

# EVD-1

## Installation, Operation, and Instruction Manual

### Electronic Vibration Detector System

(All specifications subject to revision.)



*EVD-1 Controller*

*RTA (optional)*



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# CONTENTS

General Information .....	5
Features .....	5
Specifications .....	5
Ordering Information .....	5
EVD-1 Controller .....	6
Accumulator Function .....	6
EVD-1 Controller Details .....	6
EVD-1 Terminal Connections .....	7
Recommended Wiring .....	7
Recommended Wire Types .....	7
Recommended Wiring EVD-1 Controller .....	8
Recommended Control Panel Wiring and RTA Connections .....	8
Installation .....	8
EVD Wiring with Safe Detector Zone and 24 Hour Alarm Zone .....	9
EVD Wiring with Safe Detector Zone Only .....	10
Sensitivity Adjustments .....	11
Analog Test Point Levels .....	11
Testing .....	11
Safe Construction Requirements .....	11
Recommended Detector Locations .....	12
Determining the Number of Detectors for a Safe Application .....	12
Determining the Maximum Linear Distance on a Safe .....	13
Typical Safe Exterior Dimensions and Maximum Linear Distances .....	13
Typical UL Complete Safe Installations .....	14
Typical UL Complete Vault Installations .....	14
EVD-1 Wall Protection .....	14
Typical Wall Protection Installation .....	15
Recommended Maximum EVD-1 Spacing for Wall Protection .....	15
Dimensions .....	15
EVD-1 Mounting Template .....	15



**General Information**

The EVD-1, Electronic Vibration Detector, is listed by Underwriters Laboratories, Inc. and Underwriters Laboratories of Canada for primary protection of Mercantile or Bank, safe or vault and supplementary protection of interior units such as file cabinets, display cases, walls and ceilings. The detector must be used with an appropriate UL listed control unit.

**Features**

- Detects all common threats to safes, vaults and ATM's
- Sophisticated signal processing provides unprecedented sensitivity without false alarms
- Low cost, stand alone system
- Reliable, sensitive piezo sensor technology
- On board high security safe contact interface
- Integral, multi-color status LED
- Built in test circuit
- Remote test and annunciator capabilities
- Supervised microprocessor
- Independent tamper output
- On board test point facilitates installation and service
- Built-in accumulator

**Specifications**

Dimensions: 5.10"H x 3.26"W x 1.20"D

(13,0cm H x 8,3cm W x 3,0cm D)

Weight: 0.64 lbs. (0,29 kg)

Enclosure: Base: Die-cast aluminum  
Cover: Stamped Steel, 22 Gauge

Power Input: 9.0 VDC to 16.0 VDC, 12 VDC Nominal  
Maximum 0.1 V ripple

Typical Current: (Supply Voltage 12.0 VDC)  
Normal Standby Condition: 26 mA  
Alarm Condition: 24 mA  
Tamper Condition: 34 mA  
With model RTA connected, add 10 mA in Tamper Condition and 10 mA in Alarm condition

Maximum Current: (Supply Voltage 16.0 VDC)  
Normal Standby Condition: 26 mA  
Alarm Condition: 24 mA  
Tamper Condition: 34 mA  
With model RTA connected, add 14 mA in Tamper Condition and 14 mA in Alarm condition

Contact Data: Alarm Relay: Form C, 2.0 Amps at 30 VDC  
Tamper Contact: Form A, 2.0 Amps at 30 VDC

Optional Accessories: RTA Remote Test Annunciator  
UL Listed High Security Cable  
Required for UL Safe Complete installations

**Ordering Information**

Description	Stock No.
EVD-1 Detector	2020290
EVD-1C Safe Pak	2020230

Includes:

1 HSC-1 High Security Door Contact

Optional Equipment:

RTA Remote Test Annunciator	2000073
High Security Cable ("B" Cable)	5210408

Note: If 12 VDC is not available from main burglar panel, the following power supply and transformer is recommended:

12 VDC Power Supply	2020310
16.5 VAC Transformer	2020320

**WARNING**

If the main burglar panel has ground fault detection circuitry, it may be necessary to power the EVD from a separate power supply, not from the auxiliary power on the burglar panel. Alternately, the safe may be insulated from ground.

**EVD-1 Controller**

The EVD-1 controller is a microprocessor controlled, vibration detector that incorporates advanced detection methods for identifying all common types of attacks. It detects short duration, large amplitude signals like those produced in attacks from explosions, hammering or chiseling. It also detects long duration, small amplitude signals like those produced in attacks from torches, thermic lances, drills, grinders or cutting discs. As soon as the EVD-1 detects a large amplitude alarm source it signals an alarm. Small amplitude alarm sources must persist for 15 seconds before the EVD-1 signals an alarm. Alarm contacts operate for a minimum of 2 seconds.

