

# AM-806

## Waste/Door Radiation Monitor OPERATIONS MANUAL



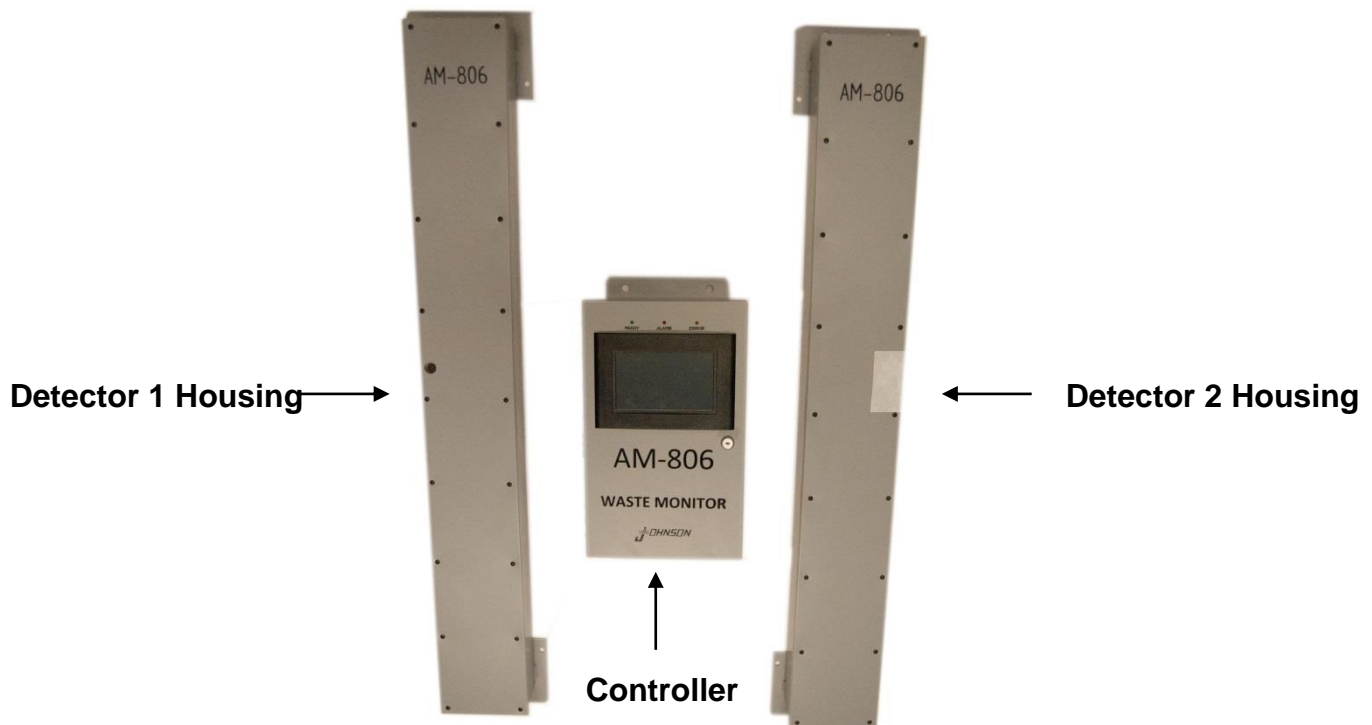
# **Section Contents**

- 1. SPECIFICATIONS**
- 2. MAIN COMPONENTS**
- 3. THEORY OF OPERATION**
- 4. OPERATING INSTRUCTIONS**
- 5. INSTALLATION**

# 1.0 SPECIFICATIONS

<b>SENSITIVITY</b>	<b>&lt; 2 <math>\mu</math>Ci Cs137 “DRIVE THROUGH” MODE OF OPERATION WITH <math>\leq</math> 72” (189 cm) BETWEEN DETECTORS</b>
<b>DISPLAY</b>	<b>VGA 256 COLOR, TOUCH SENSITIVE SCREEN</b>
<b>OPERATOR INPUT CONTROLS</b>	<b>ALL OPERATOR INPUT IS THROUGH TOUCH SENSITIVE VGA SCREEN</b>
<b>PARAMETER SECURITY</b>	<b>SETUP SCREEN PASS CODE PROTECTED</b>
<b>OPERATING MODES</b>	<b>WALK THROUGH, DRIVE THROUGH, TIMED COUNT, AREA MONITOR</b>
<b>TIMED COUNT</b>	<b>ADJUSTABLE 1 – 30 SECONDS</b>
<b>HIGH VOLTAGE</b>	<b>ADJUSTABLE - 300 - 1300 VDC – REGULATION</b>
<b>LOW VOLTAGE</b>	<b>+5 VDC &amp; -5 VDC REGULATION <math>\square\square</math>0.5 %</b>
<b>POWER</b>	<b>120/250 VAC – 50/60 Hz - BACK-UP RECHARGABLE BATTERY – NOMINAL 2HRS</b>
<b>TEMPERATURE RANGE</b>	<b>(-4°F) -20<math>\square\square</math>CENT. TO (140° F) 60<math>\square</math>CENT</b>
<b>HUMIDITY RANGE</b>	<b>5 - 95% NON CONDENSING</b>
<b>MEMORY RETENTION</b>	<b>10 YEARS</b>
<b>DETECTOR DIMENSIONS</b>	<b>40” X 3” X 1.5” (180 in<sup>3</sup> EACH DETECTOR)</b>
<b>DETECTOR HOUSING DIMENSIONS</b>	<b>48” L X 8” WIDE</b>
<b>HOUSING</b>	<b>16 Ga. ALUMINUM</b>
<b>WEIGHT</b>	<b>APPROXIMATELY 83# TOTAL</b>

## 2.0 MAIN COMPONENTS



**FIGURE**

### 2.1 DESCRIPTION

The Model AM-806 is a ruggedized, industrial grade monitor that can be utilized to detect radioactive material. The 806 utilizes 2 large area plastic scintillators totaling 360 cubic inches to detect the movement of gamma emitting isotopes passing through doorways, entrance gates or other similar openings. The instrument is durable and easy to operate with minimal training. Installation can be permanent or temporary. All of the data for the system is stored in a non-volatile memory, capable of maintaining the data for 10 years.

