MM-1241A

Installation, Operation and Maintenance Instructions

TRAMP METAL DETECTOR MODEL 1241

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WORLD AUTHORITY IN ADVANCED TECHNOLOGY FOR MAGNETIC, VIBRATORY and INSPECTION APPLICATIONS

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Operation & Description

GENERAL

The Model 1241 provides protection to downstream processing equipment by detecting the presence of potentially damaging metal objects. This Detector is designed for applications requiring large apertures and high metal sensitivity. It is particularly suited to scanning whole logs on conveyors or chutes for metal of any type: ferrous, non-ferrous, magnetic or non-magnetic.

The Detector makes use of the latest in solid state technology, incorporating programmable logic known as EPROM (Erasable Programmable Read Only memory). The design includes a number of innovative features; self-test circuits that monitor the performance of the detection circuitry; 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, etc., can then be activated by the switched alarm outputs.

The Detector is influenced only by change. Therefore, stationary structural members, metal belt cores, 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 12 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.

Type: JIC NEMA 12
Size: 16" x 14" x 6" (406 x 356 x 152)
Weight: 33 Lbs. (15 kg) (Includes All Electronics)

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

Operation & Description (cont.)

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 14-pin, 3/8" center screw type, connects the Detector's external transducers and signals. The left terminal block, a 6-pin, 7/16" center screw type, is used for all connections handling the A.C. line voltage.

ELECTRONIC MODULE	INTERFACE MODULE
Size: 10.5" x 8" x 1.5"	Size: 11" x 4.5" x 4"
(272 x 203 x 38 mm)	(279 x 64 x 102 mm)
Weight: 2.5 Lbs. (1.13 Kg)	Weight: 4.75 Lbs. (2.15 Kg)

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

An aluminum enclosure shields the receiver coil from electromagnetic interference. Mounting tabs are located on the aluminum shield to attach it to the material handling structure.

TRANSMITTER COIL

The transmitter coil is located opposite and parallel to the receiver coil. Strong, yet lightweight, molded fiberglass is used for applications that do not have vibrating or moving metal objects nearby. A shielded version maybe recommended if additional protection from electromagnetic interference is required.

MOUNTING FRAME

The mounting frame supports the coils on the trough either vertically or horizontally as shown in Figures 3 and 4. Special designs are available to accommodate other types of material handling systems.

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 cables may degrade the Model 1241's performance. Consult the Factory if other cable lengths are required.

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.

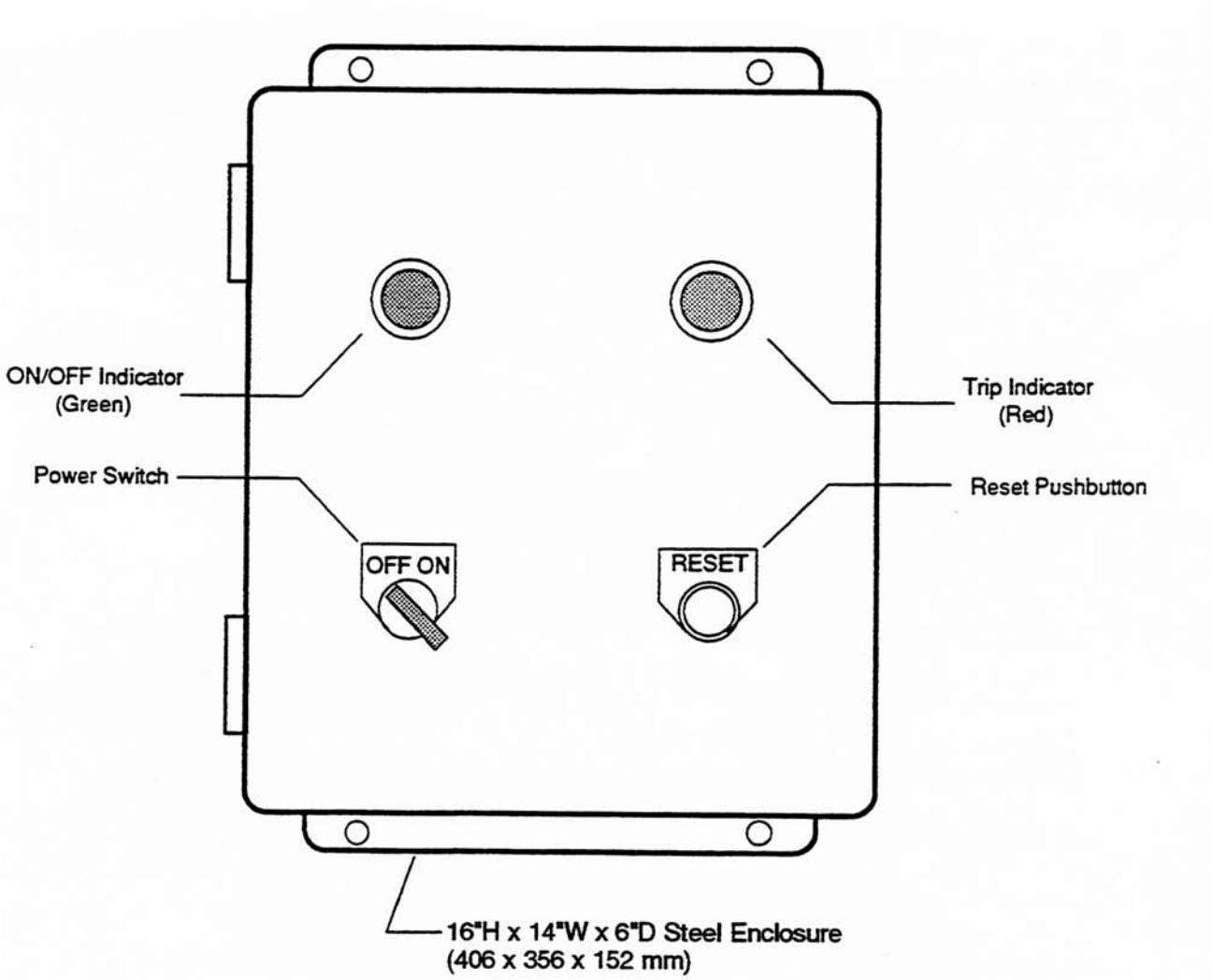


Figure 1
Main Control Enclosure
(NEMA 12, 4, 4X)

