signal given off by tramp metal. The tramp metal must enter the sensing coil at the direction and speed of normal belt flow, before the Detector will alarm. However, the “Metal Signal”, L.E.D. No. 2, will light anytime moving metal is in the sensing field. When calibrating the system, be careful not to introduce extraneous metal into the field in the form of rings, belt buckles, keys, steel-toed shoes, etc. When calibrating the system, it is best to set the metal to be detected on a cardboard box (with no staples) at the appropriate height and pass at the speed and direction of belt flow.

4. If the Detector does not trip on the 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 above the coils.

5. 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 System Programming section “Metal Gain”.

6. Repeat step 2 and 3 until the system trips on the piece of metal. When the final setting is determined, note the number on the control knob for future reference. If this number is greater than 8, increase the gain of the Detector as described in the System Programming section “Metal Gain” and repeat steps 2 and 3.

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.

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. Refer to Programming Controls Summary for an overview of switch functions Table 6 and Programming Controls & Test Point Locations Figure 25 for component locations.

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

1. The internal gain of the Detector is adjusted by a rotary switch, S4, located inside the Electronic Module (refer to Figure 25 Programming and Test Point Locations). 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.
2. 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:
3. Remove the control knobs and cover of the Electronic Module as indicated in the "General" section.

4. Set the “Metal Sensitivity”: control knob (R101) to its rotational midpoint (if the cover was not removed, the “Metal Sensitivity” would be 5)

5. 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.

6. 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.

7. If all other functions are properly programmed, replace the cover and knobs. Re-index the control knobs as indicated inthe “General” section.

8. Recalibrate the “Metal Sensitivity” control knob as instructed in the Start Up & Calibration section “Main Detector Unit”.

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 25.

Position					Time
1	2	3	4	5	sec - - x10
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

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 25.

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.

Position	Contact Mode
6	
C	Normally ON
O	Normally OFF

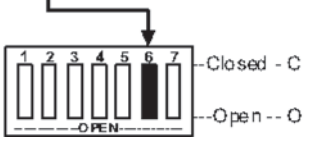


TABLE 3
S2 - Direct Output Normally On/Off Select

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. See Figure 25.

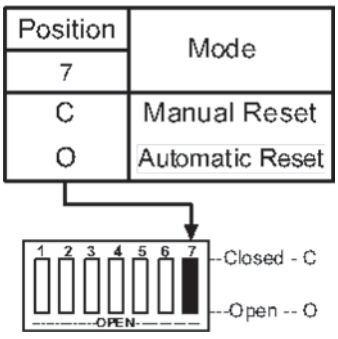


TABLE 4
Timed Output Reset Mode (Switch S3)

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.

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.

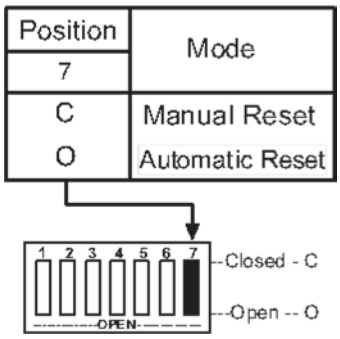


TABLE 5
Belt Reset Override (Switch S2)

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.**

Control	Position	Function	Comment
S1	1	Sampling Mode	Allows the detector to detect metal and ignore conveyed product. Factory preset do not adjust.
	2		
	3	Not Used	
	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 and times.
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 direct output contacts as normally “ON” or “OFF”. Refer to Table 3 for setting. 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” least gain “0” most gain.
R101		Metal Sensitivity	Sets metal “trip” threshold level. “10” most sensitive, “1” least sensitive.
R90		Clip Override	Attenuates (reduces) metal sensitivity to allow repair clips to pass through detector. “10” most attenuation. “1” least attenuation.
R7		Fine Frequency Adjust	Permits fine adjustment of Detector’s operating frequency.
R1-TPD		Speed Filter Adjust	Permits adjustment of a range of belt speeds that the detector will accept. Turning the pot CCW increases the range CW decreases the range. All units shipped with pot at CCW.

TABLE 6
Programming Controls Summary

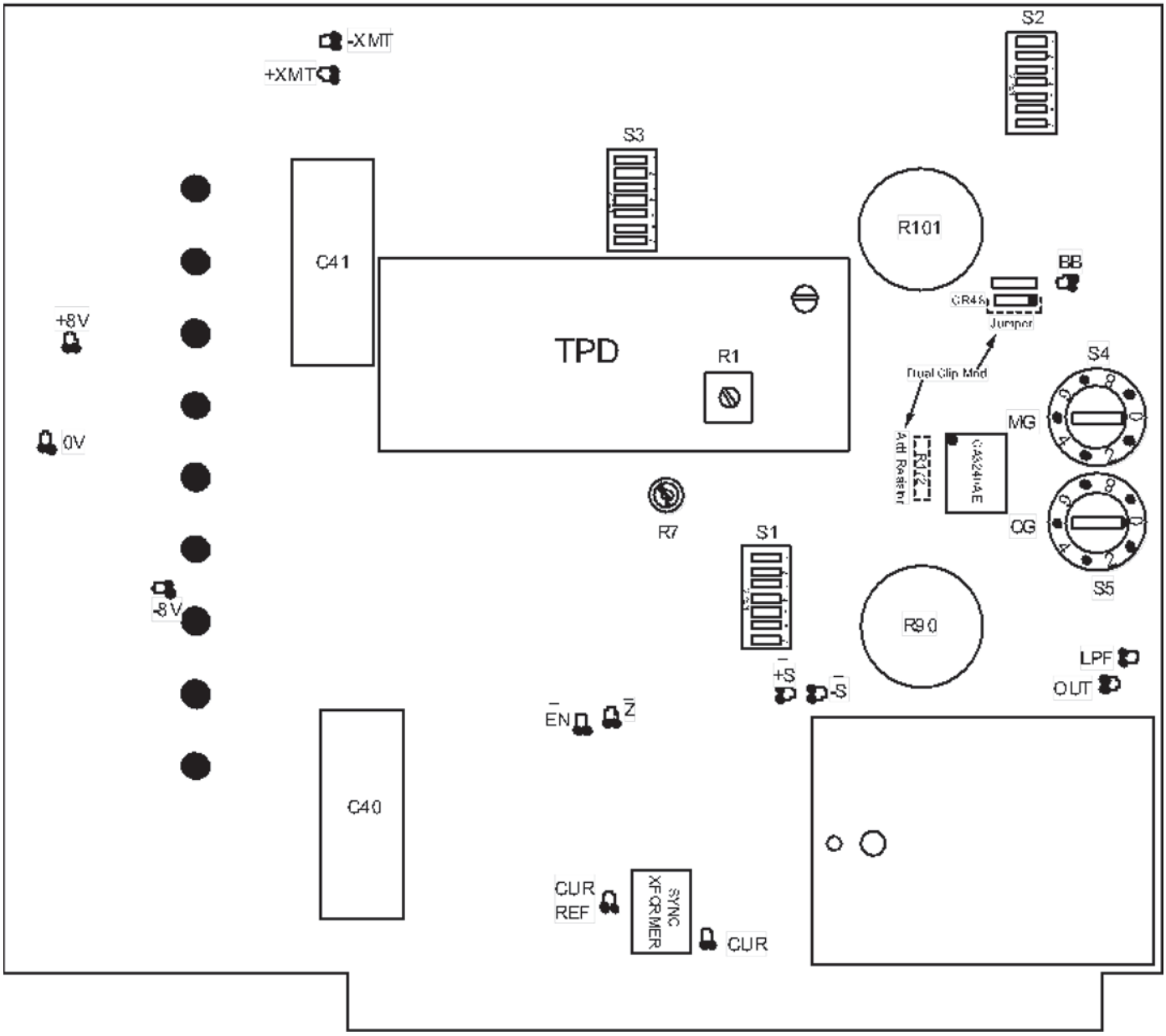


FIGURE 24
Programming Controls & Test Point Locations

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 8) 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).

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

(1) 1/16" Allen Key Wrench

(1) 5/64" Allen Key Wrench

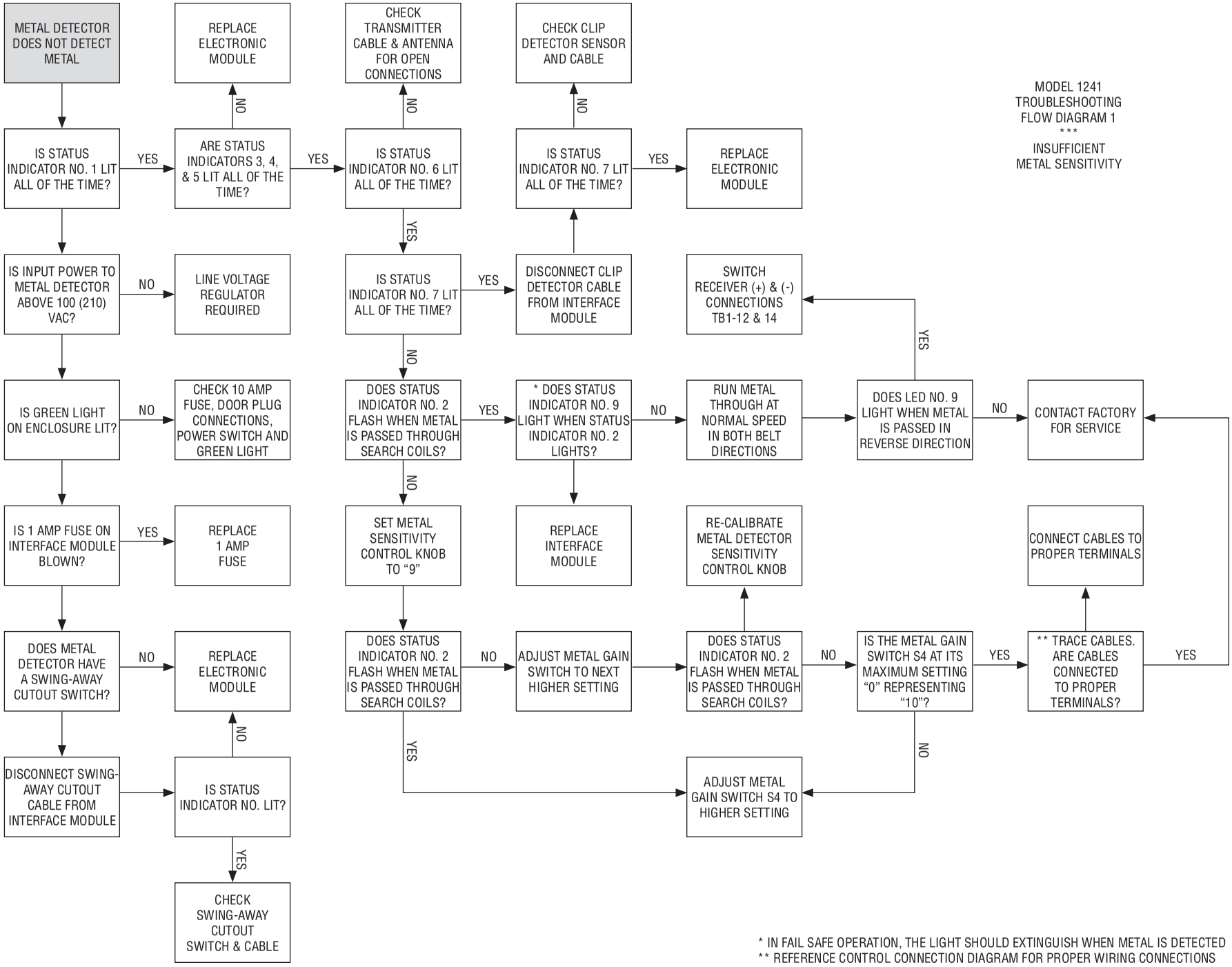
L.E.D. Number	Identification	Normal Condition	Comments
1	Power Supply	ON	Indicates detector power supply operational; must be lit for unit to detect metal. Will not light when power supply malfunctions, low line voltage is present or optional transmitter swing-away switch is activated. LED lights approximately 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	Self-Test	ON	Indicates specified internal Electronic Module circuits are functioning normally. Must be lit for unit to detect metal.
4	Self-Test		
5	Self-Test		
6	Self-Test		
7	Clip Timer	OFF	Indicates repair clip is in proximity of the clip detector head. LED remains lit for the period detector was programmed to allow clip clear the sensing zone.
8	Timed Out	OFF	Indicates the condition of the timed alarm output. If the LED is lit the timed alarm output is energized with the line voltage.
9	Direct Out	OFF*	Indicates the condition of the direct alarm output. If the LED is lit, the direct alarm outputs are energized with line voltage.