## 3.0 THEORY OF OPERATION

### 3.1 GENERAL

The AM-806 utilizes the latest field proven, microprocessor circuitry and large area plastic scintillators to accurately and rapidly measure gamma radiation from 60 KeV to 2 MeV. The instrument is very user friendly and can be utilized by persons with minimal training. Radiation detection is by 2 – 40” long plastic scintillators with a total volume of 360 cubic inches. Each Scintillator has a low energy window made of 1/32” aluminum that permits the AM-806 to measure gamma radiation from 60 KeV. The scintillators are contained in a durable aluminum housing that can be quickly disassembled with commonly used hand tools. The readout and data entry are accessed through a large area color monitor that utilizes a touch sensitive screen for all data input.

FIGURE 2 shows the VGA monitor doing the “BACKGROUND INITIALIZATION” prior to normal operation. The most pertinent measuring and diagnostic data is continuously displayed on the monitor in a configuration that looks like a doorway. The operator can see some of the data that is to be displayed i.e Detector high voltage and software versions. Parameters that are or can be displayed include the background count, date and time, number of persons who have passed through the portal, high voltage, battery voltage, counting rate of each detector, and software version of each detector. An outline of the monitor and the relative strength of the radiation field striking each detector is displayed on the green vertical bars. The count rate and high voltage are displayed by each detector. During the startup period, the instrument is automatically running systems checks, and establishing background. The upper center of the portal displays the OPERATIONAL CONDITION of the monitor i.e. Background Initialization, Too Fast, Alarm etc.

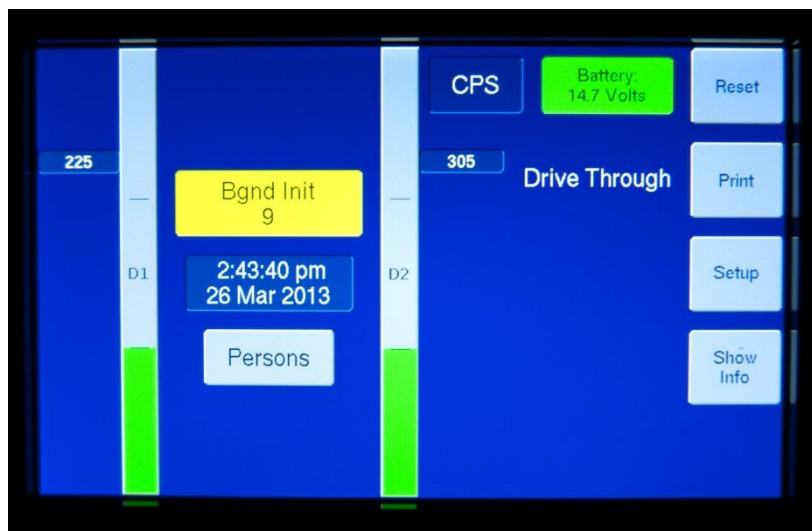
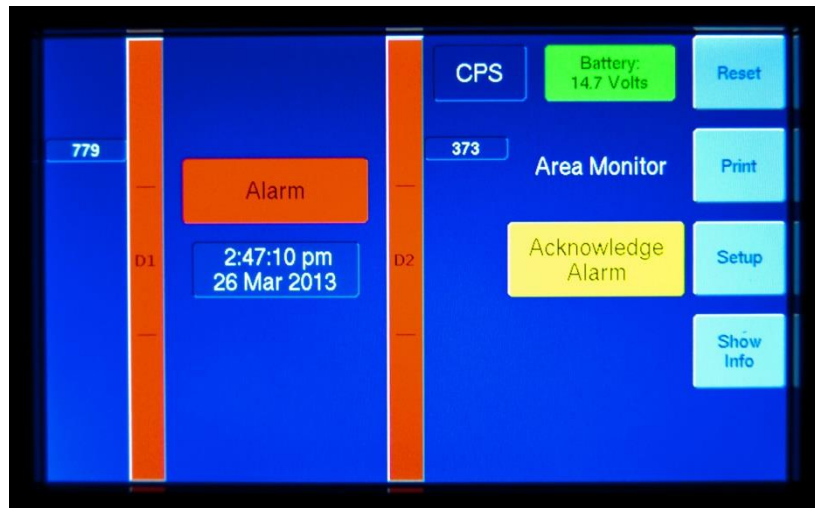


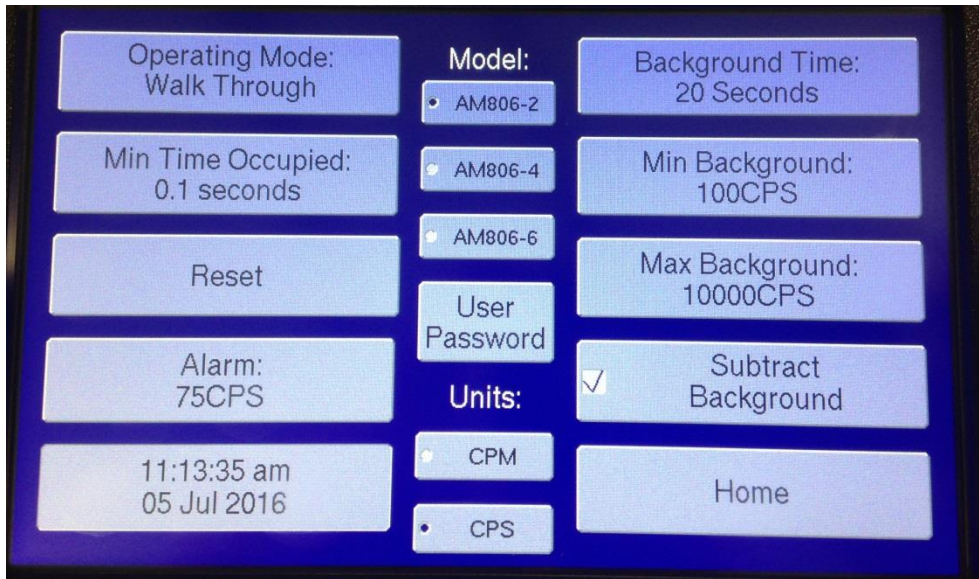
FIGURE 2

The blocks on the edge of the display on the right provide access to printer, additional menus, system setup and additional information. Four different modes of operation are provided: **“DRIVE THROUGH”**, **“WALK THROUGH”**, **“AREA MONITOR”** and **“TIMED COUNT”** of 0.1-30 seconds. The **“DRIVE THROUGH”** and **“WALK THROUGH”** modes are utilized for normal operation and will screen persons or equipment passing through the system rapidly. The **“WALK THROUGH”** mode of operation can detect radiation levels of  $<2\mu\text{Ci}$  (based on Cs137 calibration) when the detectors are separated less than six feet apart. The **“TIMED COUNT”** mode can be utilized for radiation contamination by stopping the person in the portal and counting for between 1-30 seconds. Several diagnostics are continuously monitoring the instruments systems to determine if they are operating correctly. Diagnostics are provided for low detector counting rate, background counting rate to high, high voltage out of range, and low battery voltage. Alarms are provided for some of these diagnostics that must be reset on the touch screen by touching the **“AKNOWLEDGE ALARM”** button. The operator can access the screen with alarm set points, operating mode, and operating times, by touching the **SETUP** button which will cause the screen to appear and the alarm set points will appear.