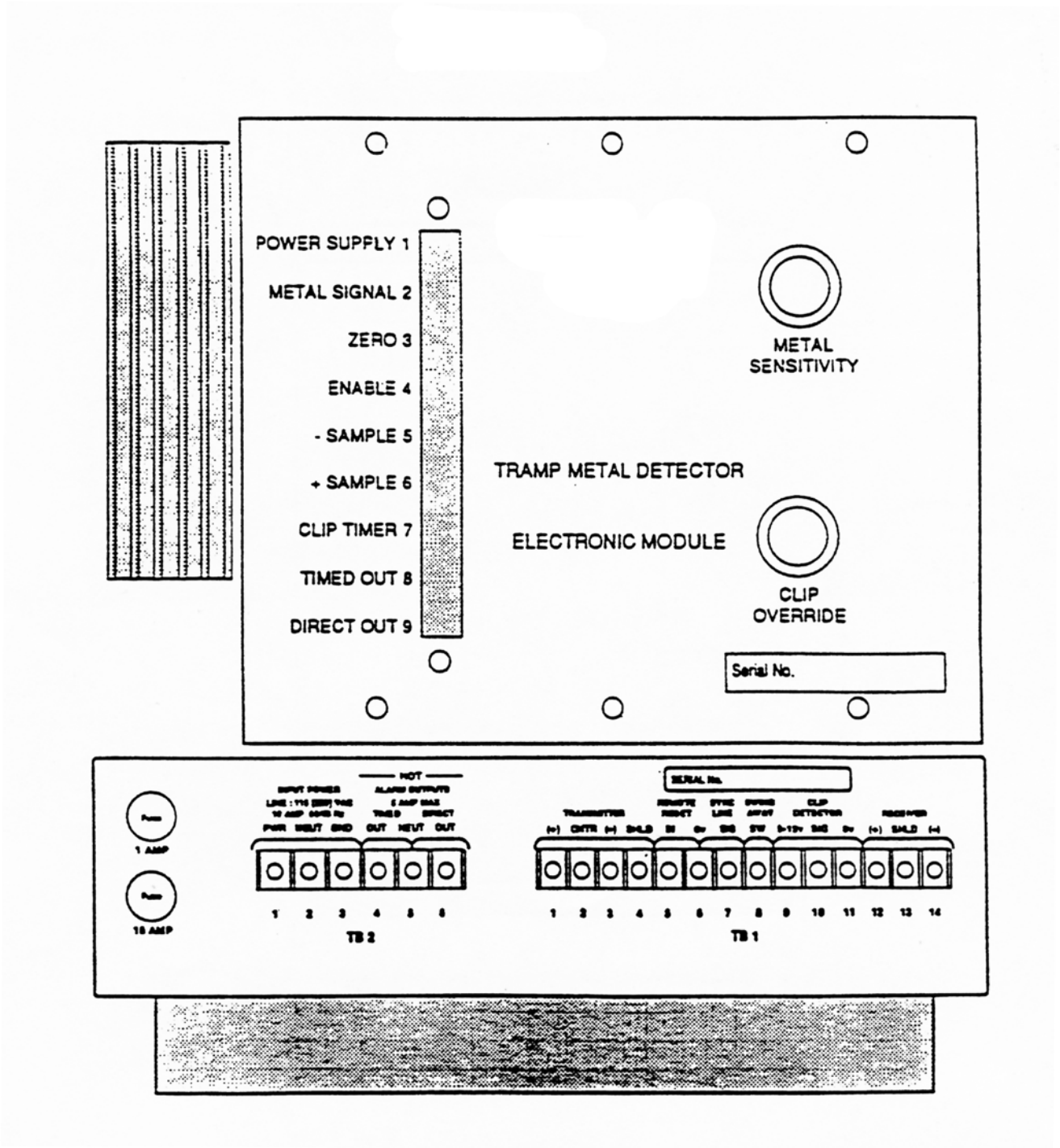


Figure 2
Electronic and Interface Modules

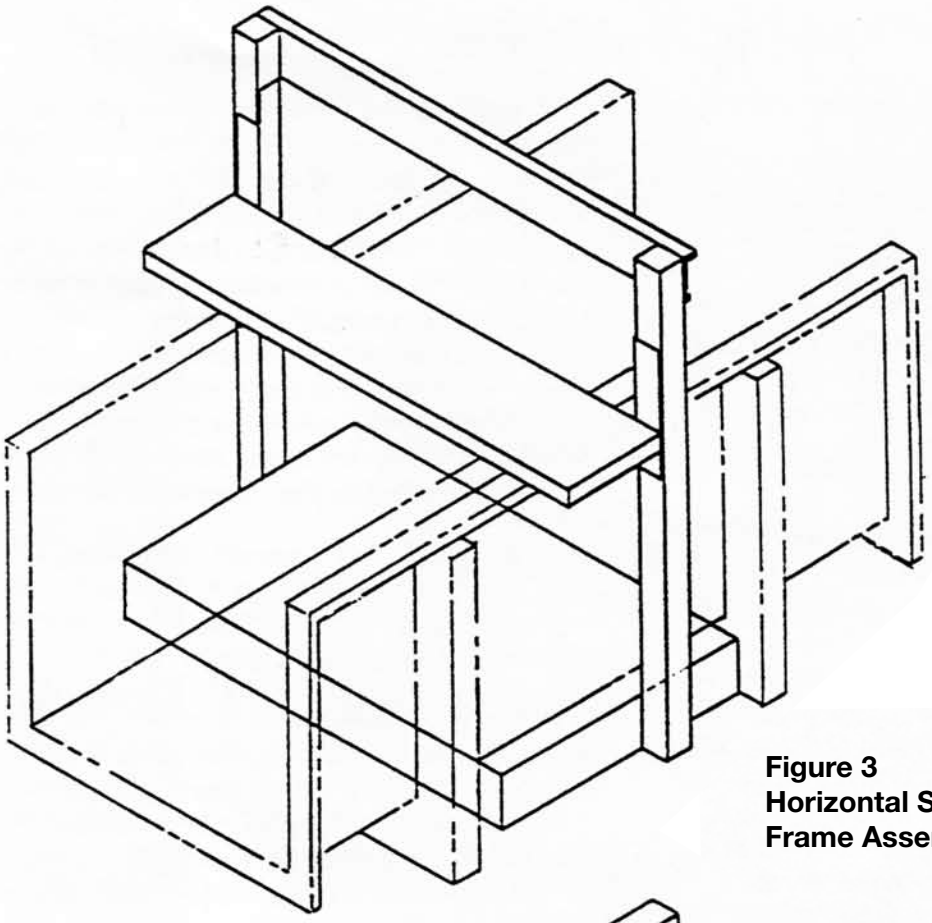


Figure 3
Horizontal Swing-Away Frame Assembly

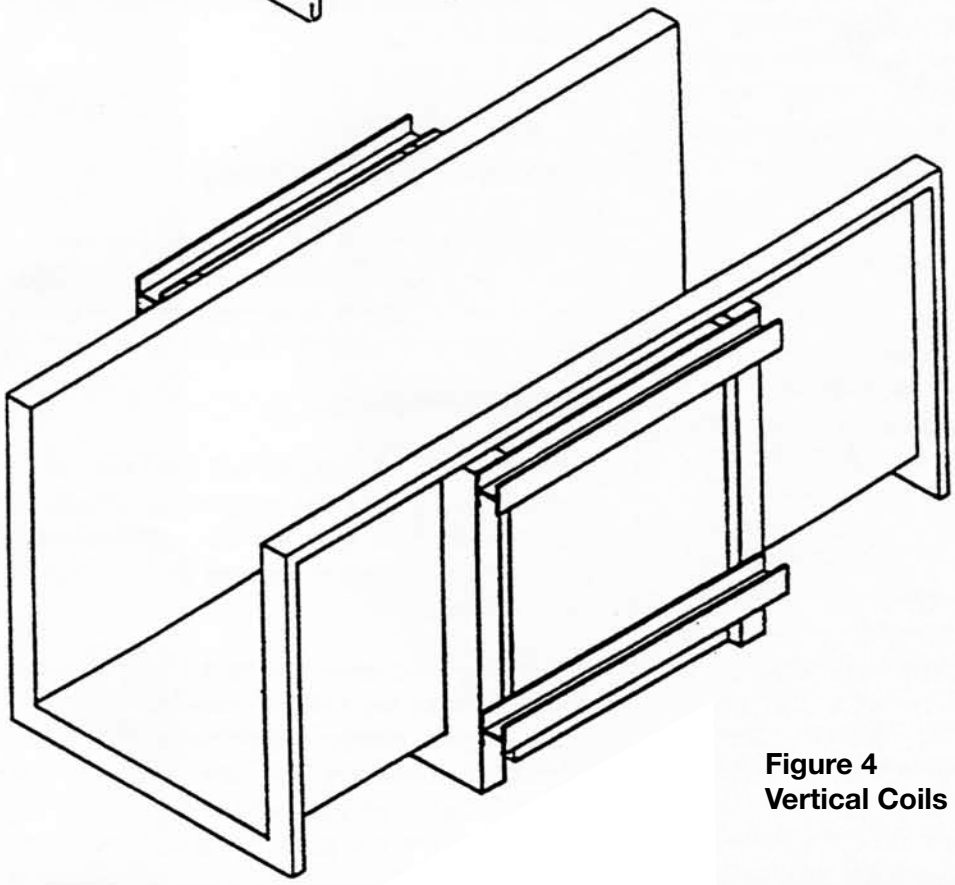


Figure 4
Vertical Coils Mounted on Trough

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. Although the receiver coil is shielded on five sides to reduce the effects of RF noise, the surface facing the transmitter is unshielded and therefore susceptible to RF noise. Because RF energy travels along a straight line (line-of-sight), position the receiver coil or relocate RF sources so they are below or out of the direct line-of-sight with the top of the receiver. Cables carrying high voltage or varying loads must be enclosed in steel conduit, grounded at both ends and located at least 4' (1.2 m) from the detector antennas.

