ADEMCO **INSTALLATION INSTRUCTIONS**

Inertia Crossbar System

TYPE 973 MULTIZONE LATCHING MONITORS

using

TYPE 985, 986* LATCHING SENSORS

TABLE A: MODEL DESIGNATIONS			
Catalog number Multizone Latching Monitor Kits	Number of Zones	Number of AN5TM Modules	Compatible Latching Sensors
973-5	5	1	985 986
973-15	15	3	985 986
973-25	25	5	985 986

*Each Sensor Type can be ordered with white or brown housing. The letters "WH" or "BR" follow the part numbers, respectively. For example 985WH is a White Slimline Latching Sensor.

INDEX:

Sections:

Tables and Diagrams:

GENERAL INFORMATION:

The Inertia Crossbar System detects shocks generated by an intruder attempting to break through a protected perimeter. Sensors, installed at key locations, process these impulses and transmit an alarm signal to the Type 973 Latching Monitor.

Individual zone annunciation is provided by LEDs on an AN5TM available in displays of 5, 15, or 25 indicators. The resultant forced-entry (shock) detection system can be used alone or can complement other forms of perimeter protection. The system possesses the ability to detect attacks **before** an intruder gains entry to the premises.

The Inertia Crossbar System Type 973 Latching Monitors can supervise and annunciate an unlimited number of Latching Sensors in any combination. For ease of servicing, however, a maximum of 30 sensors per 973 is recommended. If annunciation is required for more than 25 Latching Sensors, some combination of 973 Kits is recommended. (See Table A.)

The 973 is designed to work with any Power source providing 6-14 Volts DC and current in accordance with the General Specifications on page 5.

DESCRIPTION:

Each 973 ICS System is supplied as a kit which consists of a No. 973AP( ) switch plate, a BKT2 bracket assembly, a 973 Latching Monitor board, a Tamper switch (mounted on the BKT2 bracket) and an appropriate number of AN5TM annunciator boards.

BKT1 bracket assemblies, each for mounting two additional AN5TM, five LED, annunciator boards may be added as needed if additional LEDs are required for zone annunciation (e.g. when more sensors are used).

The bracket assemblies are mounted in a standard or multi-ganged electrical box (not included) and are covered by a 973AP (5, 15 or 25) Switch/LED plate. See Diagrams 7 and 8. Flush or surface mounted electrical boxes may be used.

Type 973 Latching Monitors:

The No. 973 Latching Monitor Board contains a RESET switch, alarm relay, system LED and terminals and leads to connect to:

Two-wire supervised sensor circuit with end-of-line resistor;
Protective circuit;
DC power (6V to 14VDC);
AN5TM annunciators.

The No. 973 Monitor board is mounted on the BKT2 bracket assembly. The board's tabs engage slots located in the BKT2 as shown in Diagrams 7 and 8.

Each sensor's sensitivity can be individually adjusted. Blows applied to the surface area that is protected (a succession of small shocks, a smaller number of larger attacks, or a single gross attack) trip and latch the sensor an in turn trip and latch the monitor and place it in alarm.

The "system" LED located above the reset switch on the 973 monitor will light and so will the AN5TM individual zone LED(s) corresponding to the sensor(s) that tripped. The LED on each tripped sensor will also light to pinpoint the source(s) of alarm.

The monitor's SPST alarm contacts can be used in any closed protective circuit. Reset is accomplished by momentarily operating the RESET switch on the edge of the monitor board or by momentarily interrupting DC Power to the unit.

Type 985 Latching Sensors:

Each sensor's tampered housing contains a shock sensing module, a "trip level" (sensitivity) adjustment potentiometer and terminals for connection of the two wire, end-of-line resistor supervised sensor loop and (if required) a separate tamper loop. The housing is designed for surface mounting. An LED is visible through its cover.

The 985 Latching Sensor's terminal blocks are removable. This allows connections to be made in a less confined space. When replacing the wired blocks, the wires should be carefully dressed to avoid interference with the cover, LED, tamper switch or other components on the circuit board.