FIGURE 3 shows the monitor in alarm and FIGURE 4 shows the screen that appears when the **SETUP** button is touched.

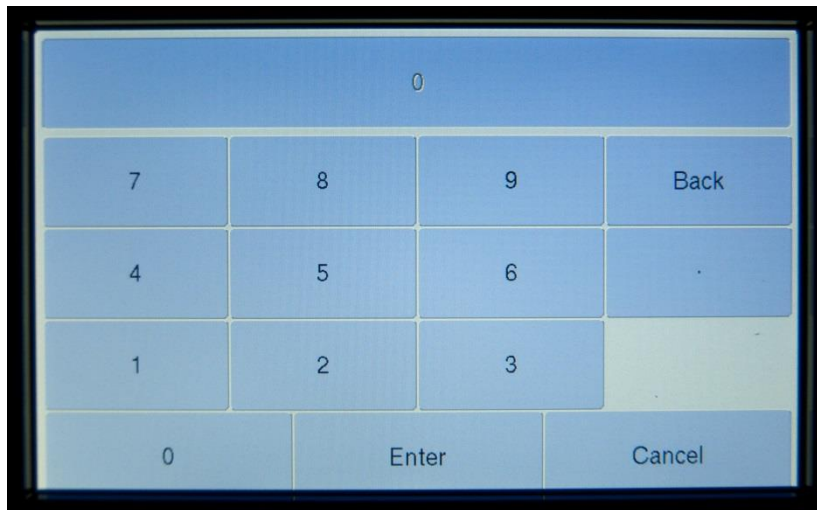


**FIGURE 3**



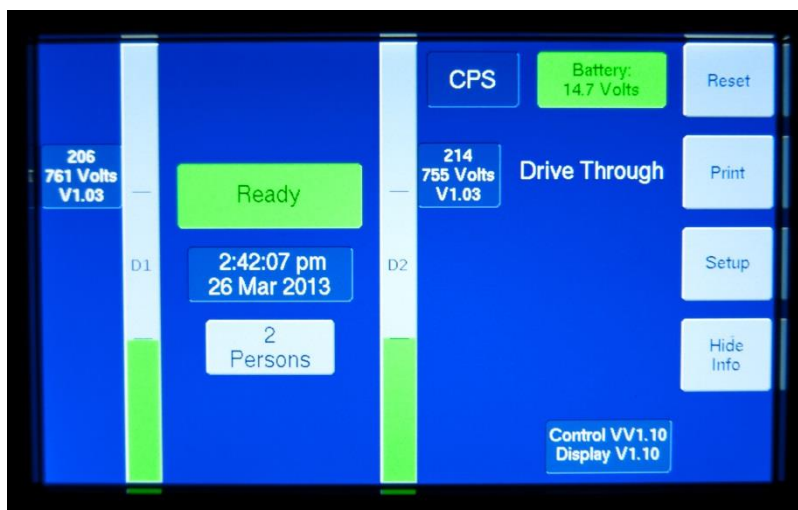
**FIGURE 4**

Touching the “Operating Mode” button on the setup screen will toggle between the Four different “Modes” of operation. Touching any of the other buttons (except Subtract Background) will make a keypad appear that will enable the parameter to be set to a particular number and/or time.



**FIGURE 5**

FIGURE 5 shows the key pad that will appear to reset the particular parameter for the button that was touched on the set up screen. After entering the new information, the operator touches the ENTER KEY to save the information and touch the HOME button to return to normal operation.



**FIGURE 6**

FIGURE 6 shows the HOMESCREEN in the NORMAL OPERATING MODE with no alarms

The AM-806 is designed to operate from regular house current of 120 vac 60 Hz or 250vac 50 Hz. If a power failure occurs the 806 will continue to operate from its internal rechargeable battery for up to 2 hours. The internal rechargeable battery is automatically charged as long as power is connected to the MAIN CONTROL housing.

## **4.0 OPERATING INSTRUCTIONS**

### **4.1 CONTROLS**

The model AM-806 monitor is 100% digital and microprocessor controlled. All data entry and readout is through the VGA touch sensitive monitor in the MAIN CONTROL HOUSING. The AM-806 can be operated from standard 120 vac 60 Hz/250 vac 50 Hz house current or from its internal rechargeable battery for up to 2 hours. Operation from the internal battery is automatic and requires no intervention by the user. All programming and important data i.e. program settings and person count is held in memory WITH AN INTERNAL BATTERY BACKUP WITH A NOMINAL 10 YEAR LIFE. WB Johnson suggests the AM-806 be tested weekly for correct operation using the Cs137 test sources provided with the instrument.

The MAIN POWER SWITCH and FUSE are located inside the MAIN HOUSING. The fuse used in the AM-806 is 1.5 Amp SLO-BLO. Access to the inside of the MAIN HOUSING is controlled by a key lock to prevent unauthorized operation of the instrument. An AC power disconnect switch is provided near the MAIN CONTROL HOUSING to permit complete power removal from the system for maintenance.