• 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 (if applicable) for details.

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

• Relocate or tightly secure moving or vibrating pieces of metal such as cables, conduit and piping within 36" (914) of the Search Coil Assembly. Remove metallic decking, skirt boards, cross bracing and return idlers below and within 5' (1.5 m) of the center line of the receiver coil (upstream and downstream).

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.

HORIZONAL MOUNTING

• Position the entire search coil assembly so that the bottom coil (usually the receiver) is equally spaced between the two adjacent idler rollers. Center the receiver coil. Do not center the 2" x 2" (50 mm x 50 mm) uprights.

• Fasten the receiver coil to the material handling system. Shim the unit as necessary to provide a uniform and sturdy mounting surface. Maintain clearance between the coil and any moving objects. Do not torque, twist or use excessive force when fastening the coil to the structure. Do not drill or weld the coil.

Installation (cont.)

Secure the frame assembly to the receiver coil. Make sure the assembly is aligned. Use the hardware provided as called out in the Frame Assembly Diagram. If aluminum side shields are used to reduce RF noise, use the electrical isolation bushings and spacers (provided). The Detector will not operate properly if the aluminum side shields make electrical contact with either the receiver or transmitter shield, or contact with metal conveyor components.

Fasten the transmitter coil to the frame assembly. If a swing-away assembly is used, make sure the transmitter brackets rest squarely with the uprights and move freely. Be careful to install the bolts, washers and nuts in the proper sequence to allow free but controlled movement of the brackets.

Inspect the coils and frame assembly for alignment and fit. Tighten all connections. The entire assembly should be rigid and sturdy.

VERTICAL MOUNTING

If practical, install the non-metallic trough section before mounting the search coil assembly.

Attach the flange beams to the transmitter and receiver coils. Use the hardware provided as called out in the Frame Assembly Diagram.

• Mount the search coil assembly to the non-metallic trough section with the hardware provided. Ensure that there is at least 1/2" (12.7) of clearance between the coils and the outside of the trough.

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.

• The Enclosure should be positioned so the front panel hinge is on the left side.

• 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.

• 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 separate conduit. Do not run powerwiring 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 115/220VAC (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.

Installation (cont.)

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, single phase operation. If the voltage source is different, contact the Factory for instructions to select the proper voltage source.

• If multiple metal detectors are installed either on the same conveyor or on different conveyors within 100-feet of each other, the detectors may need to be synchronized. Please see the Control Connection Diagram for details.

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 hook-up.

CLIP DETECTOR (if applicable)

Install the Clip Detector Unit as follows:

• Refer to Control Connection and Frame Assembly Diagrams.

Position the Clip Detector Sensor approximately (but no closer than) 2' (610) from the center line of the receiver coil on the upstream side of the Search Coil Assembly. If there are idlers adjacent to the search coils, position the Clip Detector Sensor approximately 1" to 3" (25.4 to 76 mm) upstream of the nearest upstream idler before the Search Coil Assembly. The flat face of the Clip Detector should be facing toward the belt with approximately 1/2"-1" (12.7-25.4) 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.

• Where 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.

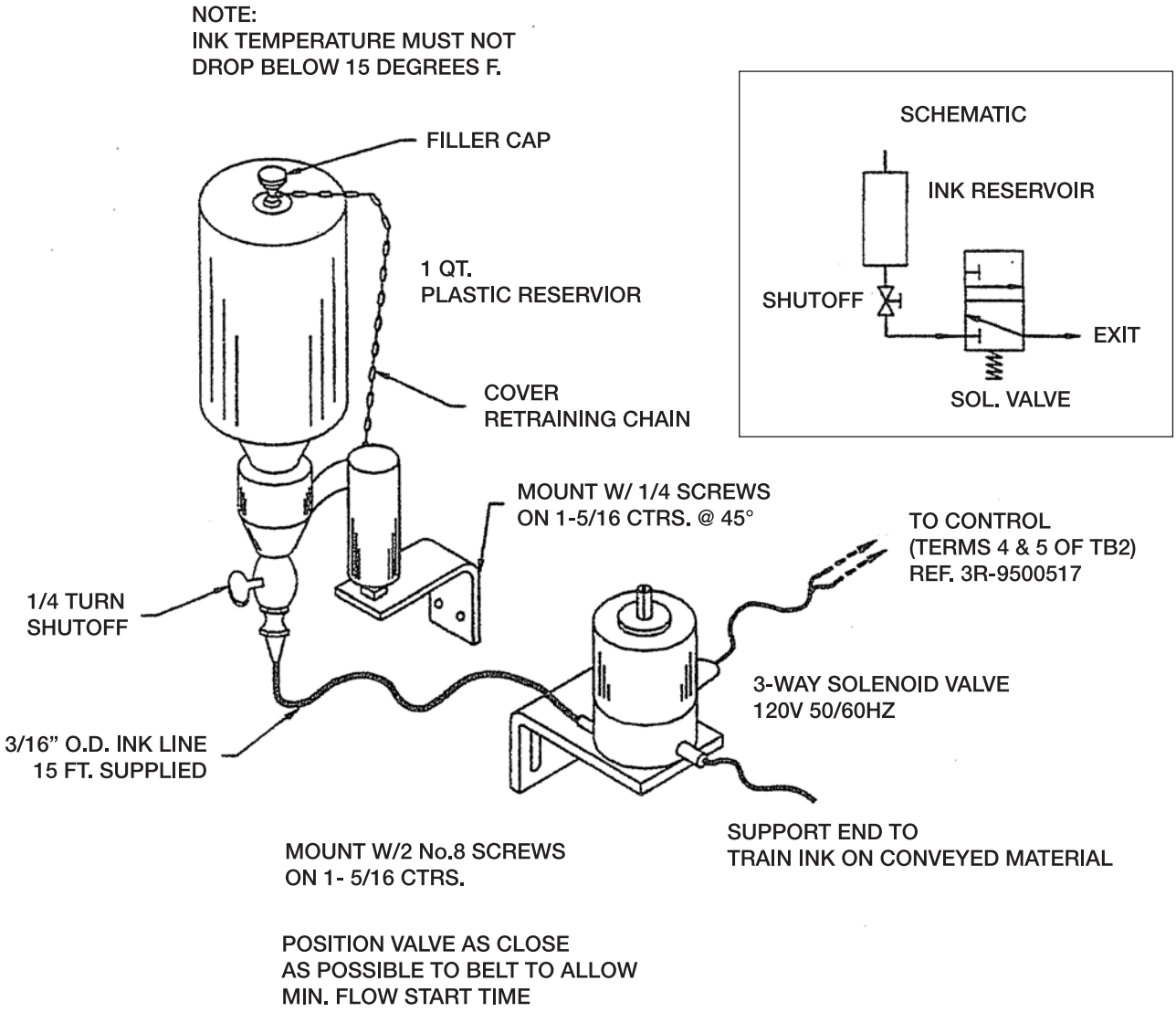
MARKING DEVICE (if applicable)