*When Programmed to operate in a fail-safe mode (output normally “ON”), the LED’s will be normally lit.

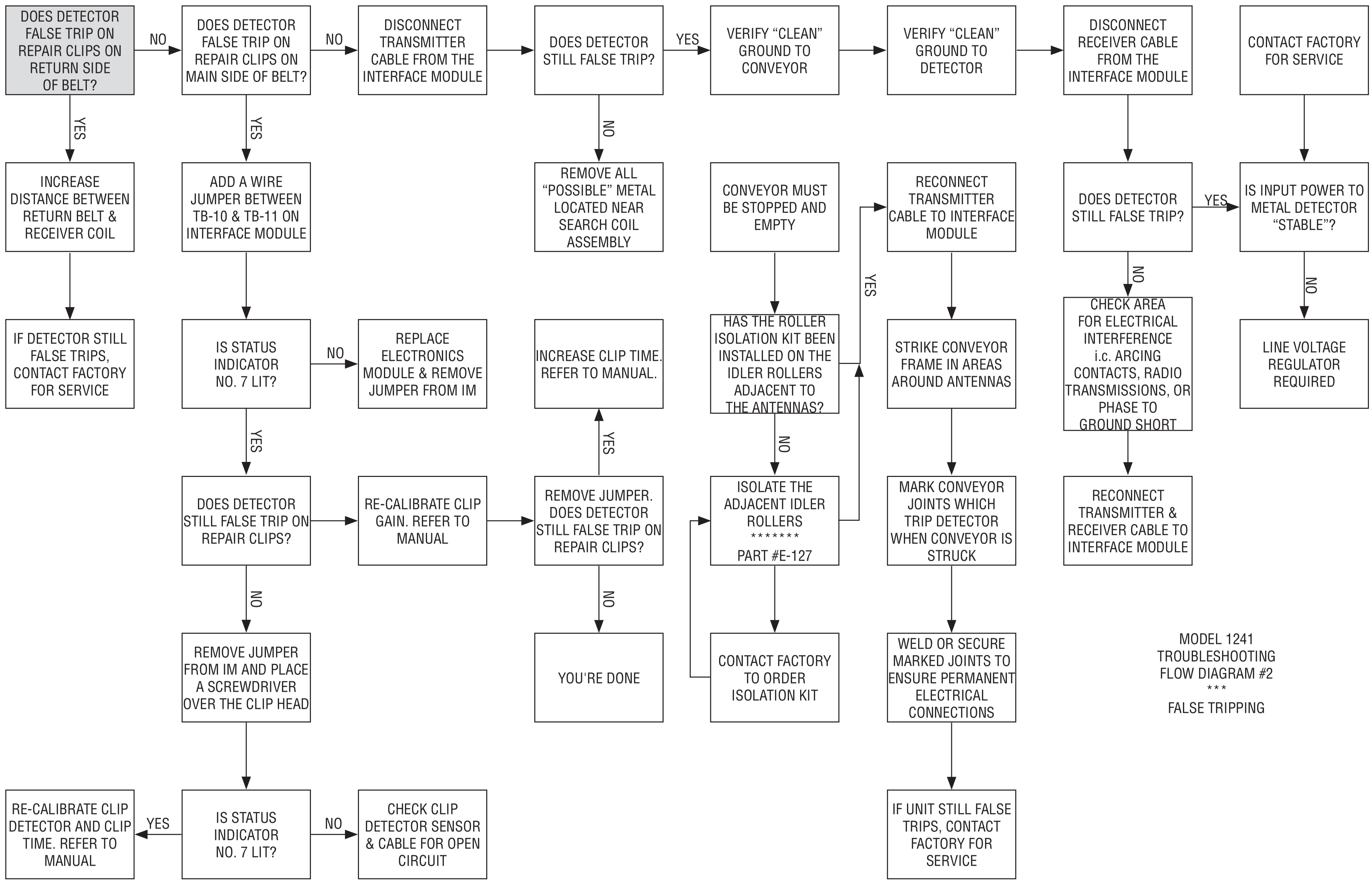
TABLE 8

Electronics Module Status Indicator Summary

MODEL 1241
TROUBLESHOOTING
FLOW DIAGRAM 1
***
INSUFFICIENT
METAL SENSITIVITY

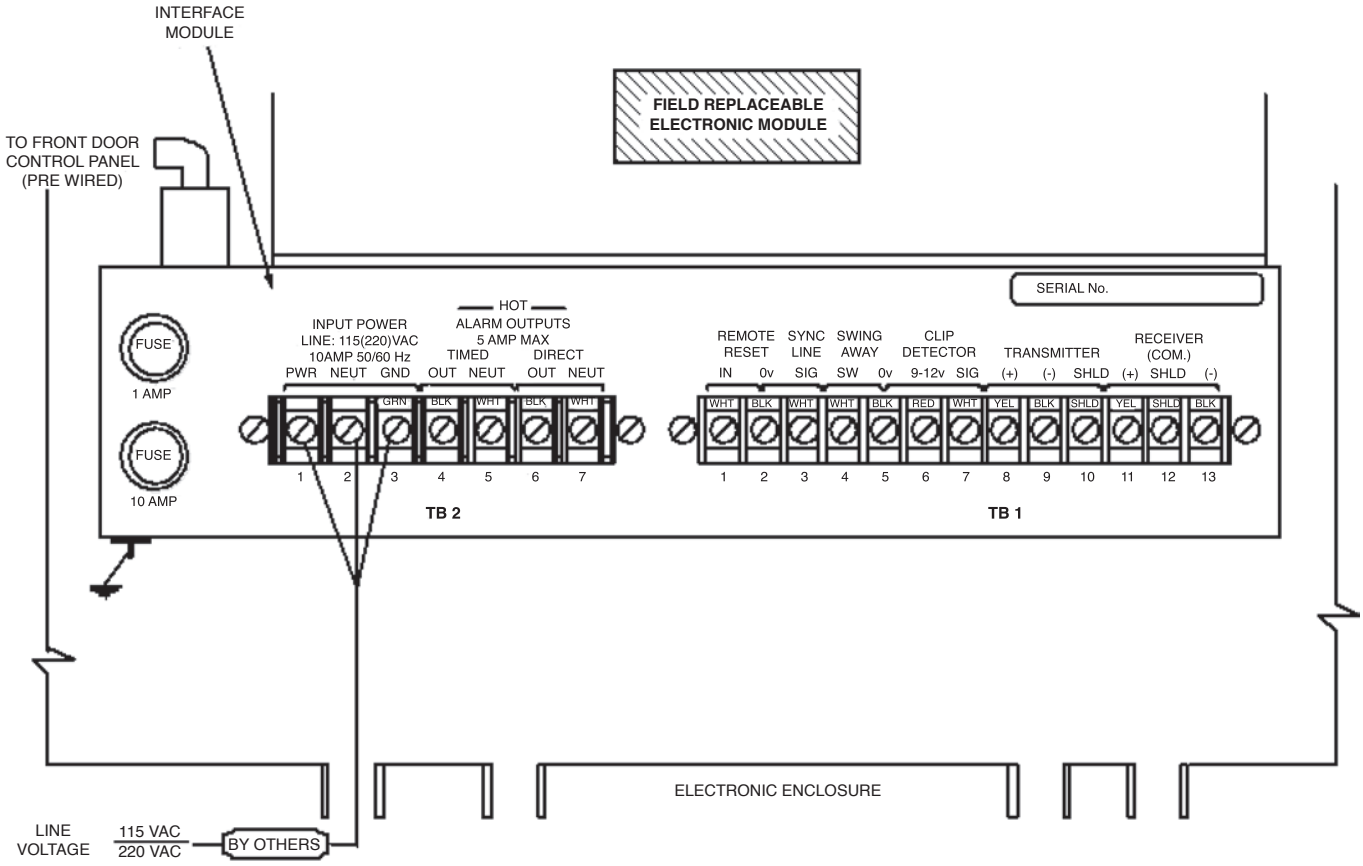


* IN FAIL SAFE OPERATION, THE LIGHT SHOULD EXTINGUISH WHEN METAL IS DETECTED
** REFERENCE CONTROL CONNECTION DIAGRAM FOR PROPER WIRING CONNECTIONS