## 4.2 AUDIBLE ALARMS

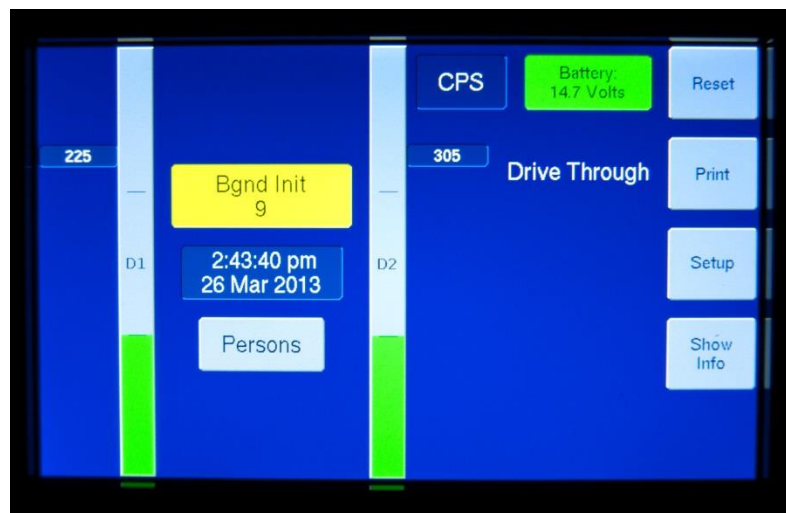
A Sonalert alarm speaker is located in the MAIN CONTROL HOUSING. The Sonalert is utilized to provide an audible alarm when the preset alarm set points have been exceeded. Once the audible alarms have been engaged they will continue to sound until they have been reset by the operator.

## 4.3 OPERATING INSTRUCTIONS

4.3.1 Turn on power to the AM-806 by engaging the external disconnect switch and the internal power switch located in the MAIN CONTROL HOUSING

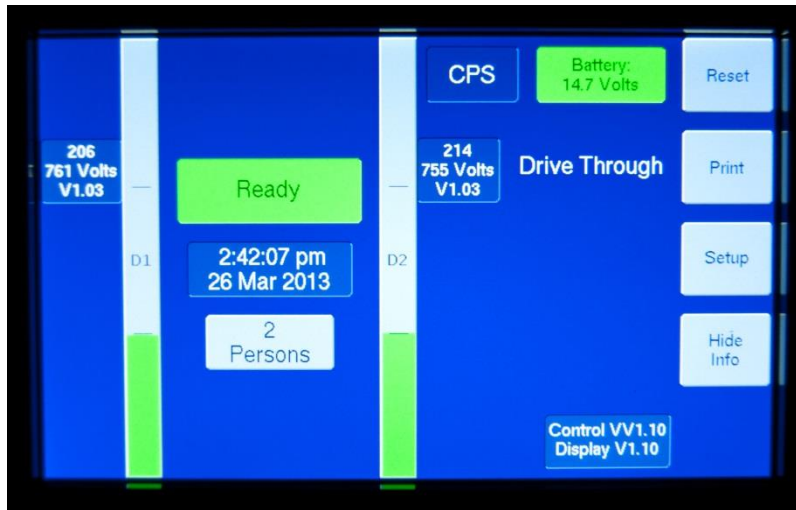
4.3.2 The AM-806 IS NOT READY FOR OPERATION. The system must go through a diagnostic check to be sure all electrical systems are operating within specification.

4.3.3 The AM-806 will then run a 20 second check to determine the BACKGROUND RADIATION in the area of the detectors. Once the background check is complete the system will display READY with a GREEN BACKGROUND in the block at top of the diagram on the monitor.



BACKGROUND INITIALIZATION SCREEN

4.3.4 When the AM-806 completes the BACKGROUND INITIALIZATION the top block on the VGA monitor will show READY with a green background and with each detector (vertical block each side will display GREEN which indicates the radiation part of the system is ready for operation.

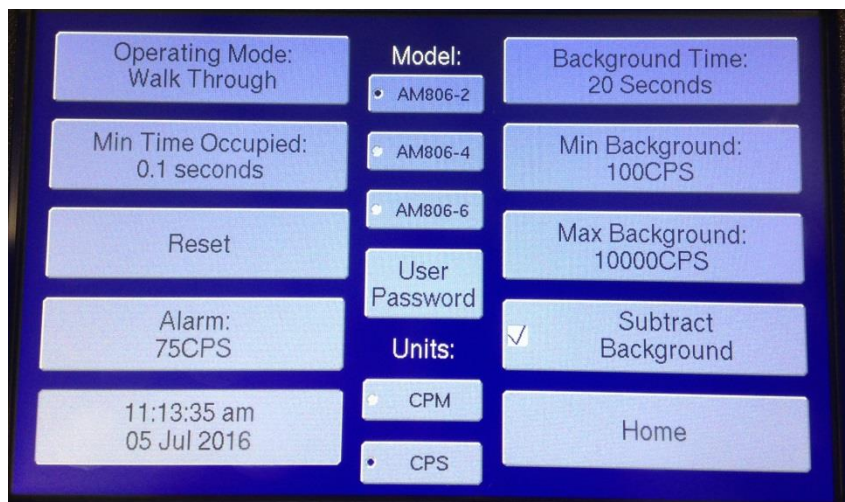


NORMAL HOME SCREEN

4.3.5 To set the other parameters of the AM-806 Touch the SETUP button on the right side of the monitor.

4.3.6 A PASS CODE screen will now appear – the default pass code is 2748 – enter this code and you will be taken to the SETUP SCREEN. At this screen you have the option of setting a new four (4) digit pass code.

4.3.7 To set a parameter i.e. clock touch the TIME/DATE button. The KEYPAD SCREEN for setting the clock will appear. Set the parameters on the screen as indicated (clock is set on 24 period, displayed on 12 hour period). When all parameters have been completed touch the ENTER button at the bottom of the screen to save the settings.