Each sensor contains a "time/pulse integrator" processing circuit which has been designed for optimum response to attempts at forced entry through most building materials. See Diagram 1. The alarm trip level is reached after the sensing of a succession of light shocks (e.g.: gentle prying of a door or window) or a smaller number of heavier shocks (e.g.: hitting or pounding on the building structure). A gross attack (very large single shock including breaking of glass) or fault in the sensor loop will trip the system **immediately**. The time/pulse integrator circuit provides good immunity to lower level **occasional** shocks that may be caused by building expansion, contraction or other transient occurrences.

The sensing module may be rotated up to 180° about its axis to facilitate mounting on a vertical, horizontal or sloping surface and to enable sensor operation in a NORMAL or DAMPED mode, depending upon range desired, characteristics of the mounting surface and other field conditions. See Diagram 2.

At the heart of the sensing module is the inertia crossbar assembly. A high inertia mass is mounted on a highly polished goldplated "crossbar" which straddles four other highly polished gold plated elements in such a manner as to provide two parallel paths for the sensor circuit current with two sensing/contact points in each path. Optimum long term stability and reliability are provided by this multiple path arrangement.

Forced entry attempts typically produce vibrations which affect the contact points of the sensing module's inertia crossbar assembly. The resultant tiny and rapid variations in sensor circuit current are then processed by the sensor's time/pulse integrator. If a series of shocks of sufficient intensity is sensed, the trip level will be reached, the unit will trip and its LED will light steadily. The monitor's system LED and appropriate zone LED will light and the alarm will be signaled to the protective system control.

TYPE 986 MULTISENSOR LATCHES:

The 986 sensor contains processing circuits similar to those of the 985. It is also designed to accept an unlimited number of 981 or 983 ICS sensors in addition to its own sensing module, and report attack on any one (or more) of them. The 986 will latch (and report an alarm to the 973) when any of the sensors served by it (see Diagram 3) causes the trip level to be exceeded. Since there is only a single trip level adjustment for the entire group of sensors, all of these sensors connected to a 986 sensor should be mounted on the same type of surface in the same vicinity so that one adjustment is optimum for all and they will all have approximately the same diameter of protection. The latched LED (and annunciator output) of the 986 reports the status of the entire group and can not register which one of the sensors was attacked. For ease of servicing a maximum of 20 sensors is recommended for connection to a single 986 and a total of 30 sensors directly to a single 973.

AN5TM ANNUNCIATOR:

Five zone annunciation is provided with an AN5TM annunciator board. Each AN5TM annunciator board contains terminals for connection of DC power and the zone leads from individual sensors. A separate wire must be run from each sensor's Annunciator terminal to the corresponding zone LED terminal on the AN5TM.

The DC input terminals of the AN5TM are marked RED and BLACK (positive and negative respectively). OBSERVE POLARITY.

The first AN5TM used is mounted on the BKT2 bracket adjacent to the No. 973 Latching Monitor board. Additional annunciator boards are mounted on BKT1 brackets when expanded zone annunciation is required. See Diagrams 7 and 8.

INSTALLATION AND WIRING:

Preliminary Considerations and Sensor Location:

Because of the many types of building materials and construction methods used, it is impossible to give precise sensor location information for any shock system. Table B gives general guidelines for sensor adjustment and the diameter of protection (DP) that might be obtained under ideal conditions when a sensor is mounted on one of various materials.