DOES DETECTOR FALSE TRIP ON REPAIR CLIPS ON RETURN SIDE OF BELT?
NO
DOES DETECTOR FALSE TRIP ON REPAIR CLIPS ON MAIN SIDE OF BELT?
NO
DISCONNECT TRANSMITTER CABLE FROM THE INTERFACE MODULE
DOES DETECTOR STILL FALSE TRIP?
YES
VERIFY "CLEAN" GROUND TO CONVEYOR
VERIFY "CLEAN" GROUND TO DETECTOR
DISCONNECT RECEIVER CABLE FROM THE INTERFACE MODULE
CONTACT FACTORY FOR SERVICE
YES
INCREASE DISTANCE BETWEEN RETURN BELT & RECEIVER COIL
YES
ADD A WIRE JUMPER BETWEEN TB-10 & TB-11 ON INTERFACE MODULE
NO
REMOVE ALL "POSSIBLE" METAL LOCATED NEAR SEARCH COIL ASSEMBLY
CONVEYOR MUST BE STOPPED AND EMPTY
RECONNECT TRANSMITTER CABLE TO INTERFACE MODULE
DOES DETECTOR STILL FALSE TRIP?
YES
IS INPUT POWER TO METAL DETECTOR "STABLE"?
IF DETECTOR STILL FALSE TRIPS, CONTACT FACTORY FOR SERVICE
IS STATUS INDICATOR NO. 7 LIT?
NO
REPLACE ELECTRONICS MODULE & REMOVE JUMPER FROM IM
INCREASE CLIP TIME. REFER TO MANUAL.
HAS THE ROLLER ISOLATION KIT BEEN INSTALLED ON THE IDLER ROLLERS ADJACENT TO THE ANTENNAS?
YES
STRIKE CONVEYOR FRAME IN AREAS AROUND ANTENNAS
NO
CHECK AREA FOR ELECTRICAL INTERFERENCE i.c. ARCING CONTACTS, RADIO TRANSMISSIONS, OR PHASE TO GROUND SHORT
NO
LINE VOLTAGE REGULATOR REQUIRED
YES
YES
NO
DOES DETECTOR STILL FALSE TRIP ON REPAIR CLIPS?
RE-CALIBRATE CLIP GAIN. REFER TO MANUAL
REMOVE JUMPER. DOES DETECTOR STILL FALSE TRIP ON REPAIR CLIPS?
ISOLATE THE ADJACENT IDLER ROLLERS
****
PART #E-127
MARK CONVEYOR JOINTS WHICH TRIP DETECTOR WHEN CONVEYOR IS STRUCK
RECONNECT TRANSMITTER & RECEIVER CABLE TO INTERFACE MODULE
NO
NO
REMOVE JUMPER FROM IM AND PLACE A SCREWDRIVER OVER THE CLIP HEAD
YOU'RE DONE
CONTACT FACTORY TO ORDER ISOLATION KIT
WELD OR SECURE MARKED JOINTS TO ENSURE PERMANENT ELECTRICAL CONNECTIONS
MODEL 1241
TROUBLESHOOTING
FLOW DIAGRAM #2
***
FALSE TRIPPING
RE-CALIBRATE CLIP DETECTOR AND CLIP TIME. REFER TO MANUAL
YES
IS STATUS INDICATOR NO. 7 LIT?
NO
CHECK CLIP DETECTOR SENSOR & CABLE FOR OPEN CIRCUIT
IF UNIT STILL FALSE TRIPS, CONTACT FACTORY FOR SERVICE

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

FIGURE A1
Power Input

NOTE

Wire color will vary with local ordinances. Power cables not suppled.