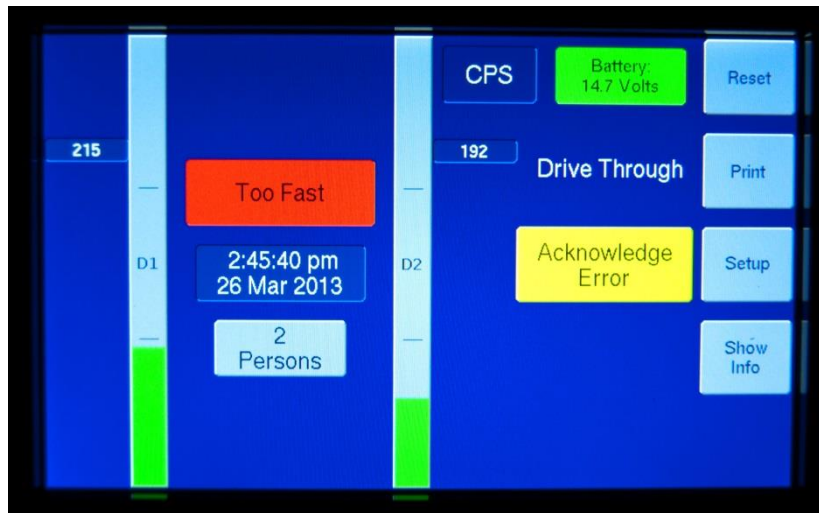


SET UP SCREEN

4.3.8 Set each parameter on the SETUP screen in the same manner being sure to SAVE each setting.

4.3.9 Normal operation for the AM-806 is in the DRIVE THROUGH/WALK THROUGH mode of operation.

4.3.10 MINIMUM TIME in the sensitive area of the detectors is 0.1 seconds. IF A PERSON OR PHYSICAL OBJECT PASSES THROUGH THE AREA IN LESS THAN 0.1 SECONDS THE INSTRUMENT WILL INDICATE "TOO FAST". This alarm will require resetting the system on the VGA screen. The "TOO FAST" screen is shown in FIGURE 19. To reset this alarm touch the ACKNOWLEDGE ERROR button.

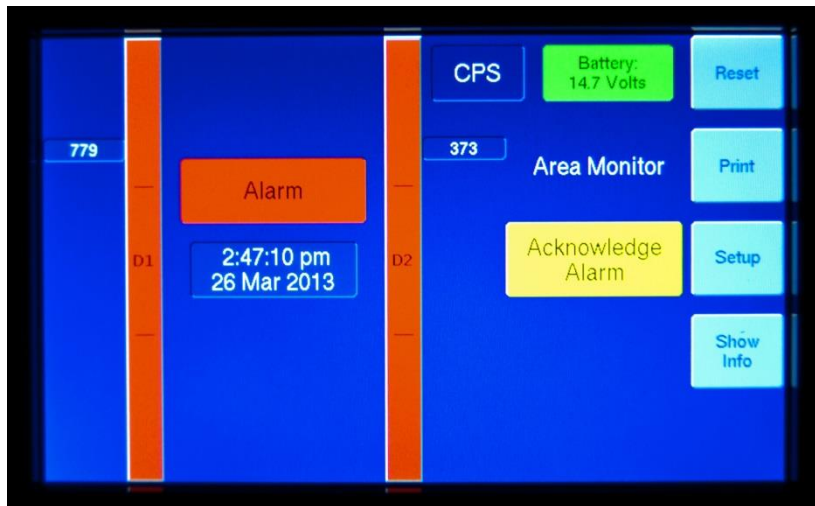


TOO FAST SCREEN

4.3.11 SENSITIVITY CONTROL: The AM-806 sensitivity control is adjustable. The sensitivity is determined by the number of counts above background the ALARM (above background) shows on the SETUP SCREEN. When the AM-806 is shipped the ALARM above background is set to 75 cps. This should cause an alarm if the system is installed in a six foot (72") door opening and a 2  $\mu$ Ci Cs 137 test source is carried by a person through the detectors. Installing the system in a smaller or wider opening will require the ALARM cps be adjusted to a higher or lower number. EACH ALARM CONDITION WILL REQUIRE THE USER TO RESET THE SYSTEM BEFORE IT WILL RETURN TO NORMAL OPERATION.

**NOTE: INCREASING THE DISTANCE BETWEEN THE DETECTORS WILL DECREASE THE SENSITIVITY OF THE MONITOR.**

4.3.12 ALARM: When the signal from one or both detectors exceeds the ALARM SETPOINT the detector or detectors with signals above the ALARM SETPOINT bar graph for that detector will turn RED and the alarm will sound. The connector bar on the VGA monitor will turn red and display ALARM.



### ALARM CONDITION

#### 4.4 MODES OF OPERATION

4.4.1 “WALK THROUGH” this Mode of operation should be used with background subtract “checked”, minimum count time of 0.1 seconds and lowest acceptable Alarm Set point – this mode uses the electric eye to initiate the counting cycle if the eye should become disabled the mode can be changed to “AREA MONITOR” and screening can continue.

4.4.2 “DRIVE THROUGH” ” this Mode of operation should be used with background subtract “checked”, minimum count time of 0.1 seconds and lowest acceptable Alarm Set point – this mode uses the electric eye to initiate the counting cycle if the eye should become disabled the mode can be changed to “AREA MONITOR” and screening can continue.

4.4.3 “TIMED COUNT” this Mode of operation requires the subject to stop between the detectors and wait for the counting cycle to finish – this mode should be used with background subtract “checked”, count time between 1 and 30 seconds and lowest acceptable Alarm Set point – this mode uses the electric eye to initiate the counting cycle.

4.4.4 “AREA MONITOR” this mode of operation does not use background subtract and Alarm Set Points should be set according to what the detectors are displaying for background cps. This mode does not use the electric eye as it is in a continuous counting cycle.