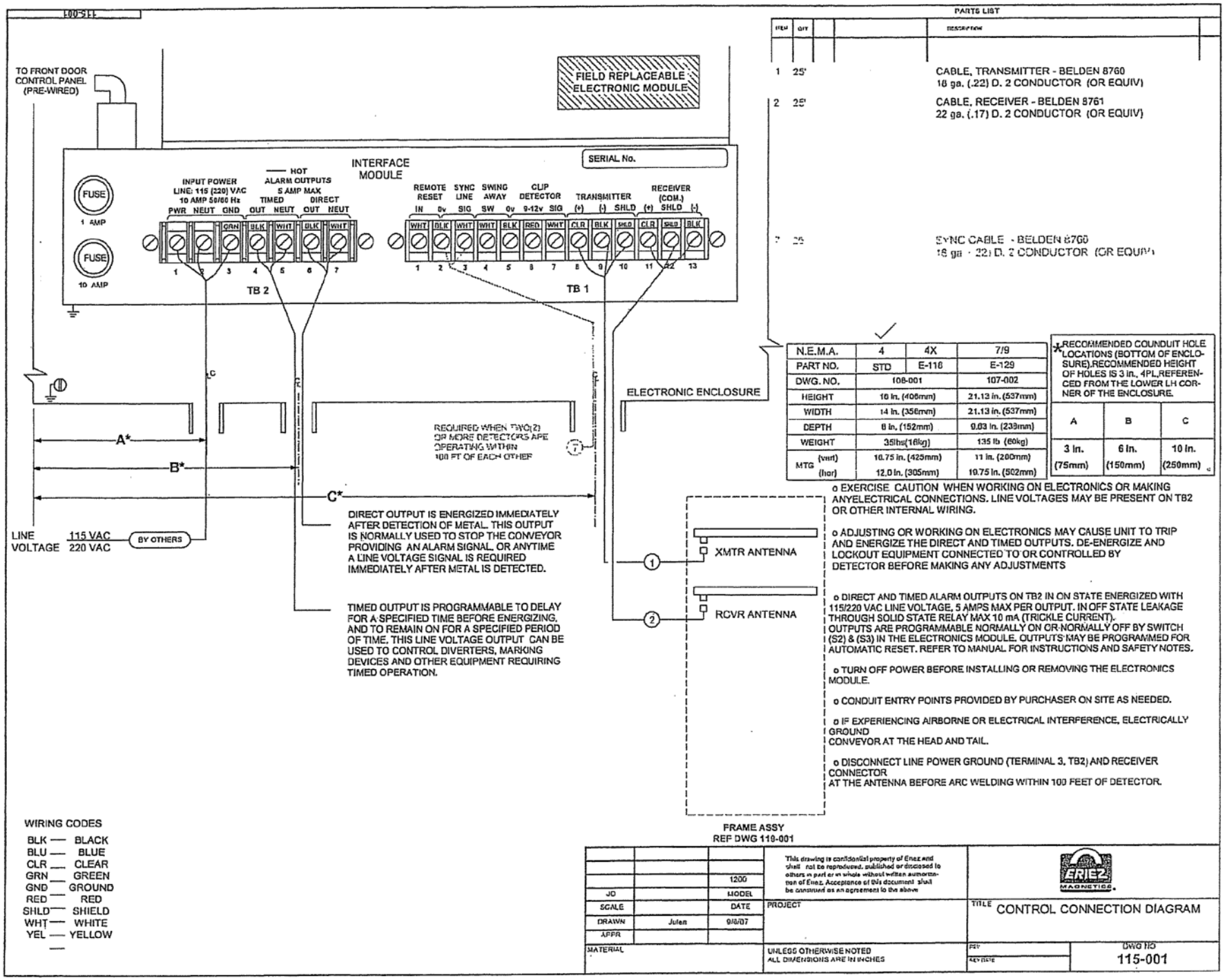
The Marking Device is a pressurized, solenoid activated liquid spray system which pinpoints the location of tramp metal to eliminate costly search and down time.

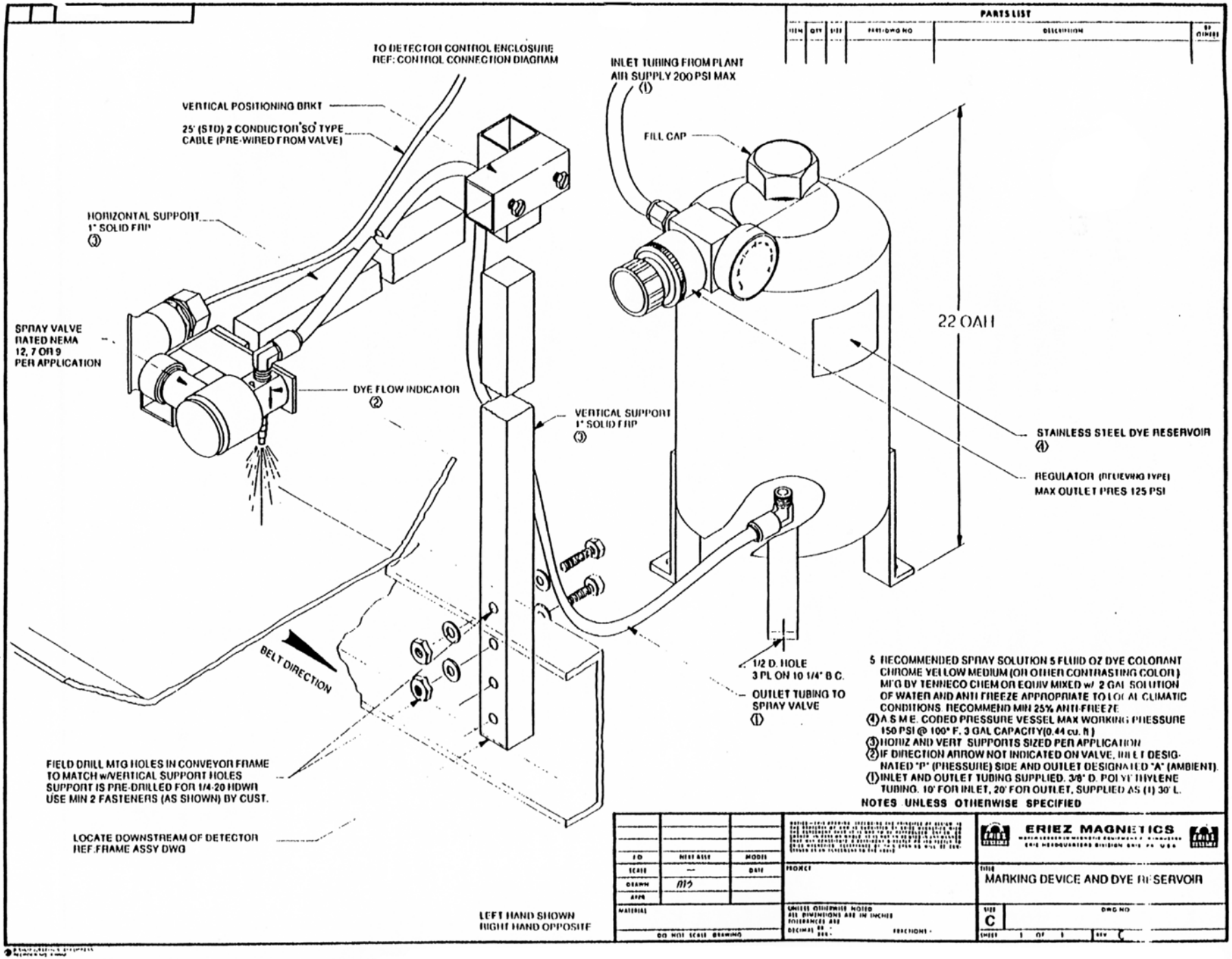
Specifications

Tank Pressure Rating:
150 psig (10.34 bar) (maximum working pressure)
Tank Capacity:
3 Gallons (11.36 liters) (liquid)
Operational Voltage:
115/220 VAC (50/60 Hz), 15 Watts
Air:
Plant air or any source of 100 to 200 psig (6.9 to 13.79 bar) inert gas