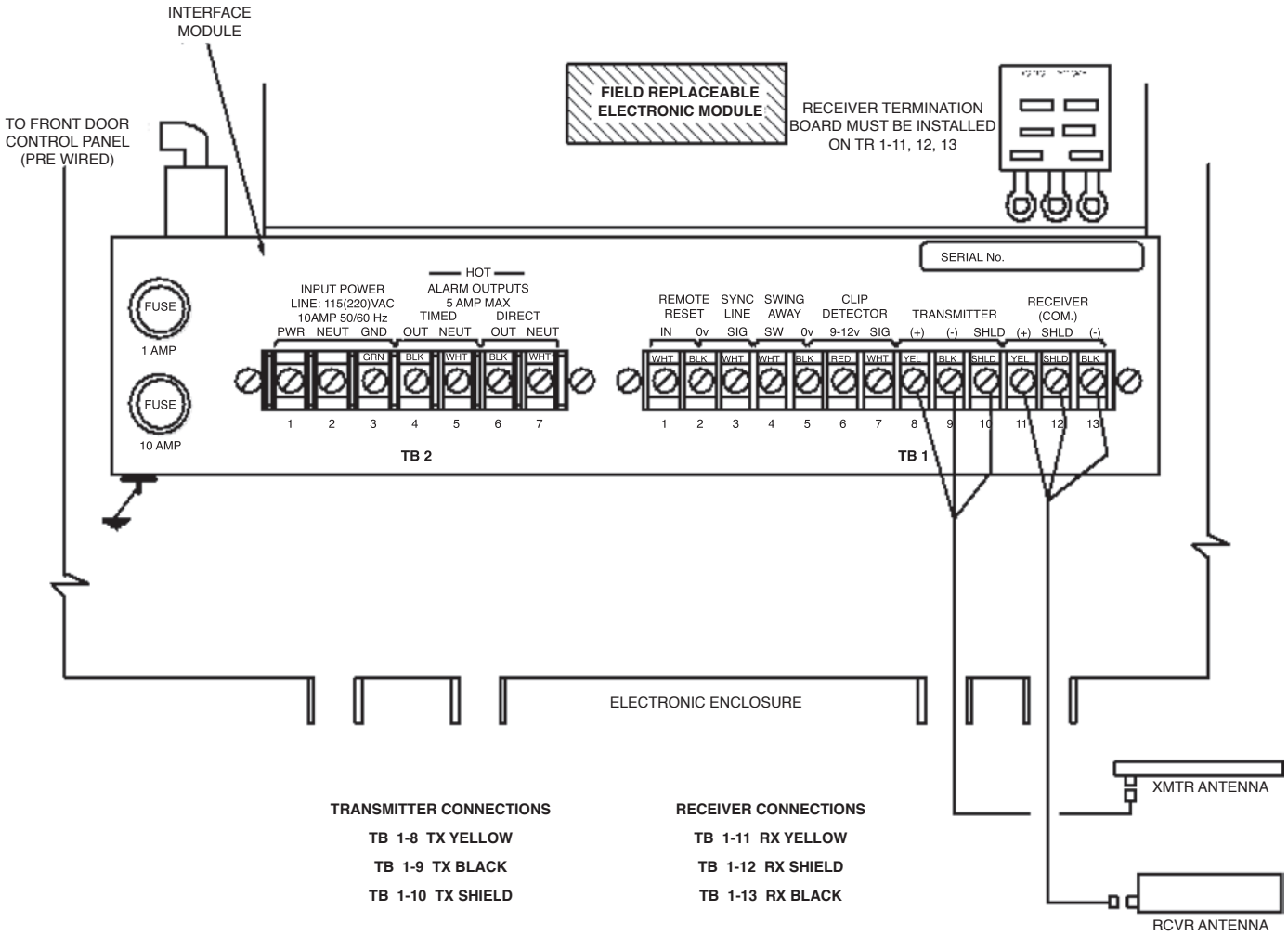


FIGURE A2

Transmitter and Receiver Antenna

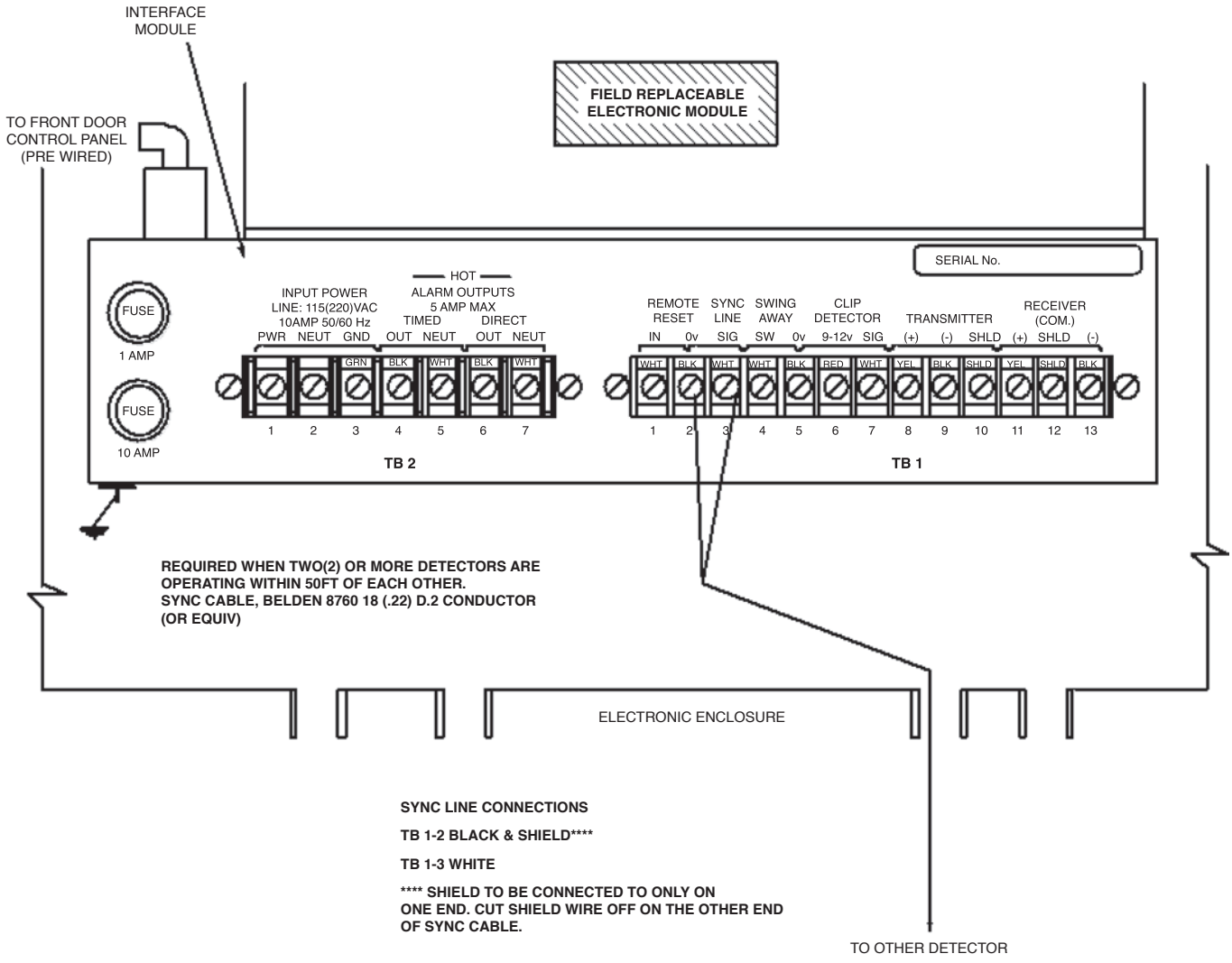


FIGURE A6
Synchronization

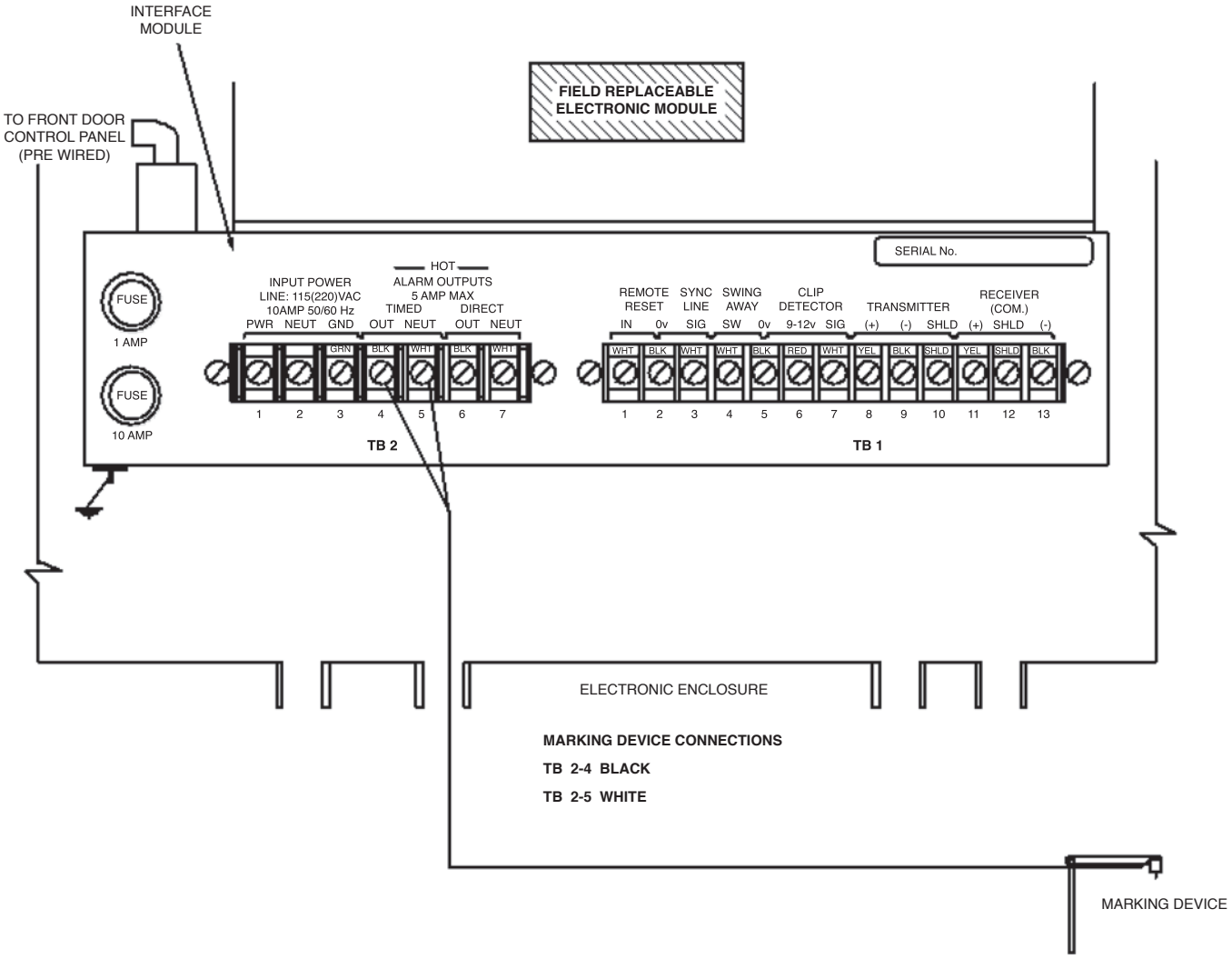


FIGURE A7
Spray Marker

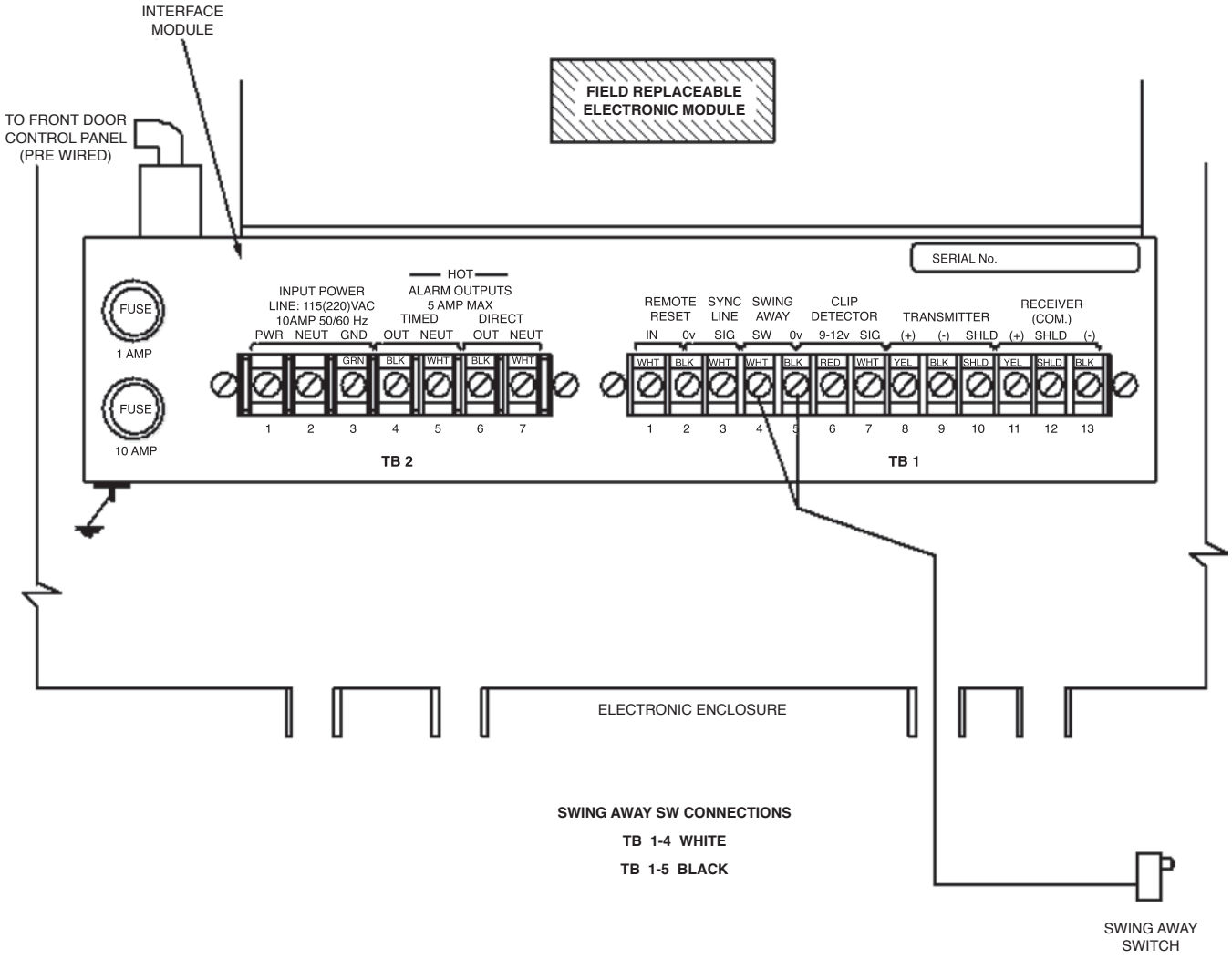
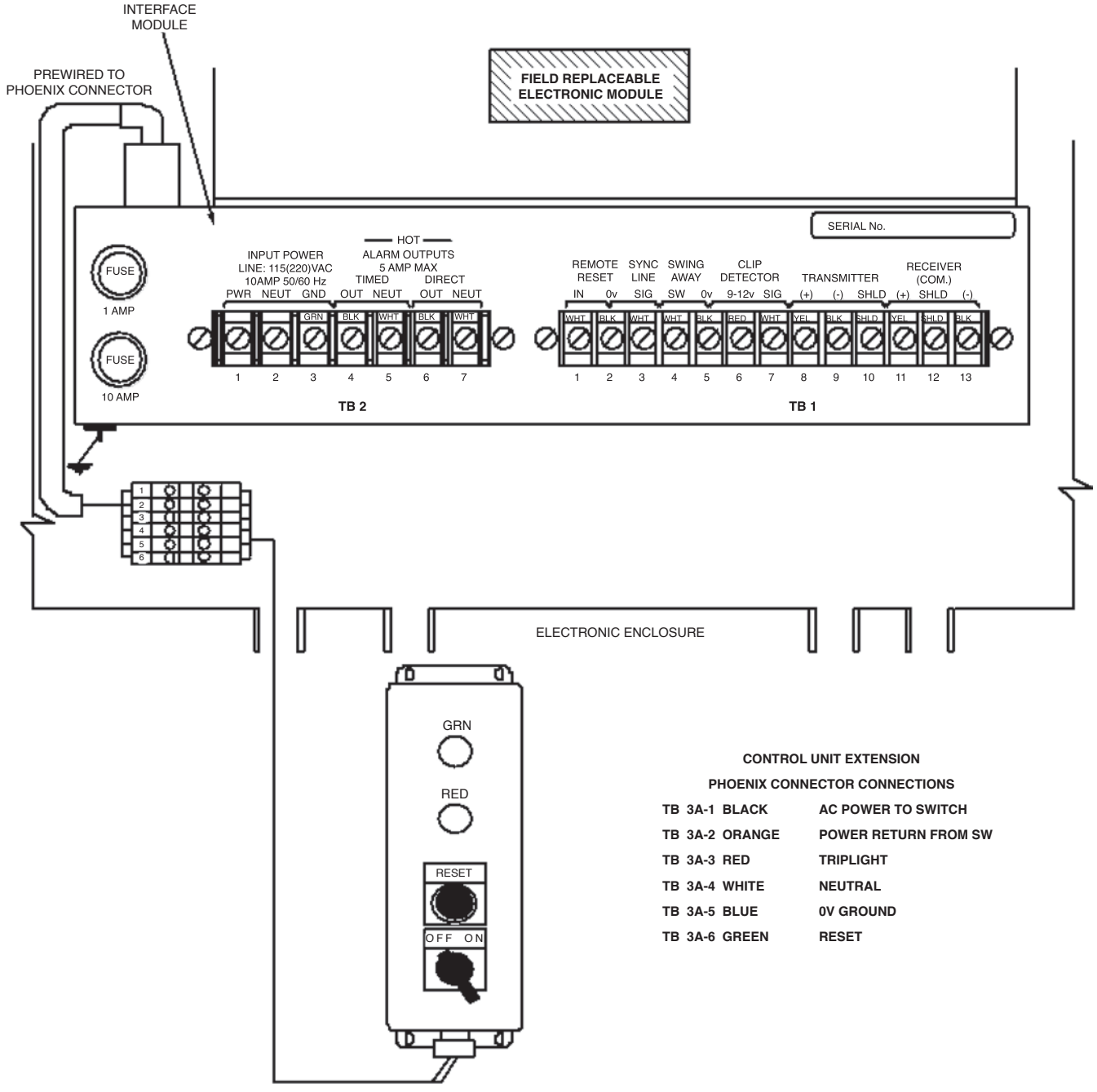