## 5.0 INSTALLATION

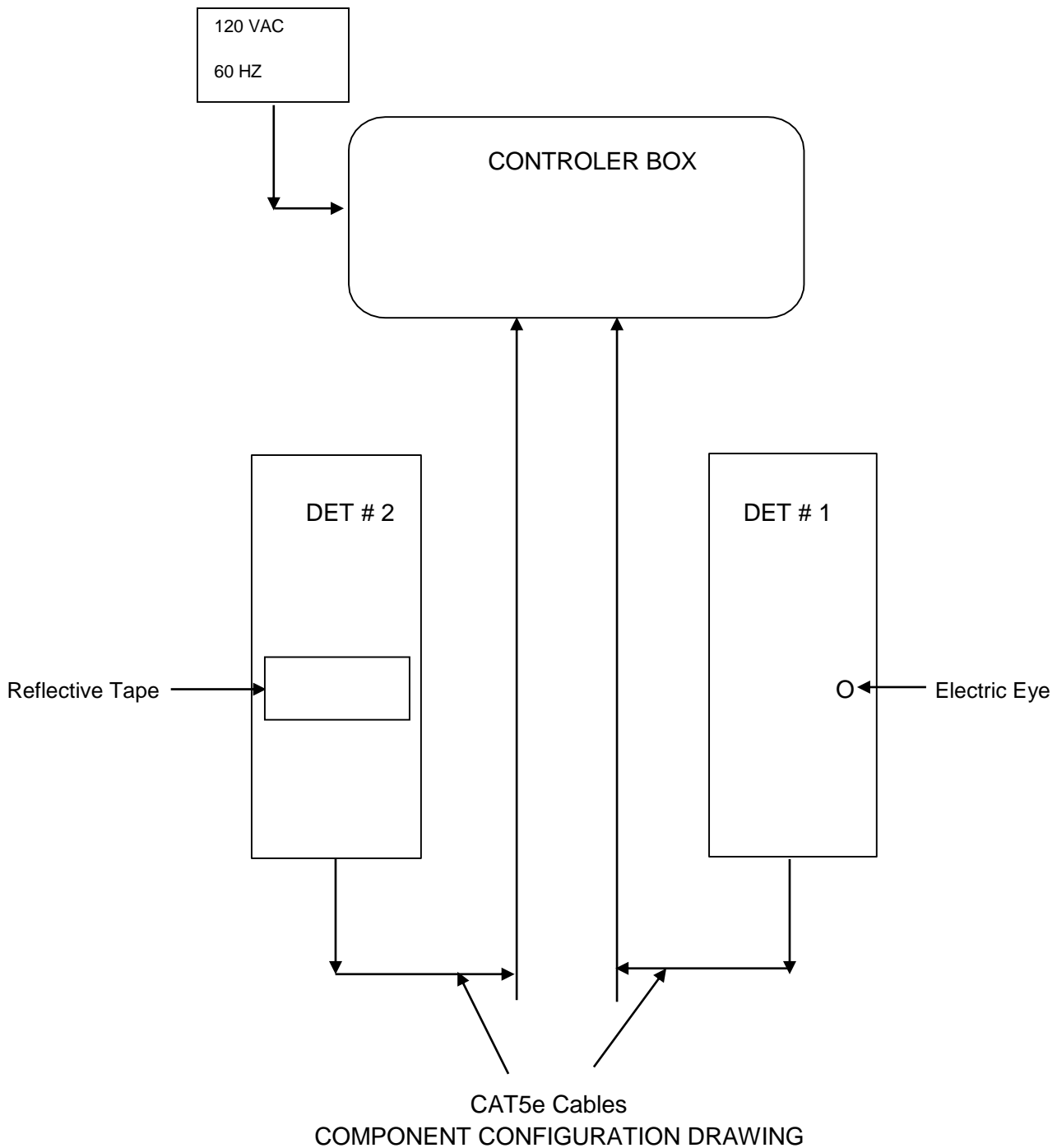
### GENERAL:

The MAIN COMPONENTS of the AM-806 are shown below and can be surface mounted on any flat vertical surface (wall, post etc.) that will hold the weight of the detector. The AM-806 is provided with Detector and Controller Box mounting flanges and two 100 ft CAT5e cables for installation. WBJI recommends the user of this instrument consider any objects that might interfere with the detectors and the distance between the detectors before deciding on an installation site and method for locating and mounting the AM-806 Detectors and Controller Box. WBJI also recommends the interconnecting wiring be enclosed in conduit or similar material to prevent damage to the wiring. All external wiring from the Detector to the Controller Box is low voltage in the 5-15 VDC range and not considered a shocking hazard.

**NOTE: 120 VAC wiring is required to power the MAIN CONTROL BOX. THE CUSTOMER IS RESPONSIBLE FOR MEETING THE LOCAL ELECTRICAL AND MECHANICAL CODES.**

**Below are the three main components of the AM-806 System:**





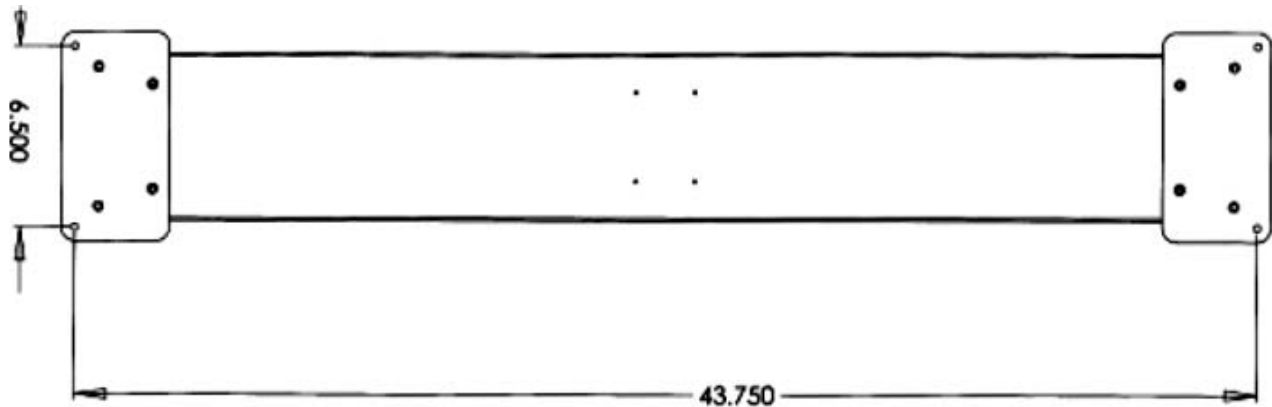
COMPONENT CONFIGURATION DRAWING

There are five basic Steps to complete the installation and they are listed in order below and explained in detail in the following Sections:

1. Detector Mounting Section 5.1
2. Control Box Mounting Section 5.1
3. CAT5 Cable, AC power connections and Power Up Section 5.1
4. Alignment of Electric Eye Section 5.2
5. Mode Selection and Use – Operations Manual

## 5.1 MOUNTING AND PLACEMENT OF DETECTORS

5.1.1 Each detector has a top and bottom mounting flange to accommodate mounting the detectors to any stable mounting material – see FIGURE - 1 for dimensions.



**FIGURE - 1** (mounting holes are 0.313" diameter)

5.1.2 The detectors can be mounted in one of two orientations – with the CAT5 cable connector on the TOP or on the BOTTOM of the detector housing.