1. **The diameter of protection (DP) may be smaller where there are discontinuities in the mounting surface,** such as windows, doors, corners or joints between panels, or cracks. In these cases, the sensors should be mounted at 1/2 DP from the center of the gap. See Diagram 4 (a,b,c,d). Where the opening exceeds the DP, use sensors around the edge as shown in Diagram 4 (e).
2. **Locate sensors at the most likely intrusion height relative to outside ground level.** Where the height of a wall exceeds 1 1/2 DP, use two rows, staggered as shown in Diagram 4 (f).
3. **Sensors on surfaces below outside ground level require half DP spacing.**
4. **Loose or rattling surfaces may give false shock signals.** In particular, check windows for loose frames or panes.
5. **Beams, studs and electrical conduit increase shock transmission.** For example, when protecting roof areas, take advantage of the shock transmitting properties of beams.
6. **Sensors on window frames should be located 2" or less from glass.**
7. **Sensors on glass should be located at least 3" in from the frame.** See Installation Procedure, Step 4b for mounting information.

Installation Procedure:

1. **Locate the monitor** either **near** the main protective system's control panel or at any other location where viewing of the zone LEDs will be convenient. The monitor is designed to be mounted in a standard electrical box (flush or surface).
2. **Run wiring between the control panel, monitor and sensor locations** as indicated in Diagram 5 or, if a separate tamper circuit is desired, Diagram 6.

Use of twisted wiring is recommended for the sensors to minimize the possibility of picking up unwanted induced voltages.

3. **Make connections to the monitor as indicated in Diagram 5 or 6** but DO NOT CONNECT DC VOLTAGE TO THE MONITOR until the sensors have been installed and all other connections have been made.

   Carefully observe the polarity on the annunciator board (AN5TM) power terminals. (Note that alternate AN5TM boards have + and − terminals in opposite positions).

4. **Mount and connect the sensors.**

   a. **Remove the cover** by releasing the screw on its face.

   b. **Mount the backplate** via the three mounting holes provided.

IMPORTANT: The backplate must be in close contact with the mounting surface. Where the surface is unavoidably rough, make sure that high points are close to and touching the area behind the sensing module.

The sensors may also be mounted using double sided foam tape (not thicker than 1/16") on firm surfaces (e.g., glass, stone, etc.).

Note: Sensors must be installed so that the **axis** of the sensing module is **horizontal,** whether the unit is mounted on a vertical, horizontal or sloping surface (see Diagram 2).

   c. **Rotate the sensing module** until the line on its end is vertical with the N (normal) or D (damped) position uppermost (see Diagram 2).

Note: The damped mode is useful on "problem" surfaces that are exposed to public areas or other possible sources of unwanted vibration.

   d. **Make connections as indicated in Diagram 5 or 6.** Be sure to install the end-of-line resistor at the last sensor. Replace sensor covers.

5. **Connect the required DC voltage to the monitor.** Observe polarity! Mount the monitor in the electrical box to be used.

   The voltage should be provided from a source that can supply 40 mA nominal at 6-14V DC and that has at least 4 hours standby in the event of AC power failure. Additional current of approximately 15 mA for each 985 or 986 connected to the system and 10 mA for each AN5TM annunciator board is required.

6. **Proceed with TESTING AND ADJUSTMENT.**

TESTING AND ADJUSTMENT:

With the required DC voltage applied to the monitor and the sensor loop closed, the monitor's system LED and all zone LEDs should be off and its alarm contact should be in the non-alarm position. In addition, all sensor LEDs should be off.

Note: If the tampers have been connected in the sensor loop (Diagram 5), the monitor's cover plate and all sensors' covers must be in place (or the tamper terminals temporarily shorted).

1. **At the first 985 or 986 sensor in the sensor loop, open the sensor loop momentarily.** (Note: If the tampers have been connected in the sensor loop, the loop will be automatically opened by the releasing of the sensor's tamper switch upon the removal of the sensor cover). The monitor's system LED should light steadily and its alarm contacts should operate while the loop is open. No zone LED will light.
2. **Remove a sensor cover and set the sensor's sensitivity adjustment pot.** to the suggested initial setting range indicated in Table B for the type of surface being protected by the sensor. Replace the cover if the sensor's tamper switch is in the tamper loop.
3. **Tap the area near the sensor with a hard object** (such as a screwdriver handle or small hammer) about once per second until the sensor's alarm trip level is reached and its LED lights.