The EVD-1 contains a sensitivity adjustment in its internal pickup. A cover tamper and a back tamper protect the EVD-1 from cover removal or prying. If either tamper on the EVD-1 activates, the EVD-1 will signal a tamper alarm condition. Tamper alarm contacts operate for a minimum of 2 seconds. *The internal pickup of the EVD-1 is always active, regardless of any tamper condition.*

The model EVD-1 controller provides a Form C, alarm contact for connection into the alarm protective circuit. Additionally, the EVD-1 provides an independent, Form A, tamper alarm contact which can be wired as a separate circuit or wired in series with the alarm protective circuit. The EVD-1 includes accessory terminals for an alarm condition remote annunciator, a tamper alarm remote annunciator, and a remote test input. The remote test input terminal permits the connection of dry contacts from any Underwriters Laboratories listed central station test unit. The remote test annunciator, model RTA, provides a normally open test switch and alarm and tamper alarm annunciators that interface directly to the accessory terminals of the EVD-1.

In addition to its remote test capability, the EVD-1 provides a magnetically activated test switch that permits testing of the installation. The EVD-1 contains a multi-color LED to indicate system status. This status LED indicates three states:

EVD-1 Status	Status LED Color	Alarm Contacts	Tamper Alarm Contacts
Normal	Green	Inactive	Inactive
Tamper	Amber (1)	Inactive	Active
Alarm	Red (2)	Active	Inactive or active (1)
No power	Off	Active	Active

**Notes**

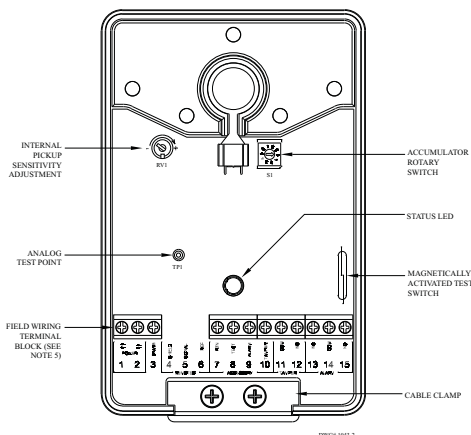
1. If both an alarm condition and a tamper alarm condition exist, the status LED will indicate RED for the alarm. The remote annunciators and the alarm and tamper alarm contacts will indicate both alarm and tamper alarm conditions.
2. If the microprocessor fails, the status LED will blink RED and both the alarm and tamper alarm contacts will be activated.

**Accumulator Function**

The EVD-1 contains a rotary switch that controls the EVD-1's accumulator setting. This accumulator, when activated, accumulates impact events. When the number of valid signals matches the setting on the rotary switch, the EVD-1 signals an alarm. This feature can be useful for installing an EVD-1 where some noise is normal. The accumulator is only active when the rotary switch setting is NOT zero. The threshold for valid signals is controlled by the sensitivity settings for the internal pickup. If the EVD-1 has not detected enough valid signals for an alarm and five minutes pass after the last valid signal, the EVD-1 resets the accumulator count to zero. As an aid to installers, the EVD-1 blinks its status LED for each valid accumulator signal that it detects. (This feature is only active while the EVD-1 cover is off and if the accumulator is activated, ie. during installation.) An analog test point provides signal level information to simplify installations.

Refer to Figure 1 for key component locations and terminal descriptions.

**Figure 1. EVD-1 Controller Details**



**EVD-1 Terminal Connections**

Terminal No.	Terminal Name	Description
1	(+)	Power Supply Connection, +12 VDC nominal (See note 1)
2	(-)	Power Supply Connection, 0 VDC (See note 1)
3	SPARE	Spare Terminal Block Position
7	RTN	Accessory Return Connection (See note 2)
8	TEST	Accessory Remote Test Input, Connect to RTN to Activate Test (See note 2)
9	ALARM	Accessory Remote Annunciator, Alarm (See notes 2, 3)
10	TAMPER	Accessory Remote Annunciator, Tamper (See notes 2, 4)
11	COM	Tamper Alarm Contact, Common
12	NC	Tamper Alarm Contact, Normally Closed in NON-TAMPER STATE
13	NC	Alarm Relay Contact, Normally Closed in NON-ALARM STATE
14	COM	Alarm Relay Contact, Common
15	NO	Alarm Relay Contact, Normally Open in NON-ALARM STATE

**Notes**

1. Observe polarity of power supply connections. **Application of voltages greater than 18 VDC may result in damage to unit.**
2. Connections to optional RTA, Remote Test Annunciator, or dry contacts from any UL listed central station test unit. See Figure 3 for details.
3. Remote annunciator terminal provides power-limited +12 VDC when alarm contact is in its ALARM state. **Limit current draw to 10mA.**
4. Remote annunciator terminal provides power-limited +12 VDC when tamper alarm contact is in its TAMPER state. **Limit current draw to 10mA.**
5. Pins 1-3 and 7-15 are power-limited.