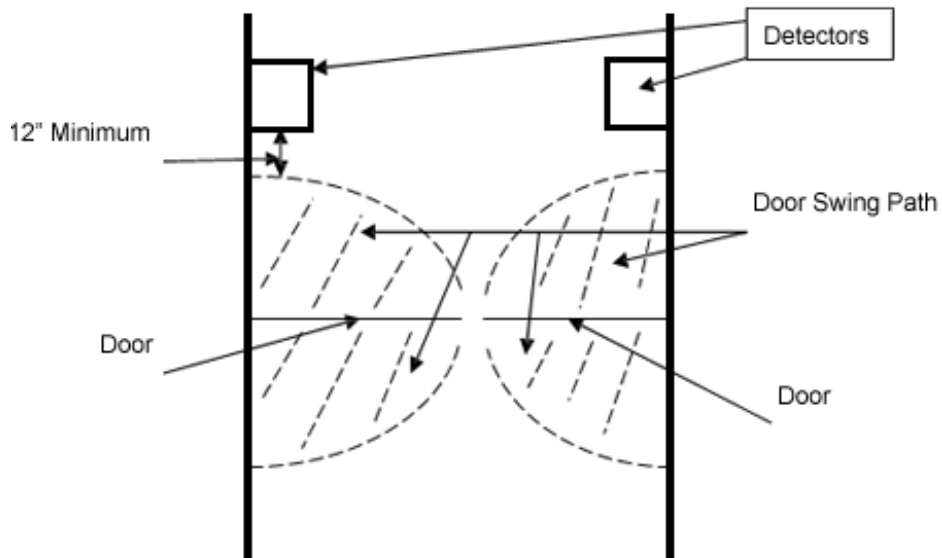
**CAUTION: FOR OUTDOOR INSTALLATION THE CAT5 CONNETORS SHOULD BE POSITIONED ON THE BOTTOM OF THE DETECTOR HOUSING TO PROVIDE BETTER WEATHER PROTECTION.**

5.1.3 The decision as to where and how the detectors should be mounted should be decided by the people who are doing the installation.

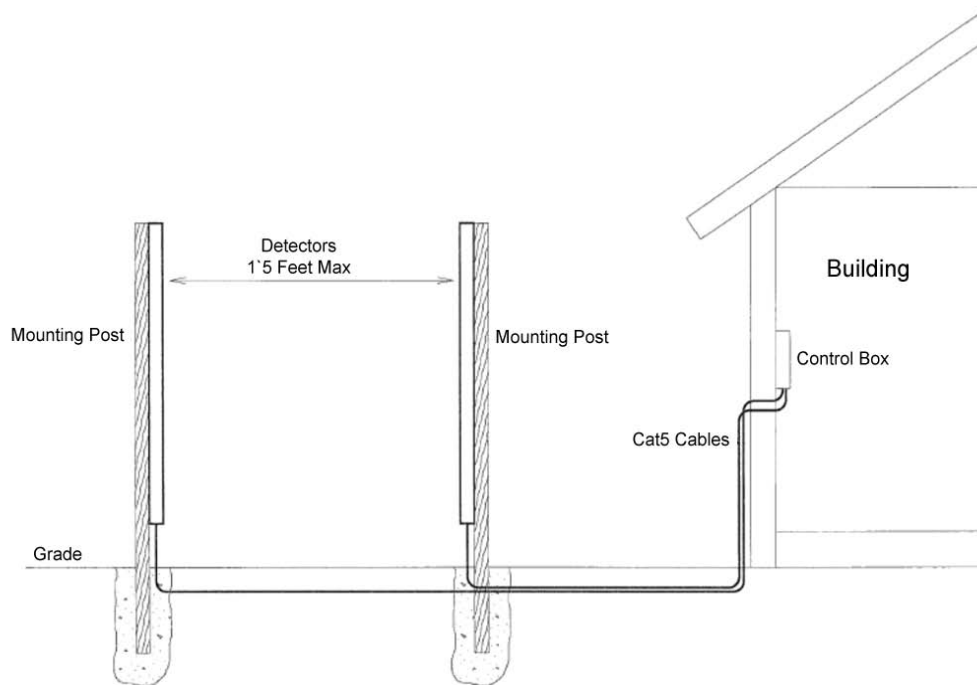
5.1.4 When mounting the detectors the alignment of the Electric Eye and the Reflective Tape needs to be taken into consideration (the Reflective Tape is shipped loose to be positioned later in the alignment process).

5.1.5 The detectors should be mounted directly across from each other and at the exact same height.

5.1.6 FIGURES - 2 and 3 illustrate possible indoor and outdoor installations.



**FIGURE - 2 - Indoor**



**FIGURE - 3 - Outdoor**

**NOTE: W B JOHNSON RECOMMENDS THE DISTANCE BETWEEN DETECTORS TO BE NO MORE THAN 15 FEET WHEN USING THE ELECTRIC EYE (WALK THRU, DRIVE THRU and TIMED COUNT MODES OF OPERATION).**



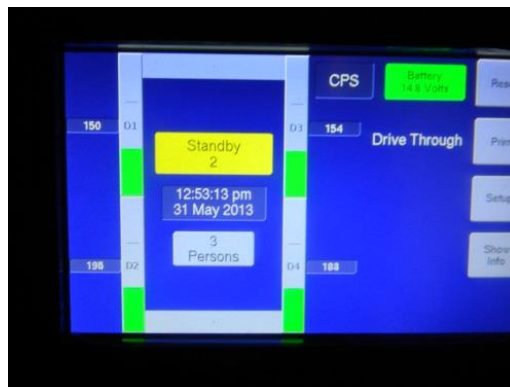
5.1.7 After the detectors have been mounted determine the location of the Controller Box and mount securely - the Monitor is supplied with two 100 ft CAT5e cables which should allow the location of the Control Box a good amount of flexibility.

5.1.8 Next attach the CAT5e cables to the Detector Housings and the Control Box – Detector 1 cable to the Detector 1 Connector and Detector 2 cable to the Detector 2 connector on the bottom of the Control Box.

5.1.9 Connect AC Power to Control Box.

## 5.2 ELECTRIC EYE ALIGNMENT

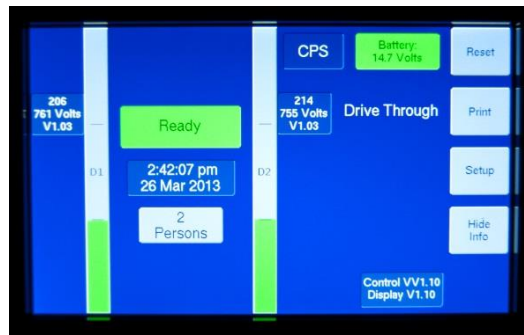
5.2.1 Power up the Control Box – after the Unit does the initialization sequence the display should look like FIGURE - 4.