Ink Marking System




115-001
TO FRONT DOOR CONTROL PANEL (PRE-WIRED)
FIELD REPLACEABLE ELECTRONIC MODULE
INTERFACE MODULE
SERIAL No.
FUSE 1 AMP
FUSE 10 AMP
INPUT POWER LINE: 115 (220) VAC 10 AMP 50/60 Hz
PWR NEUT GND
HOT ALARM OUTPUTS 5 AMP MAX
TIMED OUT NEUT
DIRECT OUT NEUT
TB 2
REMOTE RESET IN 0v
SYNC LINE SIG
SWING AWAY SW 0v
CUP DETECTOR 9-12v SIG
TRANSMITTER (+) (-) SHLD
RECEIVER (COM.) (+) SHLD (-)
TB 1
ELECTRONIC ENCLOSURE
REQUIRED WHEN TWO(2) OR MORE DETECTORS ARE OPERATING WITHIN 100 FT OF EACH OTHER
A*
B*
C*
LINE VOLTAGE 115 VAC 220 VAC
BY OTHERS
DIRECT OUTPUT IS ENERGIZED IMMEDIATELY AFTER DETECTION OF METAL. THIS OUTPUT IS NORMALLY USED TO STOP THE CONVEYOR PROVIDING AN ALARM SIGNAL, OR ANYTIME A LINE VOLTAGE SIGNAL IS REQUIRED IMMEDIATELY AFTER METAL IS DETECTED.
TIMED OUTPUT IS PROGRAMMABLE TO DELAY FOR A SPECIFIED TIME BEFORE ENERGIZING, AND TO REMAIN ON FOR A SPECIFIED PERIOD OF TIME. THIS LINE VOLTAGE OUTPUT CAN BE USED TO CONTROL DIVERTERS, MARKING DEVICES AND OTHER EQUIPMENT REQUIRING TIMED OPERATION.
XMTR ANTENNA
RCVR ANTENNA
PARTS LIST
ITEM QTY DESCRIPTION
1 25' CABLE, TRANSMITTER - BELDEN 8760 18 ga. (.22) D. 2 CONDUCTOR (OR EQUIV)
2 25' CABLE, RECEIVER - BELDEN 8761 22 ga. (.17) D. 2 CONDUCTOR (OR EQUIV)
3 25 SYNC CABLE - BELDEN 8760 18 ga - 22) D. 2 CONDUCTOR (OR EQUIV)
N.E.M.A. 4 4X 7/9
PART NO. STD E-116 E-129
DWG. NO. 108-001 107-002
HEIGHT 16 in. (406mm) 21.13 in. (537mm)
WIDTH 14 in. (356mm) 21.13 in. (537mm)
DEPTH 6 in. (152mm) 9.03 in. (239mm)
WEIGHT 35lbs(16kg) 135 lb (60kg)
MTG (vert) 10.75 in. (425mm) 11 in. (280mm)
(hor) 12.0 in. (305mm) 19.75 in. (502mm)
*RECOMMENDED COUNDUIT HOLE LOCATIONS (BOTTOM OF ENCLOSURE).RECOMMENDED HEIGHT OF HOLES IS 3 in., 4PL,REFERENCED FROM THE LOWER LH CORNER OF THE ENCLOSURE.
A 3 in. (75mm)
B 6 in. (150mm)
C 10 in. (250mm)
o EXERCISE CAUTION WHEN WORKING ON ELECTRONICS OR MAKING ANYELECTRICAL CONNECTIONS. LINE VOLTAGES MAY BE PRESENT ON TB2 OR OTHER INTERNAL WIRING.
o ADJUSTING OR WORKING ON ELECTRONICS MAY CAUSE UNIT TO TRIP AND ENERGIZE THE DIRECT AND TIMED OUTPUTS. DE-ENERGIZE AND LOCKOUT EQUIPMENT CONNECTED TO OR CONTROLLED BY DETECTOR BEFORE MAKING ANY ADJUSTMENTS
o DIRECT AND TIMED ALARM OUTPUTS ON TB2 IN ON STATE ENERGIZED WITH 115/220 VAC LINE VOLTAGE, 5 AMPS MAX PER OUTPUT. IN OFF STATE LEAKAGE THROUGH SOLID STATE RELAY MAX 10 mA (TRICKLE CURRENT). OUTPUTS ARE PROGRAMMABLE NORMALLY ON OR NORMALLY OFF BY SWITCH (S2) & (S3) IN THE ELECTRONICS MODULE. OUTPUTS MAY BE PROGRAMMED FOR AUTOMATIC RESET. REFER TO MANUAL FOR INSTRUCTIONS AND SAFETY NOTES.
o TURN OFF POWER BEFORE INSTALLING OR REMOVING THE ELECTRONICS MODULE.
o CONDUIT ENTRY POINTS PROVIDED BY PURCHASER ON SITE AS NEEDED.
o IF EXPERIENCING AIRBORNE OR ELECTRICAL INTERFERENCE, ELECTRICALLY GROUND CONVEYOR AT THE HEAD AND TAIL.
o DISCONNECT LINE POWER GROUND (TERMINAL 3, TB2) AND RECEIVER CONNECTOR AT THE ANTENNA BEFORE ARC WELDING WITHIN 100 FEET OF DETECTOR.
WIRING CODES
BLK — BLACK
BLU — BLUE
CLR — CLEAR
GRN — GREEN
GND — GROUND
RED — RED
SHLD — SHIELD
WHT — WHITE
YEL — YELLOW
FRAME ASSY REF DWG 116-001
JD 1200 MODEL
SCALE DATE
DRAWN Julen 9/8/07
APPR
MATERIAL
This drawing is confidential property of Eriez and shall not be reproduced, published or disclosed to others in part or in whole without written authorization of Eriez. Acceptance of this document shall be construed as an agreement to the above
UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN INCHES
PROJECT
TITLE CONTROL CONNECTION DIAGRAM
REV
REVISED
DWG NO 115-001



PARTS LIST

ITEM	QTY	SIZE	PART/DWG NO	DESCRIPTION	REMARKS

5 RECOMMENDED SPRAY SOLUTION 5 FLUID OZ DYE COLORANT CHROME YELLOW MEDIUM (OR OTHER CONTRASTING COLOR) MFG BY TENNECO CHEM OR EQUIV MIXED w/ 2 GAL SOLUTION OF WATER AND ANTI FREEZE APPROPRIATE TO LOCAL CLIMATIC CONDITIONS. RECOMMEND MIN 25% ANTI-FREEZE.

(4) A.S.M.E. CODED PRESSURE VESSEL MAX WORKING PRESSURE 150 PSI @ 100° F. 3 GAL CAPACITY (0.44 cu. ft.)

(3) HORIZ AND VERT SUPPORTS SIZED PER APPLICATION

(2) IF DIRECTION ARROW NOT INDICATED ON VALVE, INLET DESIGNATED "P" (PRESSURE) SIDE AND OUTLET DESIGNATED "A" (AMBIENT).

(1) INLET AND OUTLET TUBING SUPPLIED. 3/8" O.D. POLYETHYLENE TUBING. 10' FOR INLET, 20' FOR OUTLET, SUPPLIED AS (1) 30' L.