**Recommended Wiring**

Figure 2 shows the recommended wiring for two examples of EVD-1 controllers.

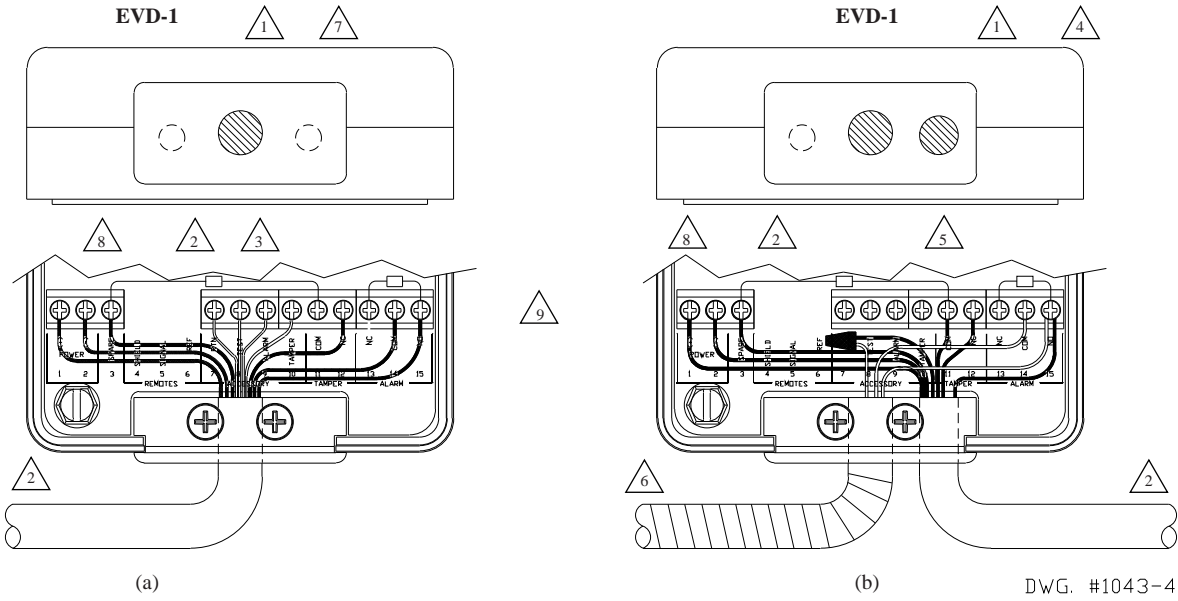
*(All wiring should be as specified in Table 1 or with UL listed equivalents.)*

1. Cable clamp knockout locations are shaded. Be sure to remove clamp from base and to cleanly knock out cable openings in the cable clamp before feeding wire through the clamp.
2. Connections to UL listed control unit via UL listed, high security cable, (See Table 1). See Figure 3b & 3c for 4 or 6 wire installation wiring.
3. Connections to remote test annunciator or RTA and/or connection of dry contacts from any Underwriters Laboratories listed central station test unit. Refer to Figure 3a for detailed information on annunciator and remote test interconnections.
4. With a safe contact, the EVD-1 requires the alternate cable clamp, (Potter #5280105), as shown in Figure 2b.
5. Safe contact circuit may be wired in series with protective alarm circuit.
6. Connections to dry contacts from any UL listed safe contact. Refer to Figure 3b for wiring.
7. Without a safe contact, the EVD-1 requires the standard, factory installed, cable clamp, (Potter #5280104), as shown in Figure 2a.
8. The EVD-1 must be connected to a UL listed control unit or power supply capable of providing nominal 12 VDC and standby power. 72 hours of standby power is required for bank vault alarms. 4 hours of standby power is required for mercantile alarms.
9. Terminals 1 - 3 and 7 - 15 on EVD-1 are power limited.