   The monitor's system LED and appropriate zone LED will light and its alarm relay contacts will operate. Depress the RESET switch. **Note:** If the tampers are in the sensor loop, reset can be accomplished at the sensor by simply removing the sensor's cover momentarily to open (release) the tamper.

   Repeat the tapping test several times at different points near the sensor.

   As explained earlier, if the sensor is properly adjusted to respond to a succession of small shocks and/or a smaller number of larger shocks it would also respond to a very large "gross" attack.

   If necessary, adjust the sensor's sensitivity pot. (clockwise to increase sensitivity, counterclockwise to decrease) until desired results are obtained. The pot's final setting does not necessarily have to be within the initial setting range indicated in Table B.

If the sensor is overly sensitive while operating in the NORMAL (N) mode, it may prove desirable to orient its sensing module in the DAMPED (D) mode and to readjust its sensitivity pot. accordingly. Conversely, a sensor with low sensitivity while in the DAMPED (D) mode may require operation in the NORMAL (N) mode.

4. **Repeat Steps 2 and 3 for each sensor** and replace all covers.

GENERAL SPECIFICATIONS:

Physical:

	973-5	973-15	973-25
Width:	2¾" (7 cm)	4½" (11.4 cm)	6½" (16.5 cm)
Height:	4½" (11.4 cm)	4½" (11.4 cm)	4½" (11.4 cm)
Depth:	1¾" (4.5 cm)	1¾" (4.5 cm)	1¾" (4.5 cm)

	985	986	983
Width:	1½" (3.8 cm)	2⅛" (5.4 cm)	1½" (3.8 cm)
Height:	2½" (6.4 cm)	3¼" (8.3 cm)	2½" (6.4 cm)
Depth:	1⅛" (2.9 cm)	1⅛" (2.9 cm)	1⅛" (2.9 cm)

	981
Diameter:	⅞" (2.2 cm)
Depth:	1¼" (3.2 cm)

Electrical:

973 MONITOR

Input Voltage: 6-14 VDC (nominal)
Input Current: 40 mA standby
15 mA (max) additional for each tripped sensor
Alarm Contacts: SPST, 1.0A, 28 VDC, 20 W (max. ratings)
Tamper Contacts: 0.1 A, 28 VDC (max. ratings)
Sensor Loop: 60 ohms permissible resistance
(plus 1K ohm end-of-line resistor)

983 SENSORS

Tamper Ratings: 0.1 A, 28 VDC (max. ratings)

986 MULTI SENSOR LATCH

Tamper Ratings: 0.1 A, 28 VDC (max.)
Input Current: 15 mA

985 LATCHING SENSORS

Tamper Ratings: 0.1 A, 28 VDC (max.)
Input Current: 15 mA

AN5TM

Input Current: 10 mA

TO THE INSTALLER

Regular maintenance and inspection (at least annually) by the installer and frequent testing by the user is vital to continuous satisfactory operation of any alarm system.

The installer should assume the responsibility of developing and offering a regular maintenance program to the user as well as acquainting the user with the proper operation and limitations of the alarm system and its component parts. Recommendations must be included for a specific program of frequent testing (at least weekly) to insure the system's proper operation at all times.

***TABLE B** COVERAGE AND SENSITIVITY ADJUSTMENT GUIDELINES

SENSITIVITY POT SETTING RANGES	MATERIAL	DIAMETER OF PROTECTION (DP) NORMAL (N) MODE	DIAMETER OF PROTECTION (DP) DAMPED (D) MODE	SENSITIVITY POT. SUGGESTED INITIAL ADJUSTMENT "O'CLOCK" SETTING RANGES (SHADED AREAS) TYPE 985, 986
A (LOW)	Heavy Metal	15 ft	9 ft	
	Sheet Metal	10 ft	7 ft	
B (LOW INTERMEDIATE)	Plate Glass	12 ft	8 ft	
	Wood Paneling	8 ft	6 ft	
	Hardboard	8 ft	6 ft	
C (HIGH INTERMEDIATE)	Multi-Pane Glass	10 ft	7 ft	
	Plaster Board	8 ft	5 ft	
D (HIGH)	Concrete Block (Hollow)	12 ft	8 ft	
	Cinder Block (Hollow)	12 ft	8 ft	
	Concrete (Solid)	10 ft	7 ft	
	Cinder Block (Solid)	10 ft	7 ft	
	Brick	9 ft	6 ft	