NOTES UNLESS OTHERWISE SPECIFIED

FD	NEXT ASSY	MODEL
SCALE	—	DATE
DRAWN	MB	
APPR		
MATERIAL		
DO NOT SCALE DRAWING		

PROJECT

UNLESS OTHERWISE NOTED ALL DIMENSIONS ARE IN INCHES TOLERANCES ARE DECIMAL ±.01 FRACTIONS ±

ERIEZ MAGNETICS

TITLE: MARKING DEVICE AND DYE RESERVOIR

SIZE C | DWG NO

SHEET 1 OF 1 | REV C

Installation (cont.)

INSTALLATION INSTRUCTIONS

• Refer to the Sensing Coil and 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' (9.1 to 18.2 m). Clamp in place temporarily.

NOTE: The 111 x111 support structure is a solid 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 (0.15 l) of colorant, Chrome Yellow (or other contrasting color) manufactured by Tenneco Chemical (or equivalent) mixed with a two (2) gallon (7.6 l) solution of water and antifreeze approximate for local climate conditions (minimum of 25% antifreeze).

• 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 (4 and 6.9 bar), as noted on the pressure gauge on top of the holding tank.

CALIBRATION OF MARKING DEVICE

• Refer to Section IV.E and IV.F 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.

Start-up and 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 in the "ON" position. The green "ON" indicator should light at this time.

• If the green "ON" indicator 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 a sample of tramp metal to be used during calibration. The piece should be the minimum size to be detected.

It is important that the clip time, L.E.D. No. 7, is not lit during the calibration. This results in erroneous data. Calibration adjustments are to be performed using controls on the Electronic Module in the following manner:

(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) 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.

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 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 Section IV.B.

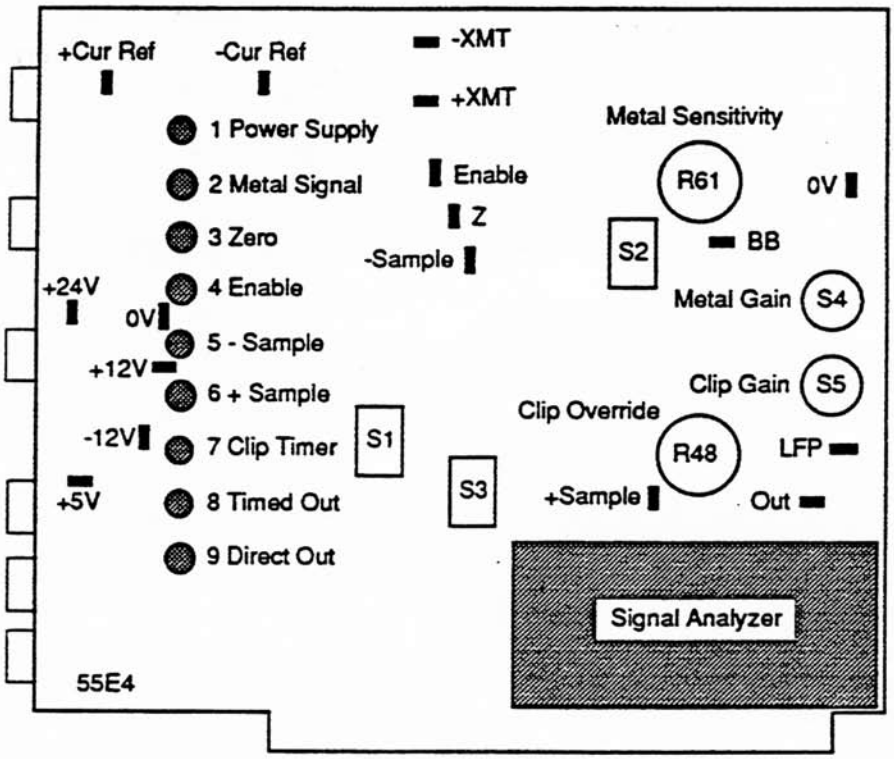
If L.E.D. No. 2 flashes, but the Detector does not alarm, pass the metal through in the opposite direction of normal belt flow. If the unit trips, then switch the (+) and (-) receiver terminal wires at the Interface Module. This will program the Detector to trigger on tramp metal traveling in the correct direction.

(3) Repeat step (2) 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.

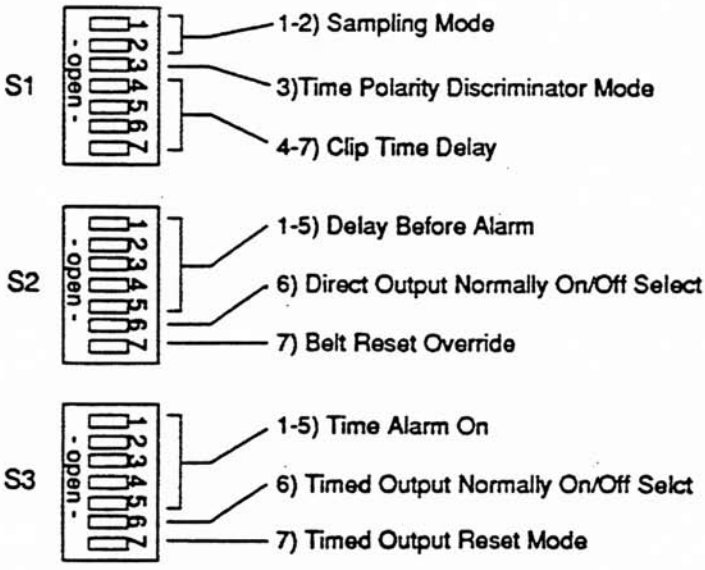
If this number is greater than 8, increase the gain of the Detector as discussed in Section IV.B. If the number is less than 3, decrease the gain of the system as discussed in Section IV.B.

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.



<-- Open Closed -->



Programming Switches S1, S2, S3
Position/Function Detail

FIGURE 5
Electronics Module Component and Test Point Layout

Start-up and Calibration (cont.)

• Observe the reference clips to see if they are passing within 1" (25) 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" (25) 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 Section IV.C, 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 shading 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 Section IV.H.

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 5 & 6 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.

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 through 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 Coils

The internal gain of the Detector is adjusted by a rotary Switch, S4, located inside the Electronic Module (refer to Figure 5). 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:

- Remove the control knobs and cover of the Electronic Module as indicated in Section IV.A.

- Set the "Metal Sensitivity" control knob (R61) to its rotational midpoint (if the cover was not removed, the "Metal Sensitivity" setting would be 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.

- 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.

- If all other functions are properly programmed, replace the cover and knobs. Re-index the control knobs as indicated in Section IV.A.

- Recalibrate the "Metal Sensitivity" control knob as instructed in Section III.B.

CLIP GAIN

When belt repair clips are used on a conveyor belt, the repair clips represent a stronger metal signal than the tramp metal. In this situation, it is necessary to reduce the gain of the system to show the clips to pass. Rotary Switch S5, shown in Figure 5, 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 calibration of the clip gain, follow the steps below:

- Run the belt at normal running speed and maximum belt load.

System Programming (cont.)

• 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 Section II.F.

• Adjust the Clip Override control knob, shown in Figure 2, to a setting of 5.

• Remove the cover as described in Section IV.A without changing the setting on the Clip Override control.