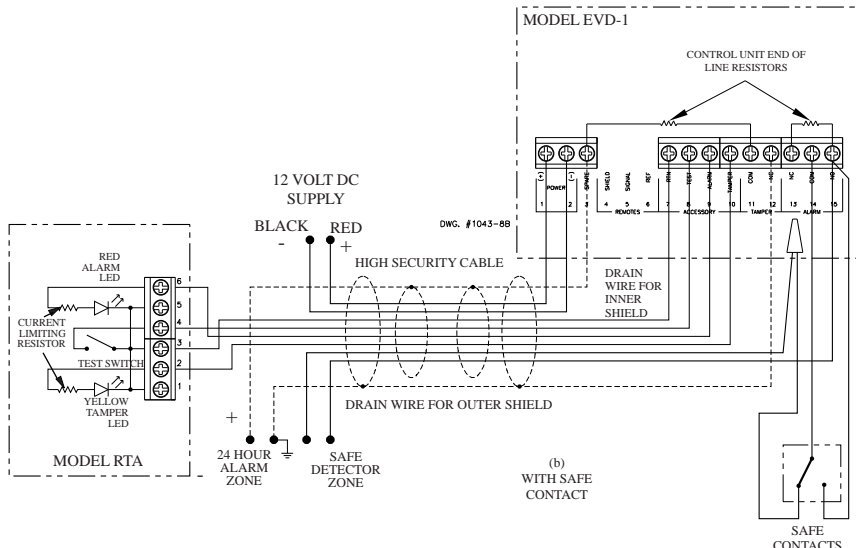
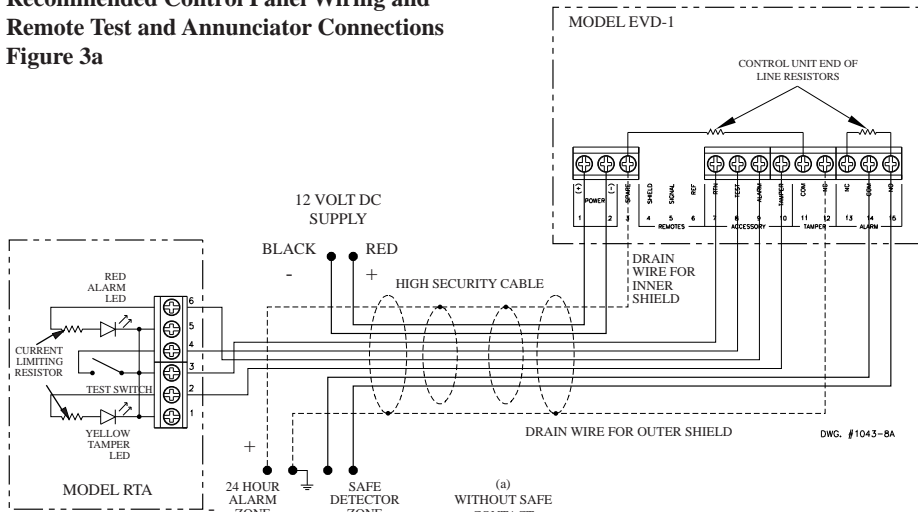
**Table 1. Recommended Wire Types**

Control Unit Connections	Remote Test/Annunciator Connections
Potter #5210408 required for UL Safe Complete installations	Belden 8444 or Alpha 1174C
4-wire hookup Belden 9512 General Cable C0762	
6-wire hookup Belden 9513 General Cable C0763	

Figure 2 Recommended Wiring EVD-1 Controller



Recommended Control Panel Wiring and Remote Test and Annunciator Connections  
Figure 3a



**Installation**

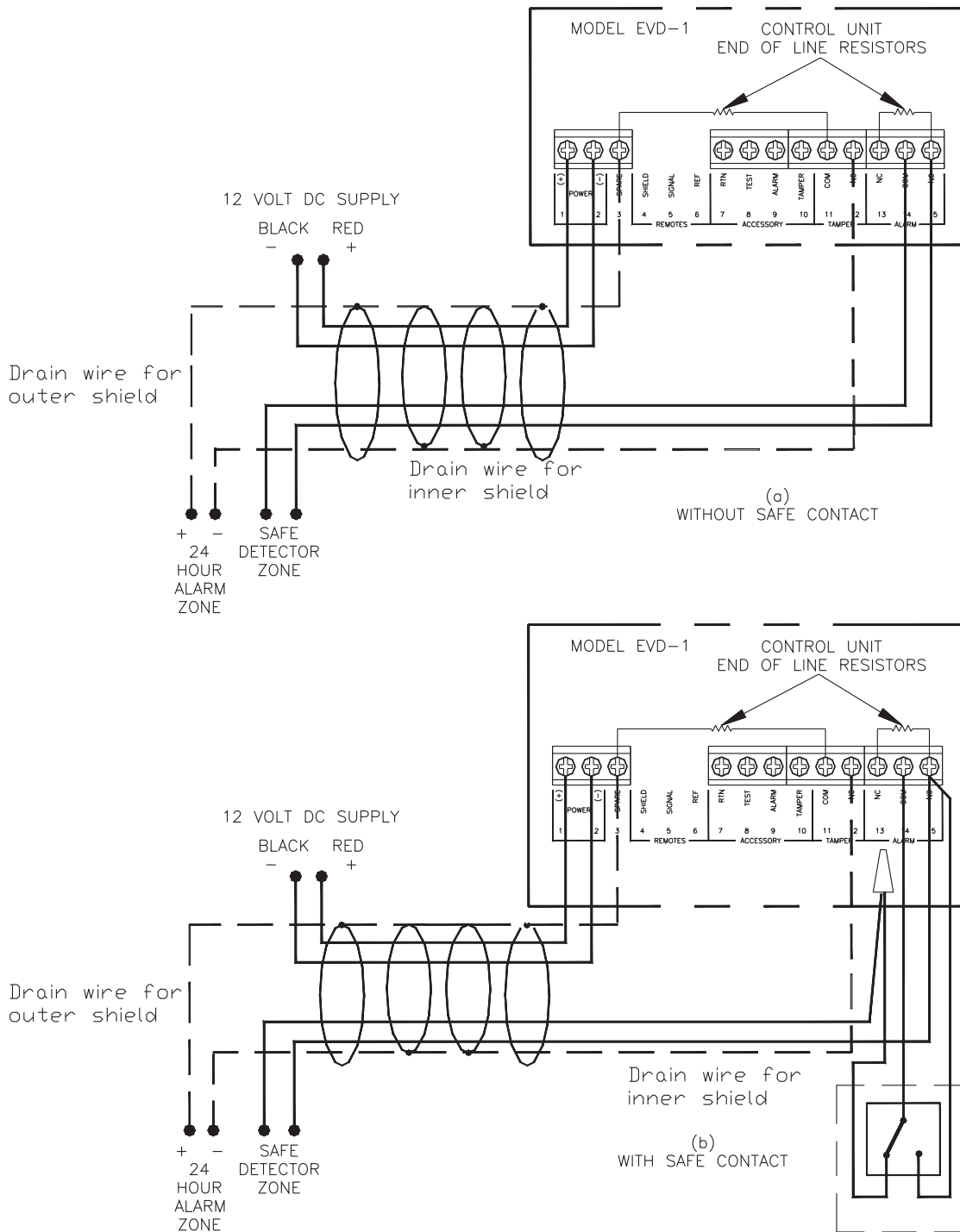
The EVD-1 System must be installed in accordance with all applicable local codes.