FIGURE A8
Swing Away Switch



CONTROL UNIT EXTENSION

PHOENIX CONNECTOR CONNECTIONS

TB 3A-1	**BLACK**	**AC POWER TO SWITCH**
TB 3A-2	**ORANGE**	**POWER RETURN FROM SW**
TB 3A-3	**RED**	**TRIPLIGHT**
TB 3A-4	**WHITE**	**NEUTRAL**
TB 3A-5	**BLUE**	**0V GROUND**
TB 3A-6	**GREEN**	**RESET**

FIGURE A9
Control Unit Extension

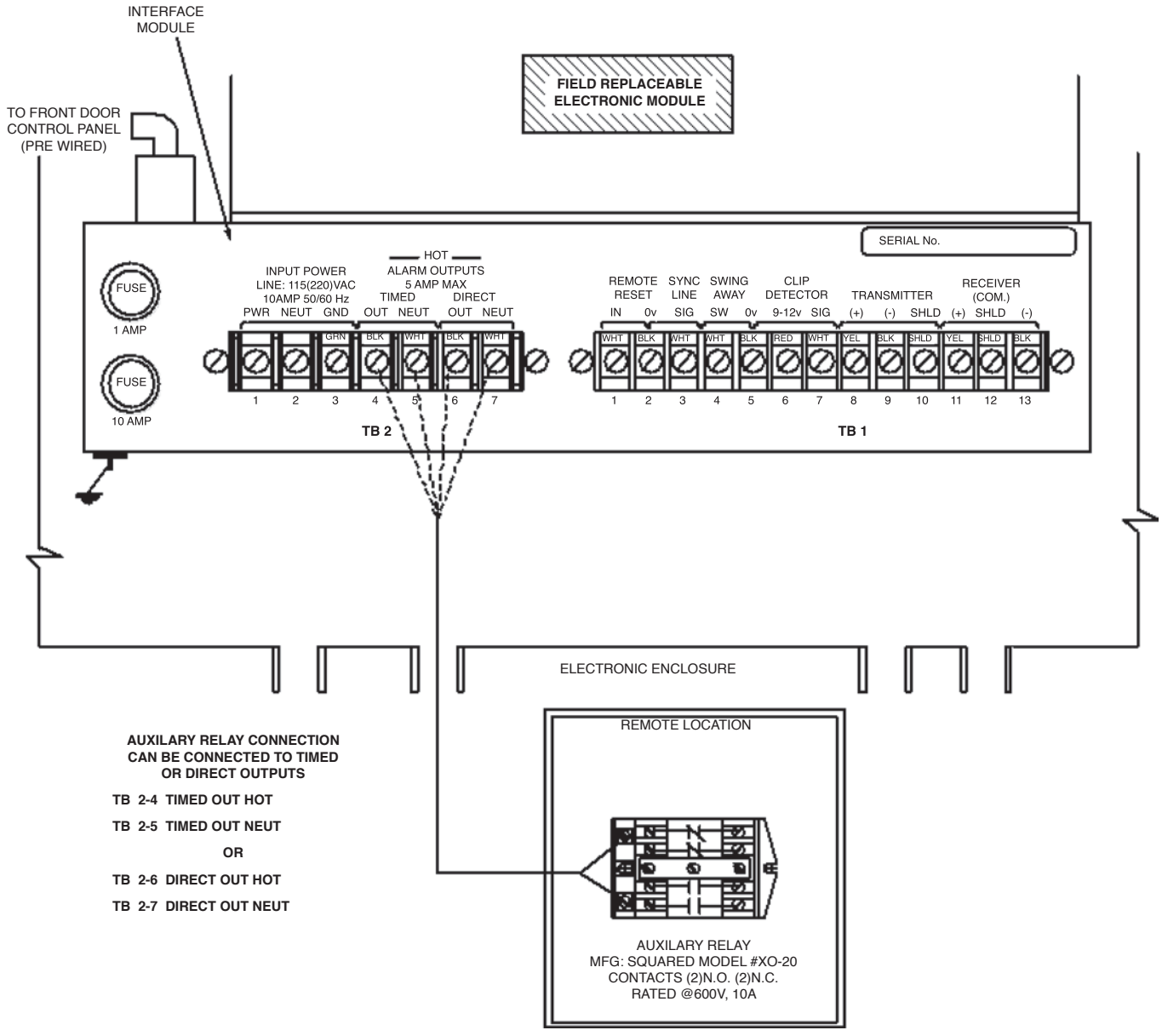
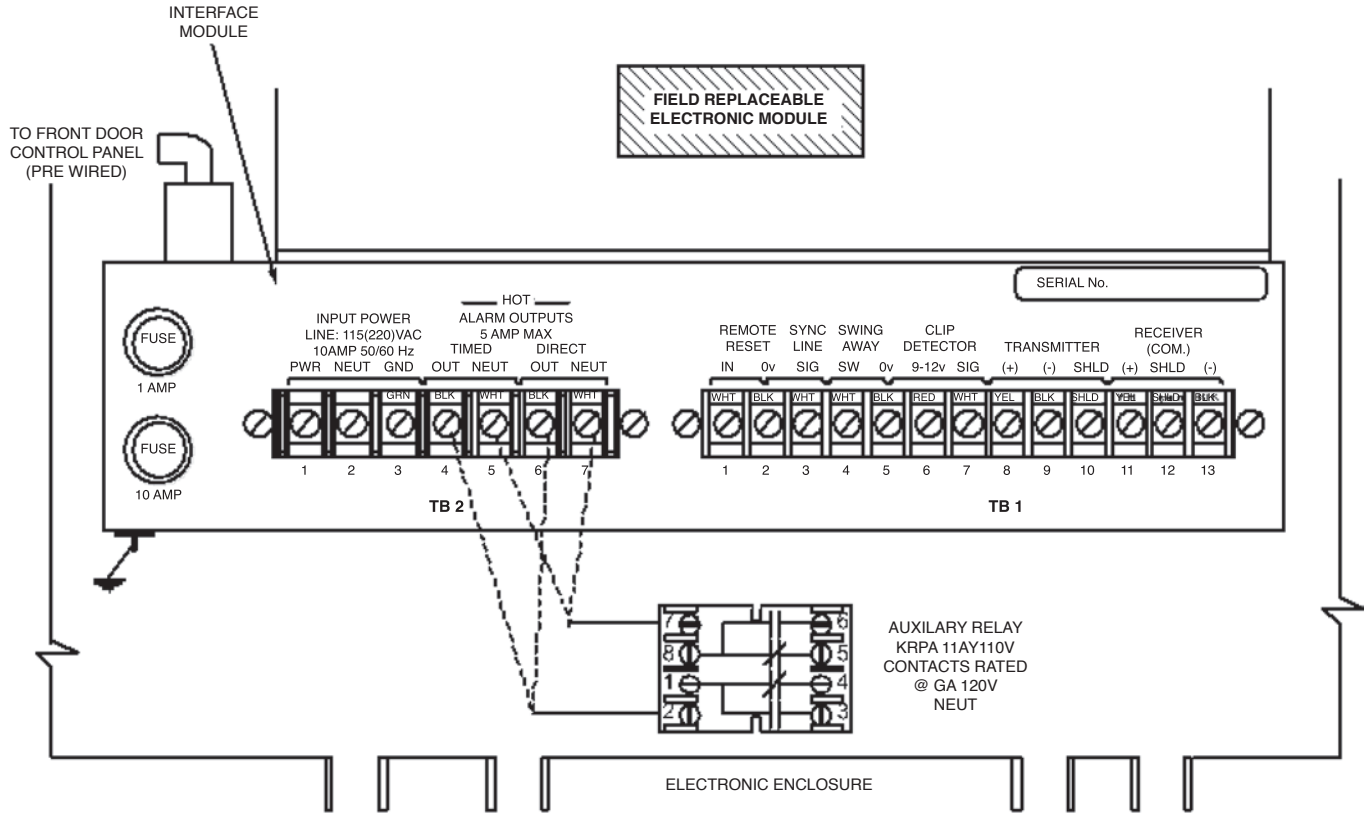