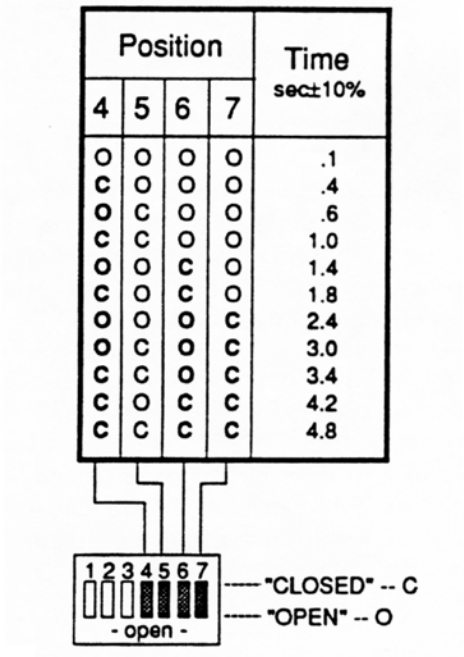
• Adjust the Clip Gain, Switch S5 shown in Figure 5, to the highest gain that does not trip the Detector when the clips pass. If the unit continues tripping even at the minimum clip gain of 1, the desensitized length of the belt may be too short. In other words, the system is switched back to full sensitivity before the clips are completely out of the Detector's field. To correct, increase the clip detector time delay as described in Section IV.D.

• If all other functions are properly programmed, replace the cover as described in Section IV.A. Return the controls to recorded settings.

• Calibrate the Clip Override as described in Section III.C.

TABLE 1
Clip Time Delay (Switch S1)

Position				Time sec±10%
4	5	6	7	
O	O	O	O	.1
C	O	O	O	.4
O	C	O	O	.6
C	C	O	O	1.0
O	O	C	O	1.4
C	O	C	O	1.8
O	O	O	C	2.4
O	C	O	C	3.0
C	C	O	C	3.4
C	O	C	C	4.2
C	C	C	C	4.8



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 S1-4, 5, 6 & 7. The locations of these switches are shown in Figure 5. The range of delay times is from .1 seconds to 4.8 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 17.0 seconds. Refer to Table 2 for tabulation of the delay time versus switch settings and Figure 5 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 17.0 seconds. Refer to Table 2 for a tabulation of the delay time versus switch settings and Figure 5 for the switch locations.

STANDARD OR FAIL-SAFE OUTPUT OPERATION

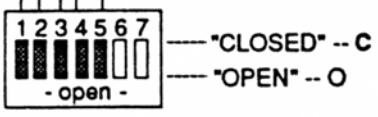
As standard, the alarm outputs of the Detector will energize when tramp metal is detected. In this mode, the solid state relay is programmed to operate in a Normally "OFF" condition. The outputs will not energize until metal is detected.

System Programming (cont.)

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.

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

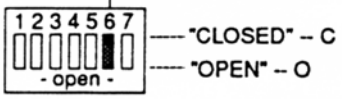
Position					Time sec ±20%
1	2	3	4	5	
C	C	C	C	O	0.01
O	C	C	C	O	0.1
C	O	C	C	O	0.2
O	O	C	C	O	0.3
C	C	O	C	O	0.4
O	C	O	C	O	0.5
C	O	O	C	O	0.6
O	O	O	C	O	0.7
C	C	C	O	O	0.8
O	C	C	O	O	0.9
C	O	C	O	O	1.0
O	O	C	O	O	1.1
C	C	O	O	O	1.2
O	C	O	O	O	1.3
C	O	O	O	O	1.4
O	O	O	O	O	1.5
C	C	C	C	C	0.1
O	C	C	C	C	1.2
C	O	C	C	C	2.5
O	O	C	C	C	3.6
C	C	O	C	C	4.5
O	C	O	C	C	5.5
C	O	O	C	C	7.0
O	O	O	C	C	8.0
C	C	C	O	C	9.0
O	C	C	O	C	10.0
C	O	C	O	C	12.0
O	O	C	O	C	13.0
C	C	O	O	C	14.0
O	C	O	O	C	15.0
C	O	O	O	C	16.0
O	O	O	O	C	17.0



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 in a Normally "OFF" condition, open the appropriate switch. Conversly, 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

Position	Contact Mode
6	
C	Normally ON
O	Normally OFF



MANUAL/AUTO 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.

The direct output can be programmed to automatically reset by shorting the remote reset terminals TB1 pins 5 & 6, located on the front of the Interface Module. To "short", install a jumper from pin 5 to pin 6. Open Switch S2-7.

System Programming (cont.)

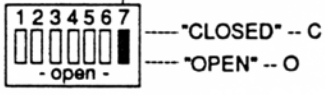
The operating mode of the timed output is governed by the position of Switch S37 as shown in Table 4. With the switch in the open position, the timed output operates in the Automatic Reset Mode. When the switch is closed, the timed output will follow the mode programmed on the direct output.

TABLE 4
Timed Output Reset Mode (S3)

Position	Mode
7	
C	Manual reset
O	Automatic reset

TABLE 5
Belt Reset Override (S2)

Position	Mode
7	
C	Disable detector during reset
O	Direct output auto reset



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 82-7 will program the Detector so it is disabled while a reset signal is applied. Refer to Table 5.

SAMPLING & TPD MODES

The Detector Sampling and TPD Modes are set at the factory to make the Detector sensitivity selective between various materials as required for each particular application. Switches S1-1 through S1-3 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 pre-programmed "Delay Before Alarm". This standard feature is automatically activated when the timed output is used for delayed operation of any device.

Troubleshooting & Maintenance

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 what each L.E.D. monitors and their normal operating condition, refer to the Status Indicator Summary (Table 7) on the next page.

TROUBLESHOOTING FLOW DIAGRAMS

NOTE: Before working with Trouble-shooting 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).

ELECTRONIC MODULE TROUBLESHOOTING

In the event that the unit does not operate and the trouble has been traced to the Electronic Module, consult Eriez factory service or your local Eriez representative.

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:

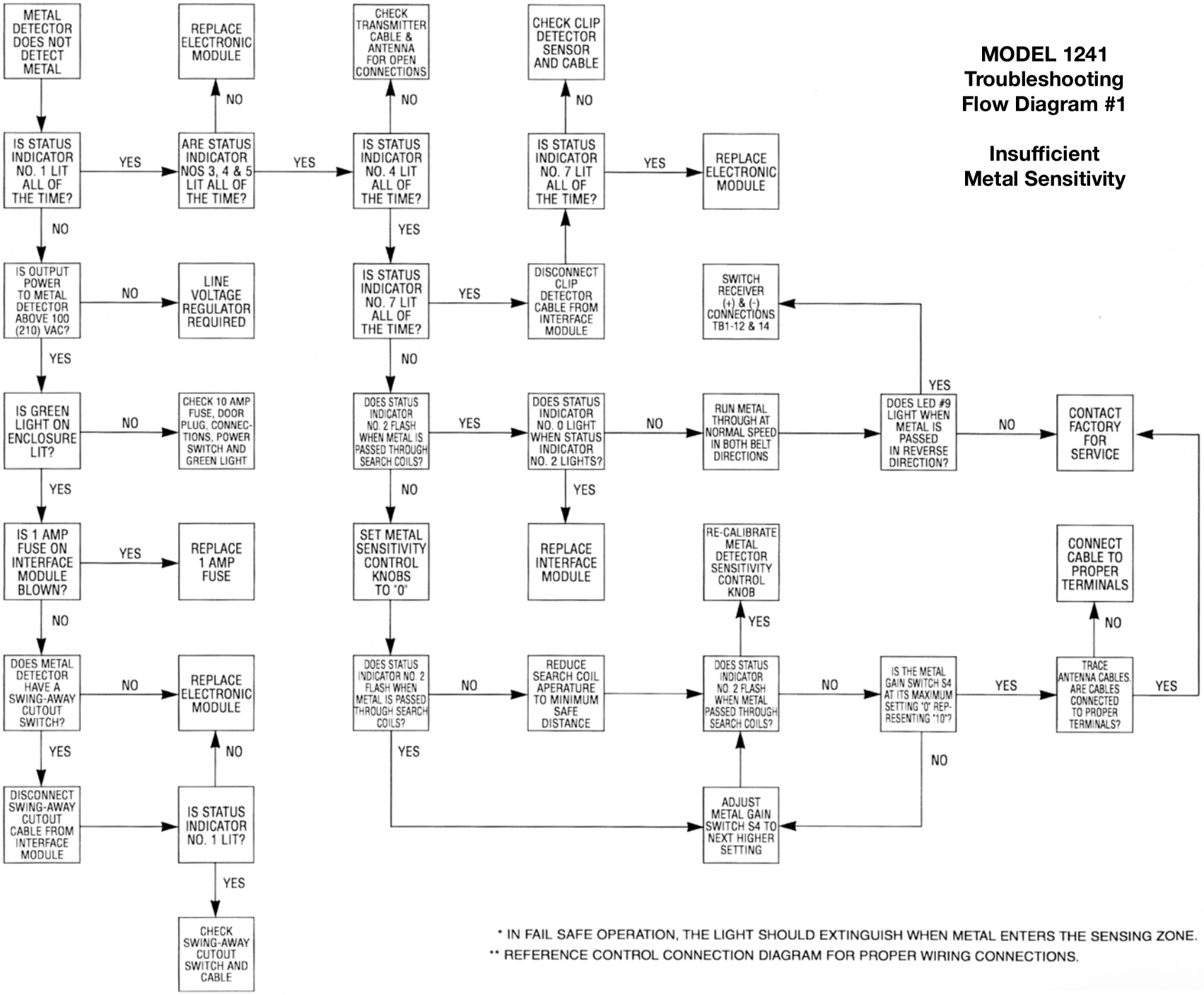
(1) 1 Amp Fuse
(1) 10 Amp Fuse
(2) Spare Bulbs
(1) 1/16" Allen Key Wrench
(1) 5/64" Allen Key Wrench