***IMPORTANT:** This table is for guidance and comparison only. Actual coverage obtained and final sensitivity pot. setting required will vary because of differences in materials, construction methods and other field connections and will not necessarily fall within the boundaries shown here.

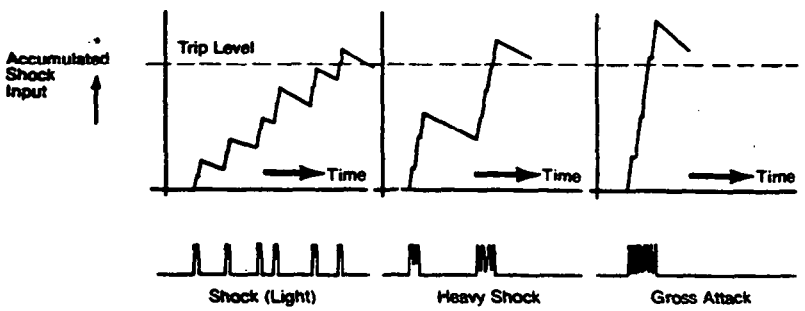


Diagram 1: LATCHING SENSOR TIME/PULSE INTEGRATOR SHOCK RESPONSE

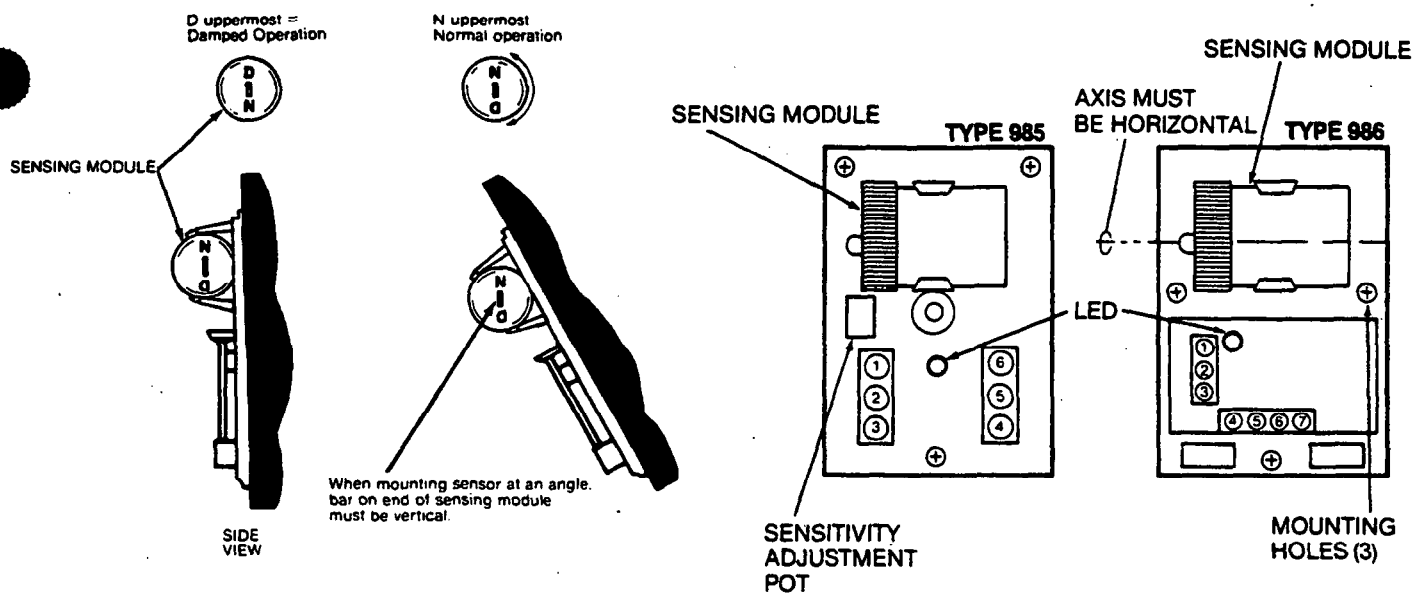


Diagram 2: LATCHING SENSORS, INSTALLATION DETAILS

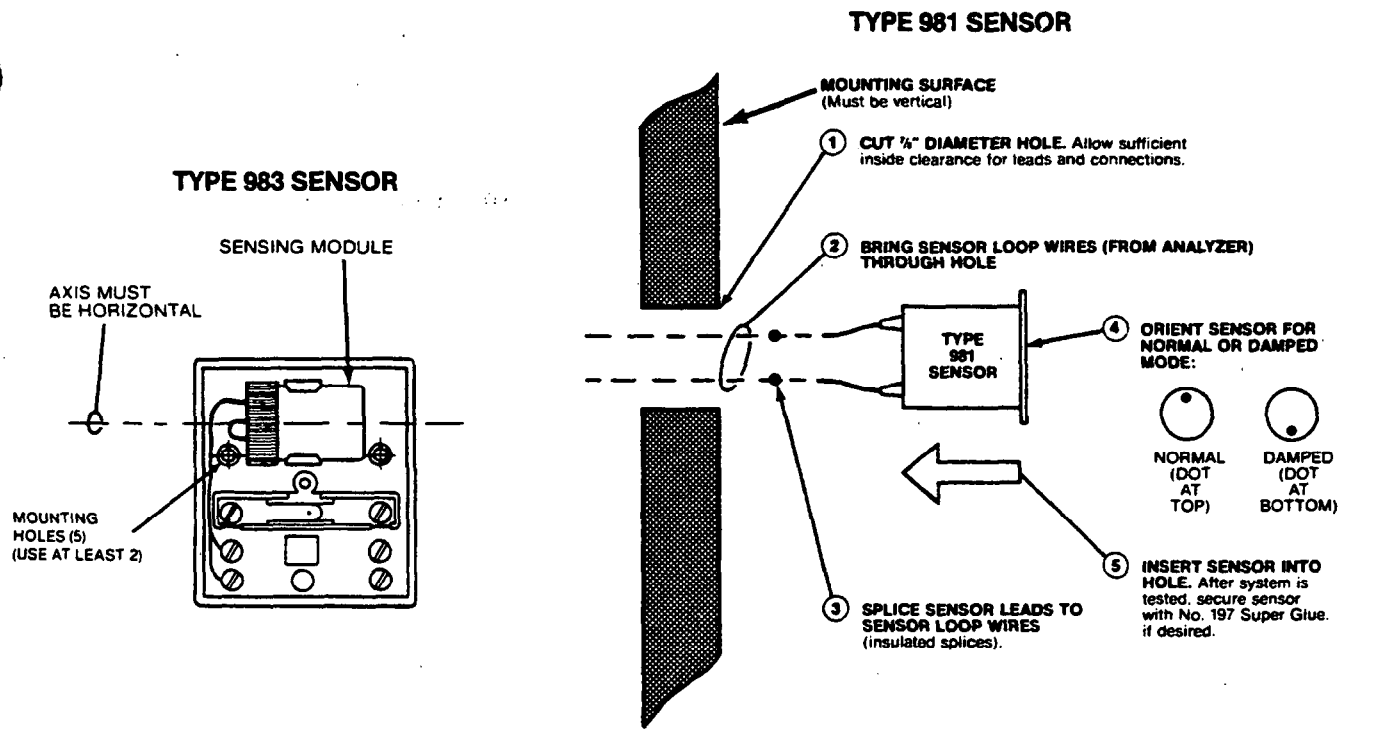
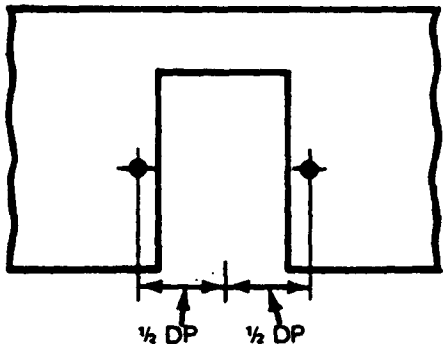
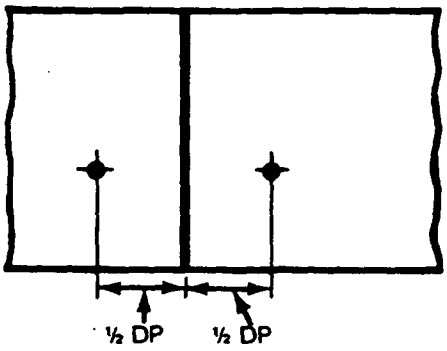