FIGURE A10

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



AUXILARY RELAY CONNECTION
CAN BE CONNECTED TO TIMED
OR DIRECT OUTPUTS

TB 2-4 TIMED OUT HOT

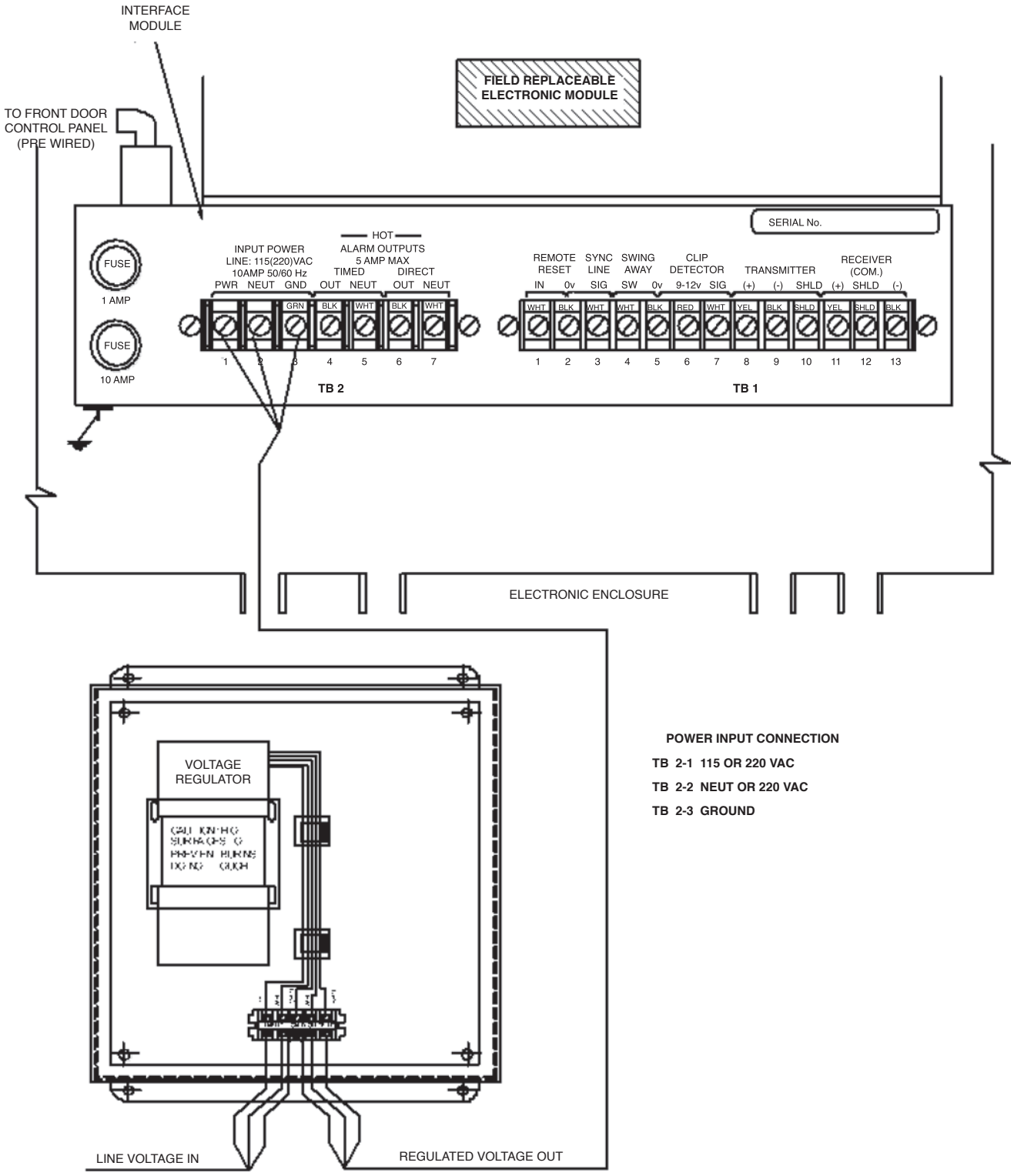
TB 2-5 TIMED OUT NEUT

OR

TB 2-6 DIRECT OUT HOT

TB 2-7 DIRECT OUT NEUT

FIGURE A11
Auxiliary Relay KRPA 115 vac or 220 vac



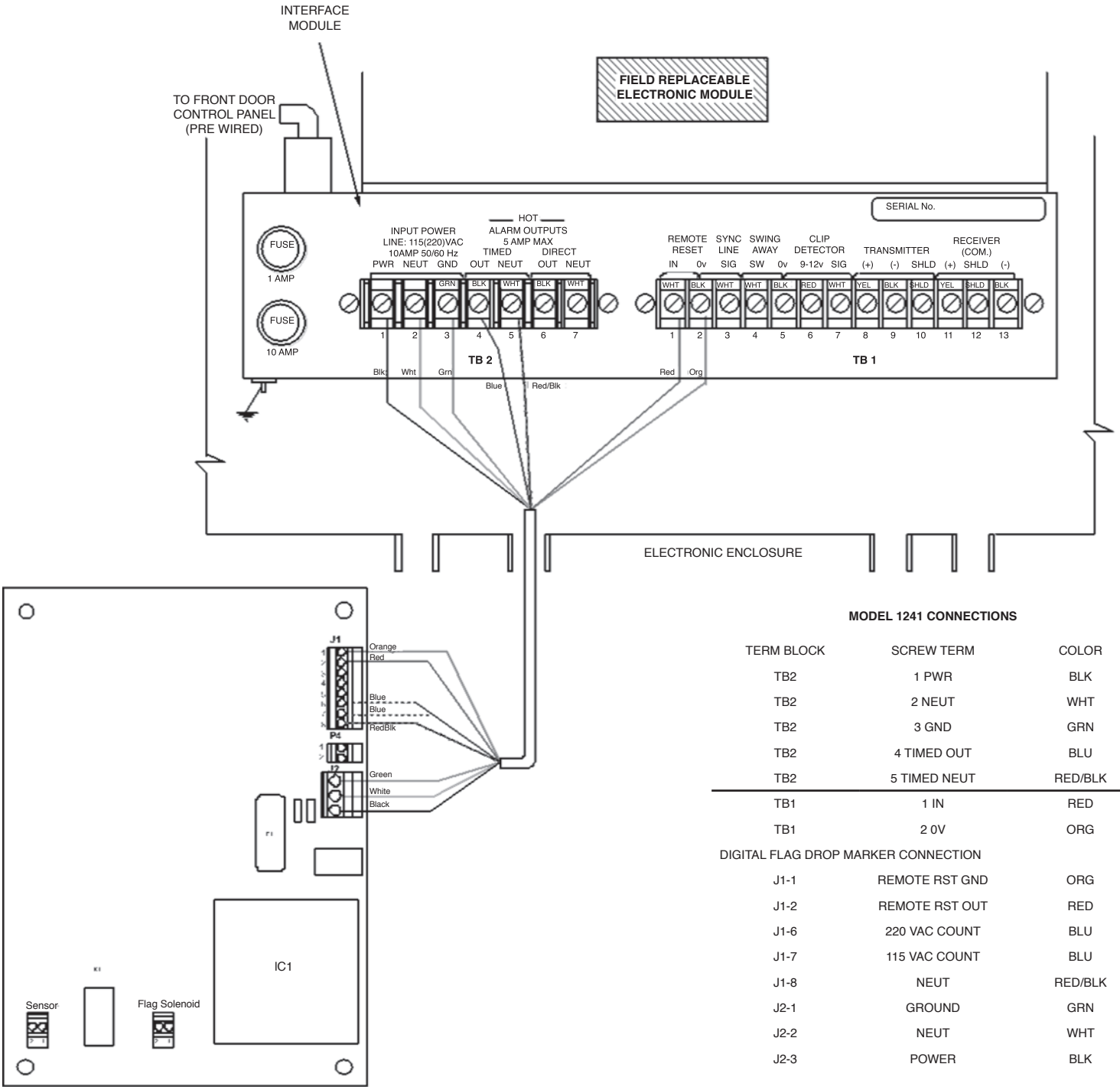
POWER INPUT CONNECTION

TB 2-1 115 OR 220 VAC

TB 2-2 NEUT OR 220 VAC

TB 2-3 GROUND

FIGURE A12
Voltage Regulator



MODEL 1241 CONNECTIONS

TERM BLOCK	SCREW TERM	COLOR
TB2	1 PWR	BLK
TB2	2 NEUT	WHT
TB2	3 GND	GRN
TB2	4 TIMED OUT	BLU
TB2	5 TIMED NEUT	RED/BLK
TB1	1 IN	RED
TB1	2 0V	ORG
DIGITAL FLAG DROP MARKER CONNECTION		
J1-1	REMOTE RST GND	ORG
J1-2	REMOTE RST OUT	RED
J1-6	220 VAC COUNT	BLU
J1-7	115 VAC COUNT	BLU
J1-8	NEUT	RED/BLK
J2-1	GROUND	GRN
J2-2	NEUT	WHT
J2-3	POWER	BLK