**FIGURE - 4** (Picture is a four detector model)

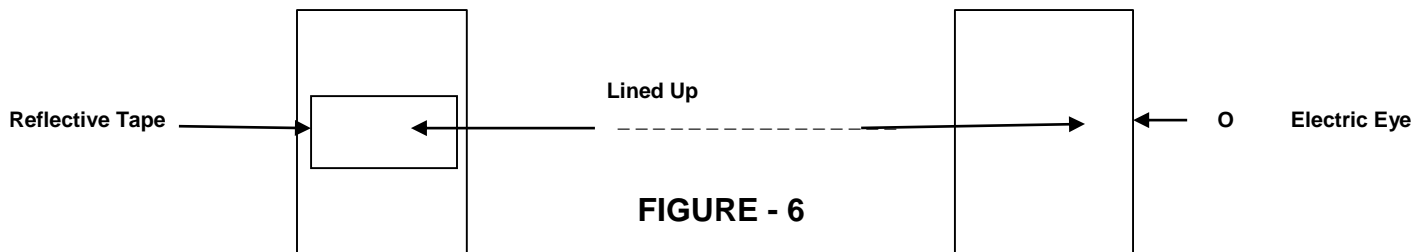
5.2.2 Figure 1 shows the Unit is in the YELLOW **“Stand By”** mode – this will change after the Electric Eye and Reflective Tape are aligned.

5.2.3 Depending on the distance between the two detectors it might be possible to see the red of the beam on Detector 2 housing so the Reflective Tape can be easily installed – if the beam cannot be located the loose piece of Reflective Tape will have to be repositioned on the Detector 2 housing until the Control Box Display is like FIGURE - 5 showing the GREEN **“Ready”** mode.



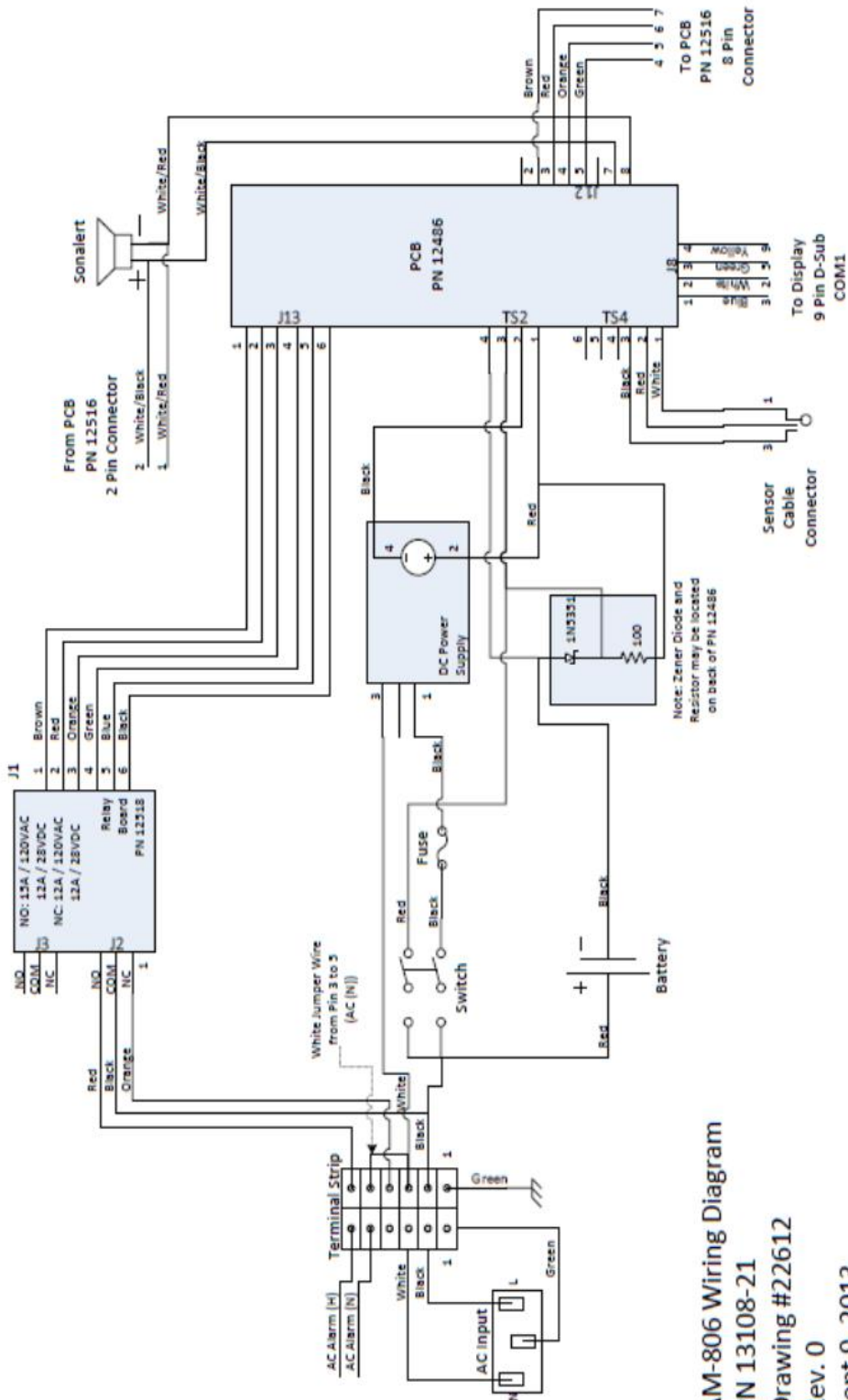
**FIGURE - 5**

5.2.4 Once the correct position of the Reflector Tape is established peel off the protective seal and attached the Reflective Tape FIGURE - 6 to the Detector Housing making sure the Unit stays in the GREEN “Ready” mode or if the beam is broken it returns to the “Ready” mode.



5.2.5 Installation is now complete and Monitor is now ready to be set up as described in the Operations Manual.

# 5.3 CONTROL BOX WIRING DIAGRAM



AM-806 Wiring Diagram  
 PN 13108-21  
 Drawing #22612  
 Rev. 0  
 Sept 9, 2013