Control	Position	Function	Comment
S1	1 2	Sampling Mode	Allows the detector to detect metal and ignore conveyed product. Factory pre-set; do not adjust.
	3	TPD Mode	Turns TPD on or off; TPD reduces false trips due to false signals. Factory pre-set; do not adjust.
	4 5 6 7	Clip Time Delay	Selects how long the detector remains desensitized to metallic repair clips. Ref. Table 1 for position settings and times.
S2	1 2 3 4 5	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.
	6	Direct Output Normally On/Off Select	Sets direct output contacts as normally "ON" or "OFF" Ref. 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. Ref. Table 5 for settings.
S3	1 2 3 4 5	Time Alarm On	Controls timed output. Selects how long the output remains energized. Ref. Table 2 for position settings and times.
	6	Timed Output Normally On/Off Select	Sets timed output contacts as normally "ON" or "OFF" Ref. 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. Ref. 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.
R61		Metal Sensitivity	Sets metal "trip" threshold level. ("10" most sensitive, "1" least sensitive)
R48		Clip Override	Attenuates (reduces) metal sensitivity to allow repair clips to pass through detector. ("10" most attenuation, "1" least attenuation)

TABLE 6
Programming Controls Summary

MODEL 1241
Troubleshooting
Flow Diagram #1

Insufficient
Metal Sensitivity



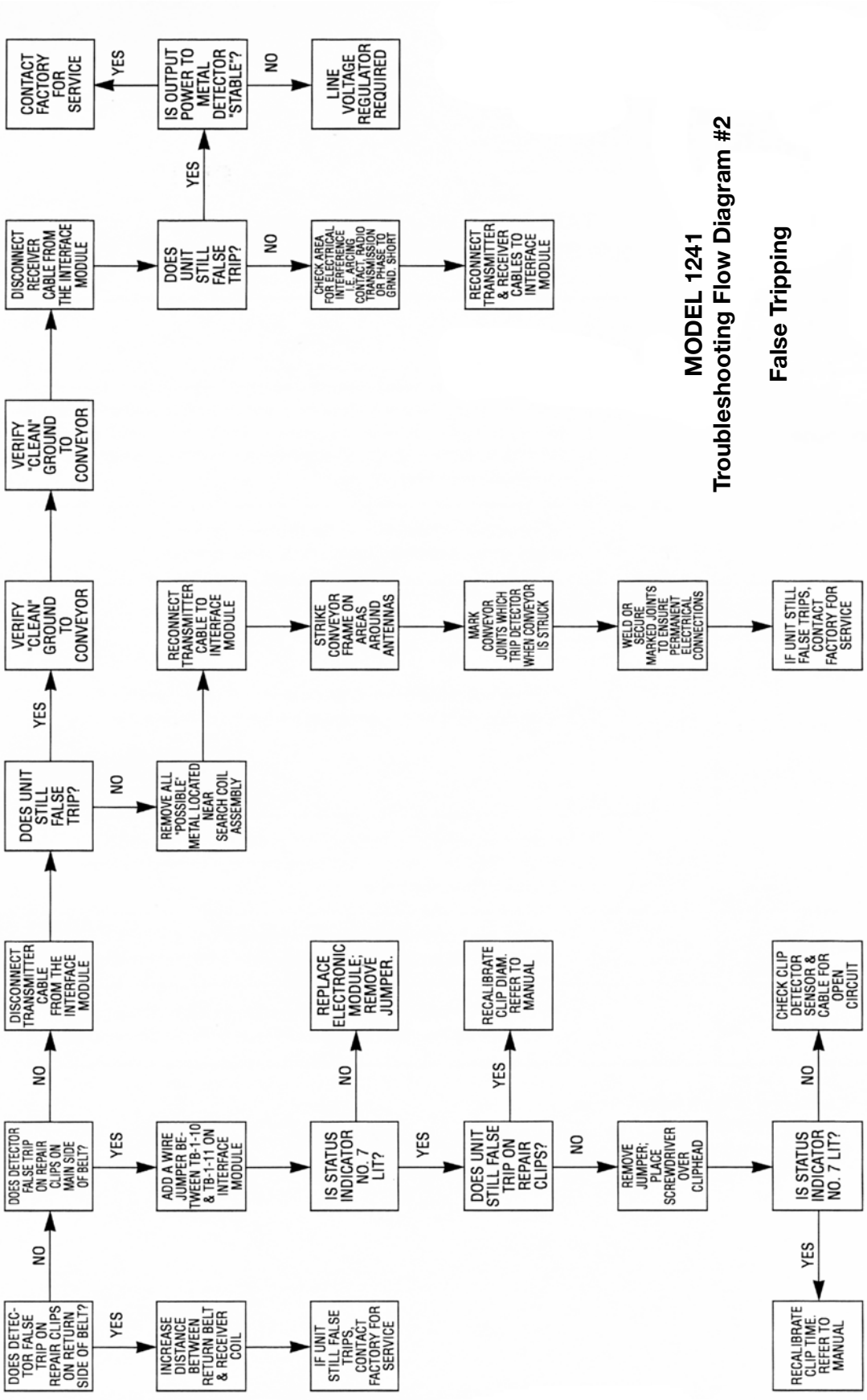
* IN FAIL SAFE OPERATION, THE LIGHT SHOULD EXTINGUISH WHEN METAL ENTERS THE SENSING ZONE.

** REFERENCE CONTROL CONNECTION DIAGRAM FOR PROPER WIRING CONNECTIONS.

L.E.D. Number	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 present, or optional transmitter swing-away switch is activated. LED lights for approximately 5 seconds after power is turned on.
2	Metal Signal	OFF	Indicates signal analyzer output is above threshold limit, usually when detectable metal is in sensing zone.
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	OFF	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 L.E.D. is lit, the timed alarm outputs are energized with the line voltage.
9	Direct Out	OFF*	Indicates the condition of the direct alarm output. If the L.E.D. 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 L.E.D.'s will be normally lit.

TABLE 7
Electronics Module Status Indicator Summary



MODEL 1241
Troubleshooting Flow Diagram #2

False Tripping

NOTE: Some safety warning labels or guarding may have been removed before photographing equipment.

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