FIGURE A13
Flag Drop Marker

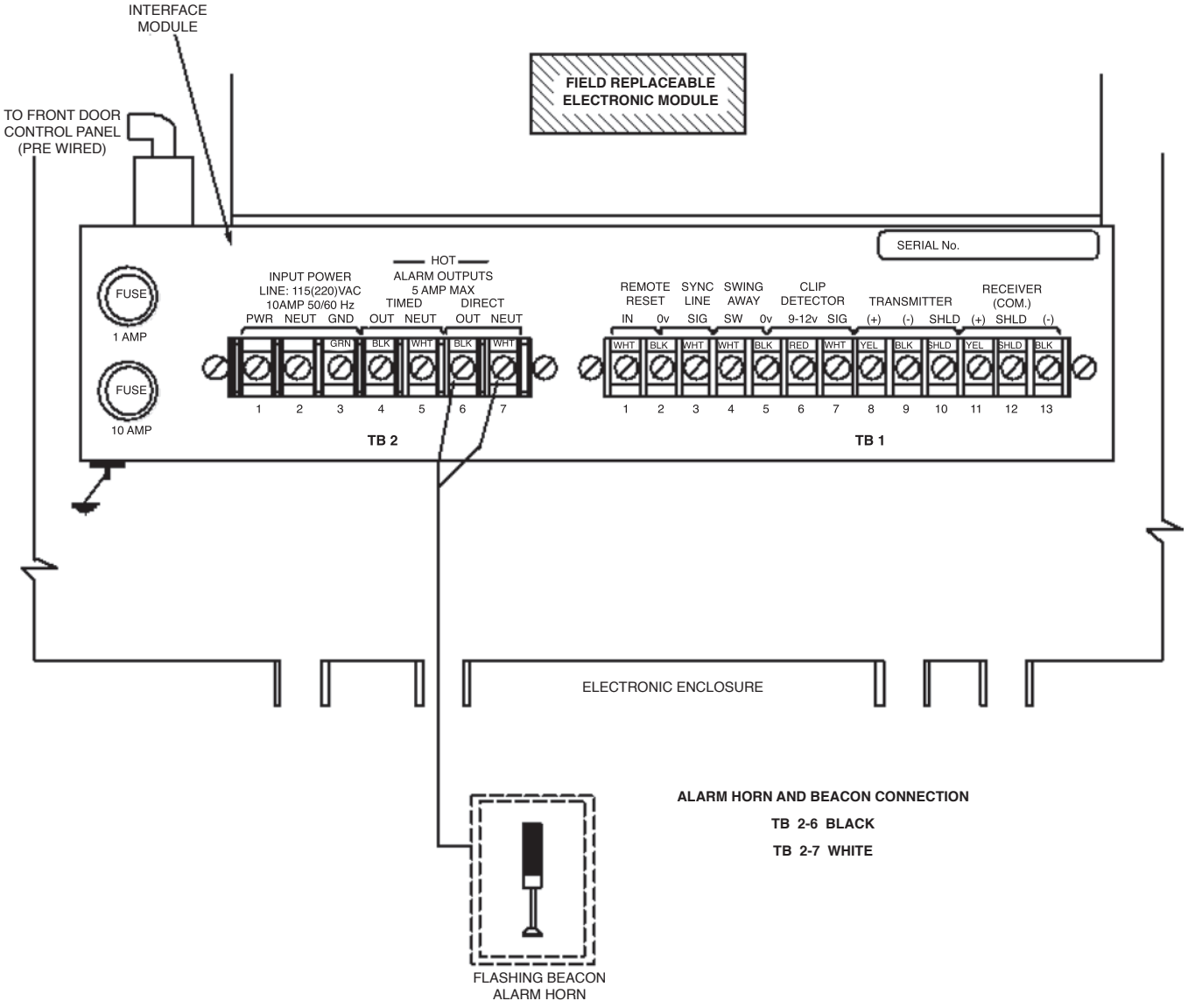


FIGURE A14
Alarm Horn & Flashing Beacon

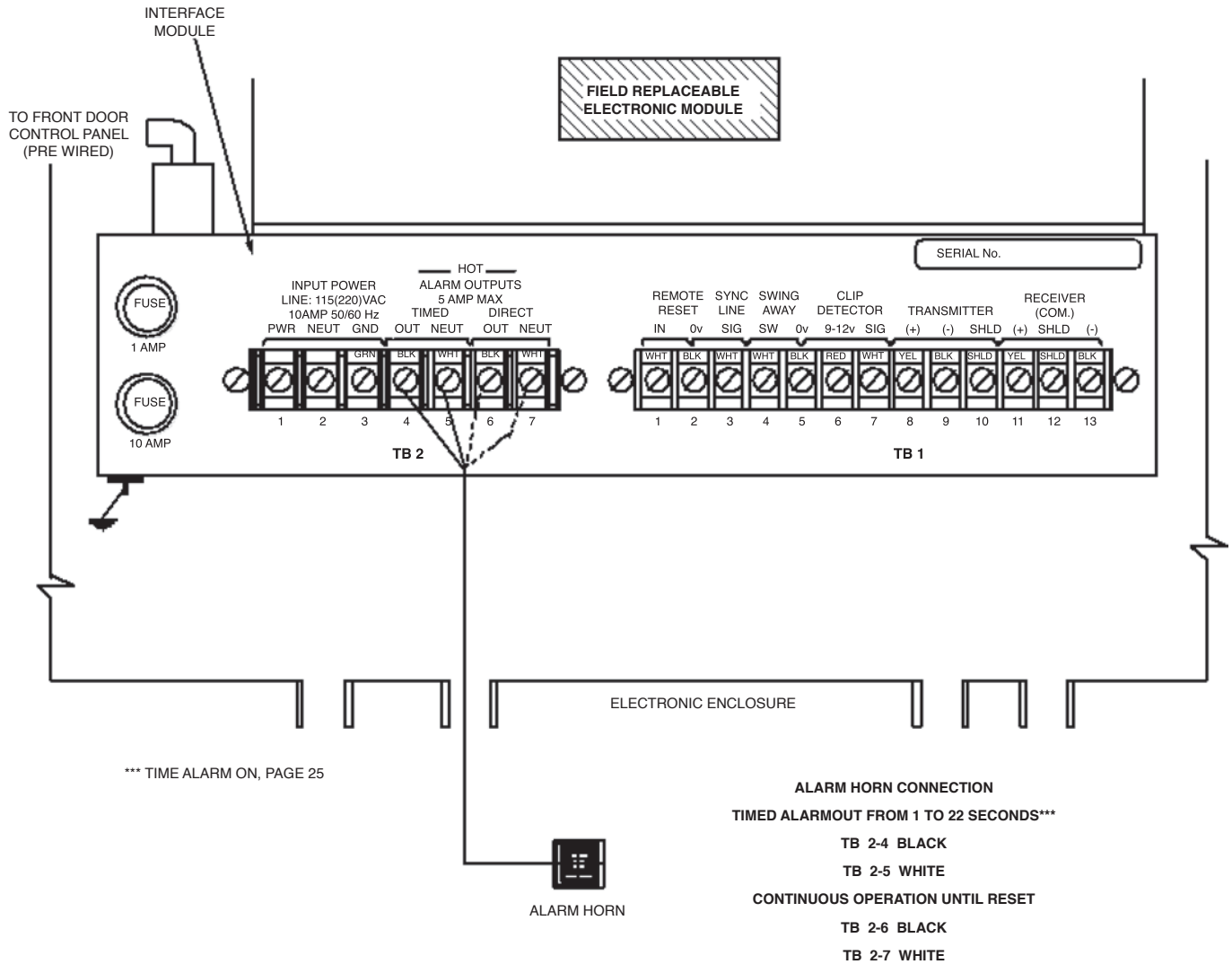


FIGURE A15
Alarm Horn

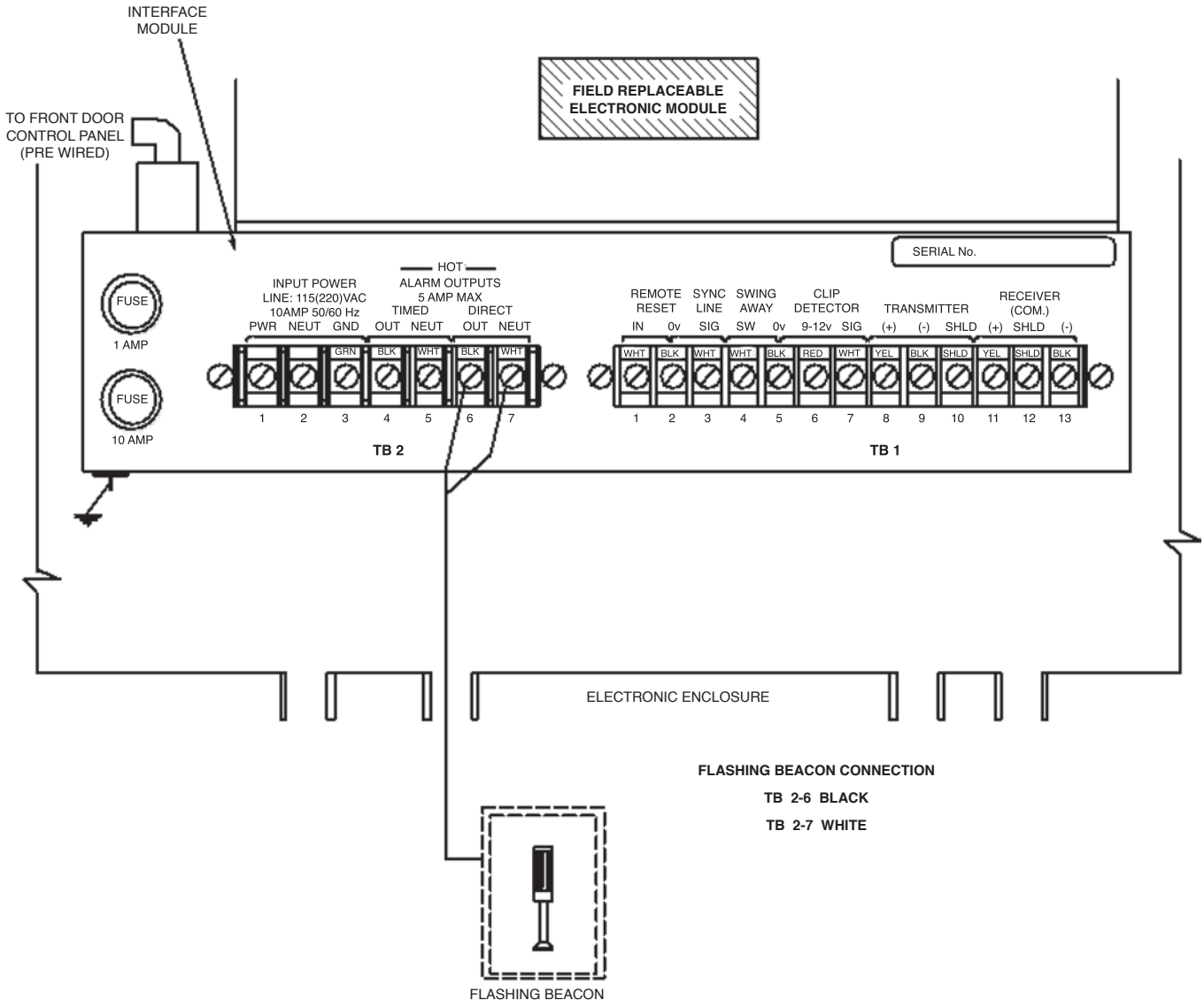
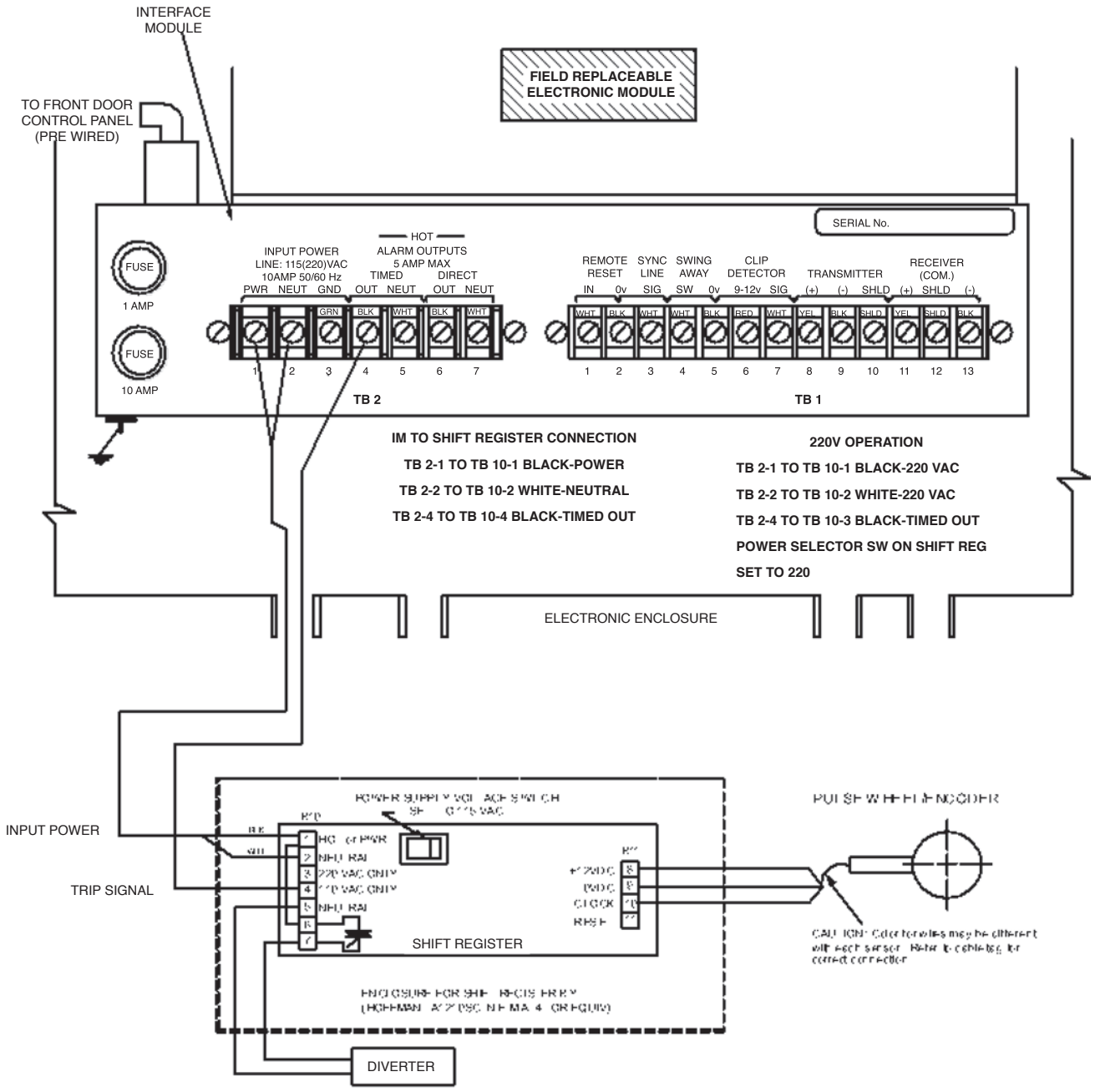