1. Mount EVD-1 controller and wire according to Figures 2 and 3a.
2. Refer to Figures 2a and 3a for connection of a remote test annunciator, RTA, and/or a UL listed central station test unit, if applicable.
3. Refer to Figures 2 and 3a for the connection of UL listed dry contacts, if applicable.
4. Wire control unit connections and apply 12 VDC to the EVD-1 system.
5. See Figures 3b & 3c for 4 or 6 wire installation wiring.
6. High Security "B" cable and connections to 24 hour alarm zone as shown are UL requirements for UL Safe Complete installations.



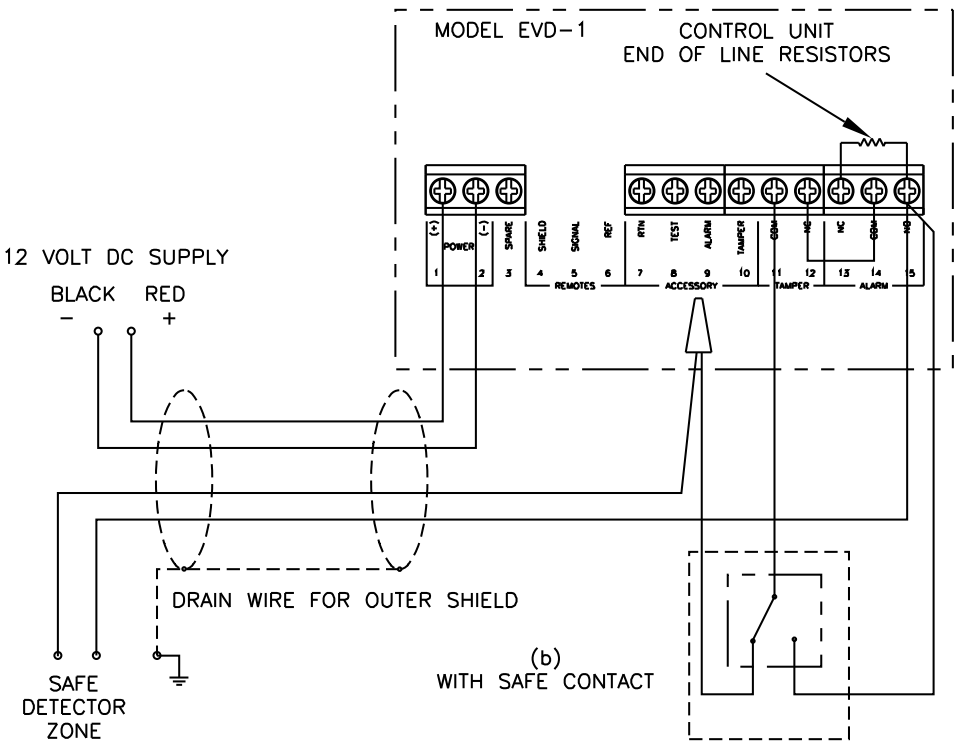
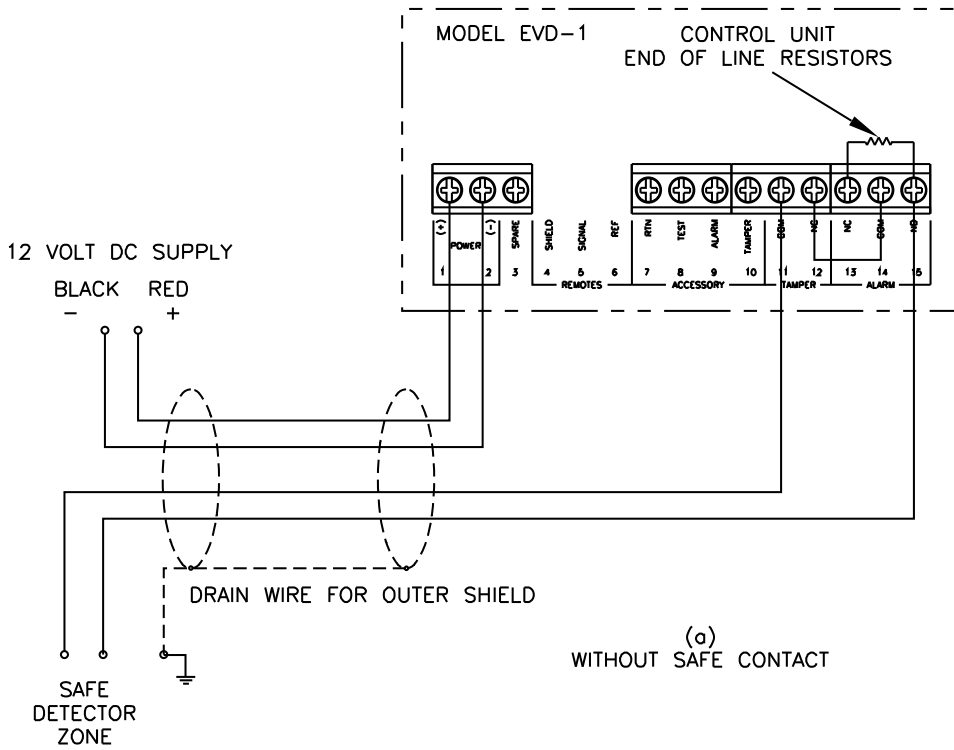
**Recommended Control Panel Wiring With Safe Detector Zone And 24 Hour Alarm (High Security "B" Cable Required For UL Safe Complete Installations)**

**Figure 3b**



DWG# 1043-10

Optional Control Panel Wiring With Safe Detector Zone Only (4 Conductor Shielded Cable Required)  
Figure 3c



DWG. #EVD4

### Sensitivity Adjustments

1. Adjust the EVD-1's internal pickup sensitivity control, **RV1**, to 1/2 scale (12 o'clock position). Refer to Figure 1 for location of **RV1**.
2. Adjust accumulator rotary switch, **S1**, to desired setting. A setting of zero disables the accumulator function. Refer to Figure 1 for location of **S1**.
3. Perform simulated attack tests on all accessible surfaces that are protected by EVD-1. Strike the protected surfaces using a plastic mallet or the plastic handle of a large screwdriver. An alarm condition (as indicated by the status LED turning RED) must occur. Lightly scrape the blade of a screwdriver next to the EVD-1. After 15 seconds of **continuous** scraping, an alarm condition (as indicated by the status LED turning RED) must occur. **Be sure the scraping generates a test point voltage greater than the minimum constant noise level shown in Table 2.** Adjust sensitivity settings to the **minimum** needed to achieve desired level of response.

*Note: Extreme care should be exercised so that the protected surfaces are not marred or damaged while performing simulated attack tests. A voltmeter can be connected to the analog test point and pin 2 of the field wiring terminal block to aid the installer in adjusting the sensitivity controls. Refer to Figure 1 for analog test point location.*

**Table 2. Analog Test Point Levels**

Signal Description	Analog Test Point Level
Maximum ambient noise level	0.20 VDC
Minimum constant noise for alarm (except drilling) (min. 15 sec. duration)	0.25 VDC
Minimum single noise for alarm (accumulator on)	0.70 VDC
Minimum single noise for alarm (accumulator off)	1.25 VDC

4. With the system operating in a non-alarm state, verify the operation of all tampers. A tamper condition is indicated by the status LED turning AMBER. *If the system is in alarm when a tamper condition occurs, the status LED will remain RED, identifying the alarm condition. The tamper alarm remote annunciator and the tamper alarm contact always identify a tamper condition.*

### Testing

Applying a magnet to the side of the EVD-1 controller, (see Figure 1), actuates a magnetic switch and generates a test signal. The EVD-1 activates the alarm contacts, activates the alarm remote annunciator, and illuminates the status LED in RED.