FIGURE A16
Flashing Beacon



SHIFT REGISTER CONNECTION

TB 10-1 TO TB 10-6 AC POWER	**TB 11-8 TO ENCODER SENSOR POWER**
TB 10-7 TO DIVERTER - AC IN	**TB 11-9 TO ENCODER SENSOR GROUND**
TB 10-5 TO DIVERTER - NEUT/220	**TB 11-10 TO ENCODER SENSOR OUTPUT**

FIGURE A17
Shift Register

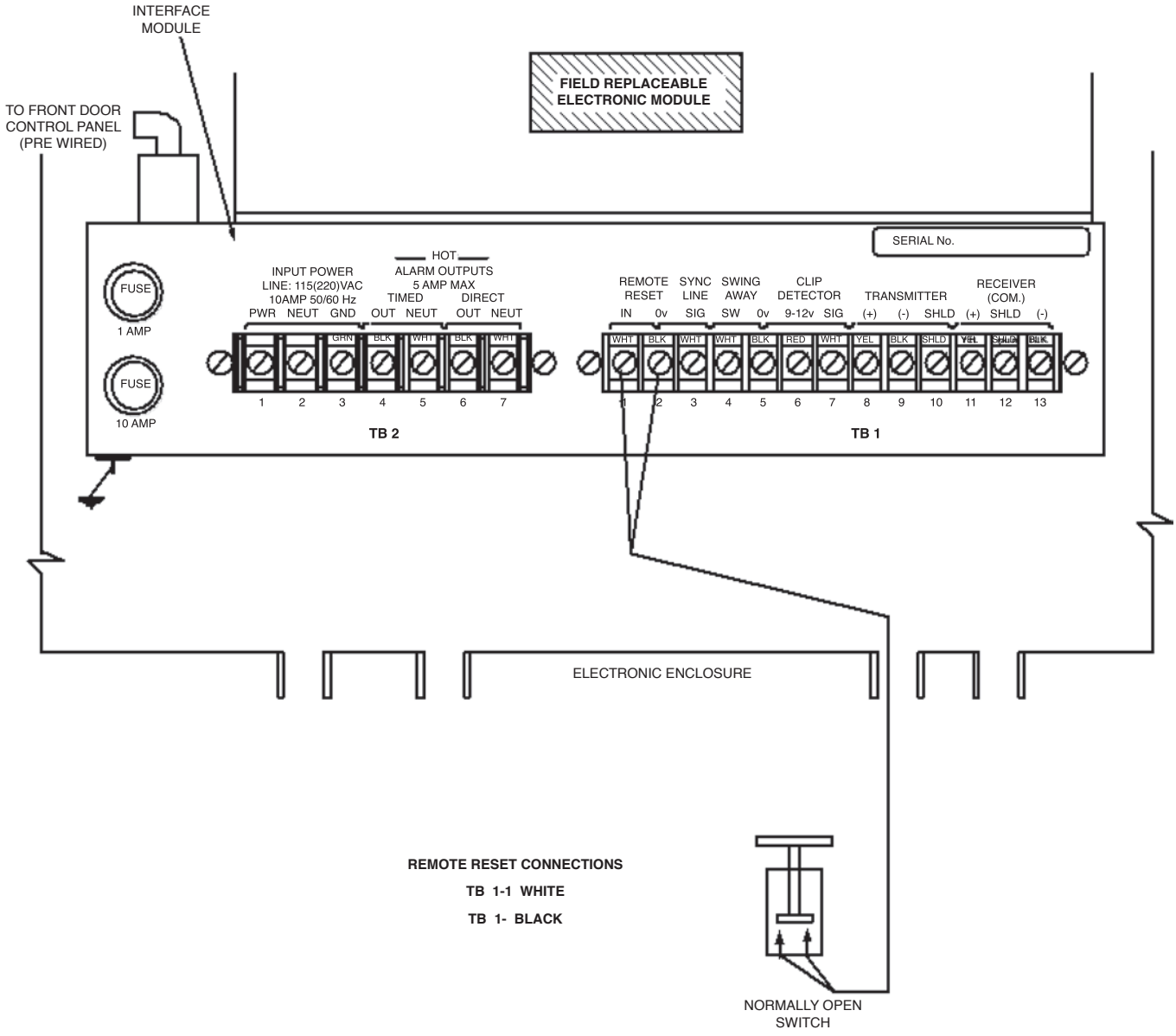
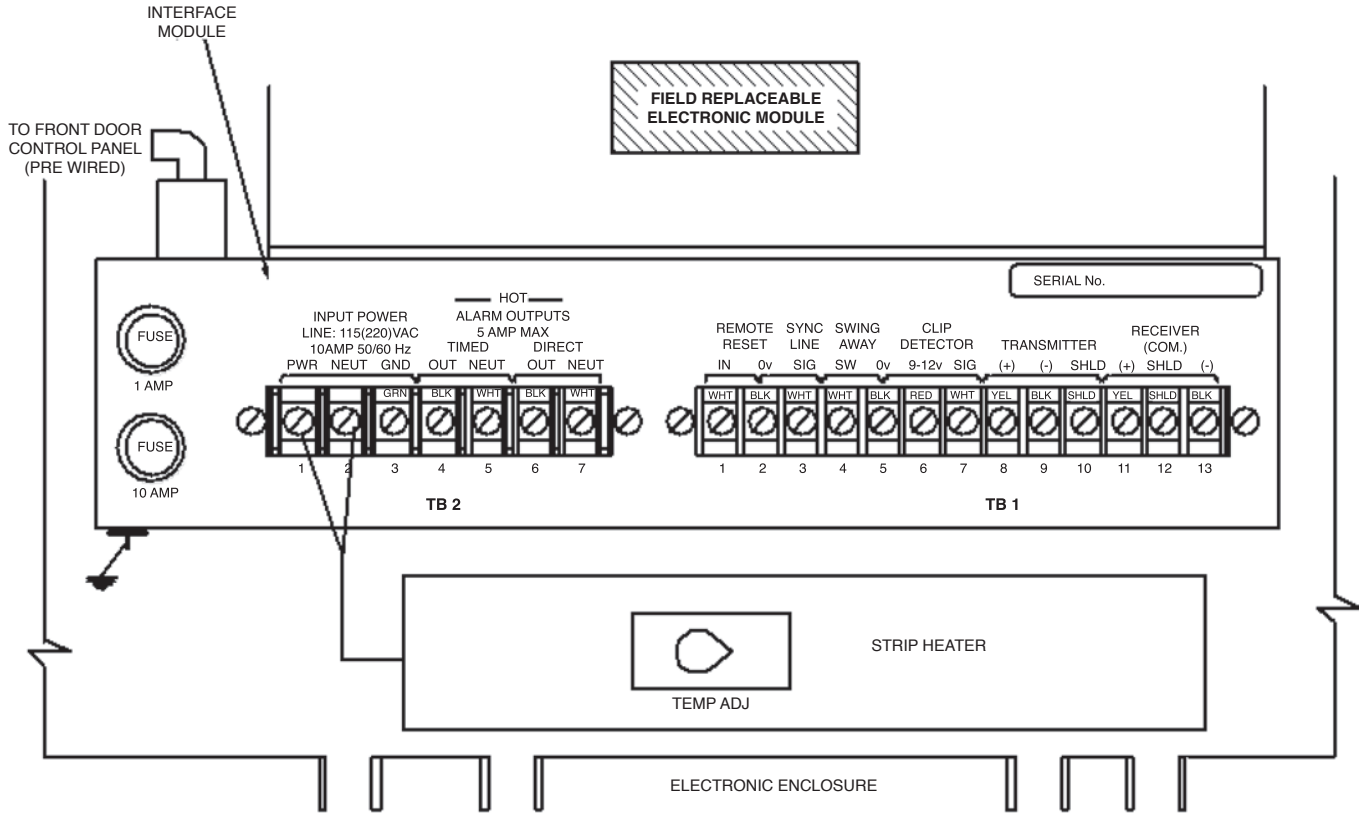


FIGURE A18
Remote Reset Switch



STRIP HEATER CONNECTION

TB 2-1 115 OR 220 VAC

TB 2-2 NEUT OR 220 VAC

FIGURE A19

Strip Heater 115 vac or 220 vac

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