*Note: Most ordinary door contact magnets will activate the test feature on the EVD-1.*

System operation can also be verified from a remote location by use of an optional RTA and/or a UL listed central station test unit. Operating a normally open test switch generates a test signal which causes the EVD-1 to signal an alarm condition.

*Note: Always test unit prior to placing unit into service. Unit must be tested at least once a year.*

### Safe Construction Requirements

**Table 3. Maximum Linear Distances From Detector To Any Point On The Protected Surface**

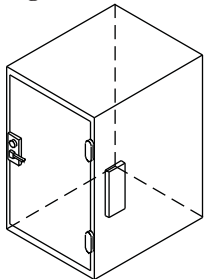
Safe Construction	Maximum Linear Distance from Detector to Any Point	Local Pickup Minimum Sensitivity Setting, RV1
Steel Safes Body: minimum 1/4" Door: minimum 1/2"	96 inches	Fully counterclockwise
Composite safes Body: minimum 16 gauge steel over 3" Composite material Door: minimum 1/4" steel over 3" composite material	110 inches	Fully counterclockwise

## Recommended Detector Locations

### Single Detector Applications

All safe applications must have at least one EVD-1 on the body of the safe. When only one detector is required on a safe, mount the detector on the exterior of the safe on the door hinge side, near the front edge and centered within the height of the safe. (Ideally, mount the detector's sensor center point 2 inches in from the front edge of the safe on the centerline of the safe's height, refer to Figure 9). Figure 4 shows the recommended detector location of a safe application requiring one detector. *Safes with double doors require a minimum of two detectors, even if the dimensions of the safe conform to the requirements for the use of a single detector.*

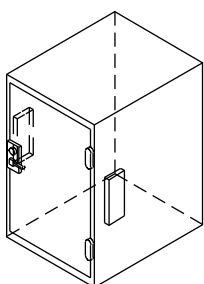
**Figure 4.**



### Two-Detector Applications \*

When two detectors are required on a safe, mount the first detector as recommended for a single detector installation. Mount the second detector on the opposite side of the safe, at the same height and with the same front edge offset as the first detector. *Safes with double doors that conform to the dimensional requirements for the use of one or two detectors should be protected in this fashion.* Figure 5 shows the recommended detector locations of a safe application requiring two detectors. Figure 6 shows the recommended detector location(s) of a safe application with double doors.

**Figure 5.**



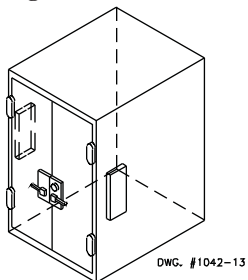
### Multiple Detector Applications \*

When more than two detectors are required on a safe, mount the first two detectors as recommended for a two-detector application. Mount the remaining detectors on the remaining surfaces, centered and spaced evenly to ensure complete detector coverage. Alternately, mount a detector centrally on the safe door and the remaining detectors centrally on the remaining surfaces, evenly spaced.

**Note: If any recommended detector location is not physically accessible, contact Potter's technical support for assistance.**

**\* The EVD-1 is a stand-alone detector. For applications requiring more than one detector, the EVD-2 may be more appropriate.**

**Figure 6.**



DWG. #1042-13

## Determining the Number of Detectors for A Safe Application

Refer to column one in Table 3 for the type of the safe in the application. In column two find the maximum linear distance from a detector to any point on the protected surface. This distance is the **detector range**. Next, refer to column one, (for steel safes), or column two, (for composite safes), in Table 4. Find the range of distances based upon the detector range that corresponds to the safe in the application. Using the row of this range of distances, determine the number of detectors from column three, (if safe has a single door), or from column four, (if safe has double doors). For applications with a larger distance than that shown in Table 4, consult Potter's technical support for assistance.

**Table 4.**

Max. Linear Distance from Detector to Any Point on Protected Surfaces of Steel Safes*	Maximum Linear Distance from Detector to Any Point on Protected Surfaces of Composit Safes*	Number of Detectors Required for Complete Coverage of Single Door Safes	Number of Detectors Required for Complete Coverage of Double Door Safes
D≤96"	D≤110"	1	2
96"<D≤192"	110"<D≤220"	2	2
192"<D≤288"	220"<D≤330"	3	3
288"<D≤384"	330"<D≤440"	4	4
384"<D≤480"	440"<D≤550"	5	5

Note: D=Maximum Linear Distance

\*Steel Safe Construction:

Body: Minimum 1/4" Steel

Door: Minimum 1/2" Steel

\*\*Composite Safe Construction:

Body: Minimum 16 Gauge Steel over 3" Composite Material

Door: Minimum 1/4" Steel over 3" Composite Material

#### Determining The Maximum Linear Distance on A Safe

A rule of thumb for estimating the maximum linear distance from the recommended detector location to any point on the protected surface is:

Example: h = 62" w = 55" d = 29"

- |                                       |  |
|---------------------------------------|--|
| 1. Compute $X1 = h + w$               | 1. $X1 = 62" + 55"$ ( $X1 = 117"$ )            |
| 2. Compute $X2 = 2d + w$              | 2. $X2 = (2 \times 29") + 55"$ ( $X2 = 113"$ ) |
| 3. Find $X =$                         | minimum ( X1, X2 )      3. $X = 113"$          |
| 4. Compute $J =$                      | $w + d4. J = 55" + 29"$ ( $J = 84"$ )          |
| 5. Find $D = \text{maximum} ( X, J )$ | 5. $D = 113"$                                  |

Where: h = Safe Height

w = Safe Width

d = Safe Depth

D = Maximum Linear Distance

This rule of thumb is valid for **most** available safe sizes. However, if any one dimension is very large or very small when compared to the other two dimensions, the safe may not follow this rule. In those cases, contact Potter's technical support for assistance. Table 5 lists some common safe dimensions and their maximum linear distances when detectors are installed in recommended locations.

**Table 5. Typical Safe Exterior Dimensions and Maximum Linear Distances**

Height (inches)	Width (inches)	Depth (inches)	Volume (cu. ft.)	Maximum Linear Distance (inches)
25.00	21.00	21.00	6.38	46.00
32.00	25.00	25.00	11.57	57.00
42.00	31.00	29.00	21.85	73.00
52.00	31.00	29.00	27.05	83.00
62.00	31.00	29.00	32.26	89.00
62.00	55.00	29.00	57.23	113.00
64.00	31.00	29.00	33.30	89.00
72.00	35.00	29.00	42.29	93.00
79.00	43.00	33.00	64.87	109.00

**Recommended Detector Locations**

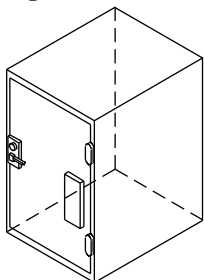
Detector on safe door:

If necessary, the detector can be mounted on the safe door (single door only). Mount the detector 1.75" from the edge of the hinge side of the door, centered on equal distance between both hinges.

Fig. 9 shows the recommended detector location when mounting the detector on the door.

*Note: When the detector is mounted on the safe door, the maximum linear distance decreases to 73.5" from the sensor location, through the hinges, to all points on the safe body.*

**Figure 7**



**EVD-1 Mounting on Safe Door**

Typical UL Complete Safe Installations

1. Install in accordance with Underwriter Laboratories' standard UL 681.
2. Install EVD-1 detectors in recommended locations at recommended spacings.
3. Install UL listed, high security contacts on the exterior of the safe or UL listed, ordinary use contacts on the inside of the safe.
4. Wire detectors and safe door contacts as shown in Figures 2 and 3a.
5. Listed power supply or control unit must provide at least 4 hours of standby power for mercantile alarms and 72 hours of standby power for bank vault alarms.

Typical UL Complete Vault Installations

1. Install in accordance with Underwriter Laboratories' standard UL 681.
2. Install EVD-1 detectors on interior walls, ceilings, and floors, spaced as shown in Figure 7. Refer to Table 6 for maximum spacing on various materials.
3. A detector must be installed on the vault door if the net steel thickness is less than 1 1/2 inches.
4. Wire detectors and door contacts as shown in Figures 2 and 3a.
5. Listed power supply or control unit must provide at least 4 hours of standby power for mercantile alarms and 72 hours of standby power for bank vault alarms.

**EVD-1 Wall Protection**

Figure 7 shows the rectangular areas of 100% coverage when detectors are installed adjacent to one another. The detector spacing is the sensor center point distance between adjacent detectors. The detector spacing is the same as the width of the rectangular area of 100% coverage. Table 6 lists the dimensions of the rectangular areas of 100% coverage on continuous surfaces for several materials and sensitivity settings. When a surface extends around a corner via a solid connection, detector coverage extends into that surface, but the coverage is reduced to 3/4 of the remaining detector range. All joints, cracks, and corners dampen structure borne vibrations. Vibration transfer across these imperfections must be tested to ensure complete coverage within the detector's range. Modular constructions require one detector per panel and must be constructed of the materials listed in Tables 3 and 6.

**Table 6 Recommended Safe Sizes When Mounting Detector on the Safe Door**

Height (inches)	Depth (inches)	Width (inches)
12	12	12
12	18	18
12	24	18
12	24	24
18	12	12
18	18	18
18	24	18
18	24	24
24	12	12
24	18	18
24	24	18
24	24	24
24	12	12
24	18	18
24	24	18
24	24	24
30	30	30
30	24	30
30	30	24
30	36	24
30	24	36
36	12	12
36	18	18
36	24	18
36	24	24
36	24	24
36	24	28
36	28	24