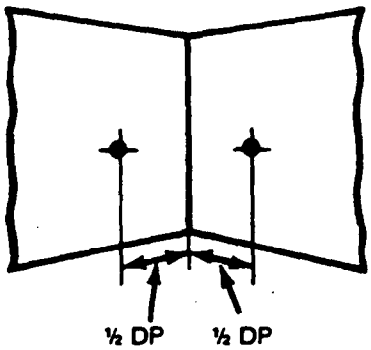
Diagram 3: SENSORS FOR USE WITH TYPE 986, INSTALLATION DETAILS



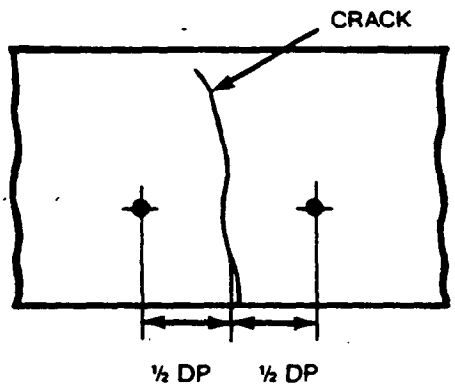
a. Sensors mounted to either side of door opening.



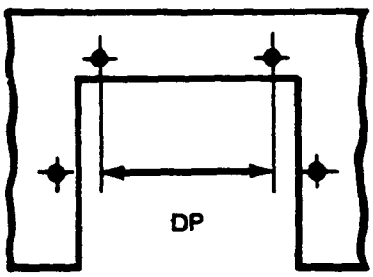
b. Sensors mounted close to gap in partitioning.



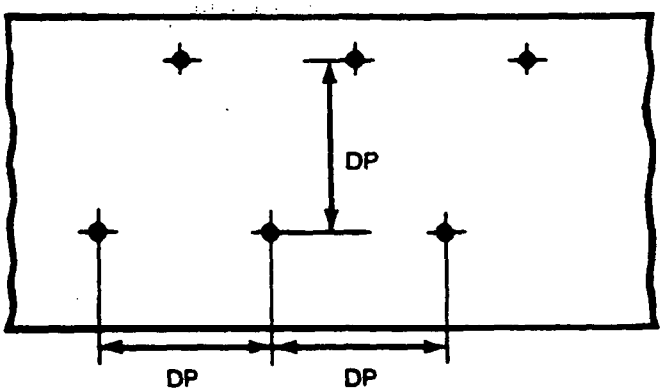
c. Sensors mounted close into corner.



d. Sensors mounted adjacent to crack.



e. Sensors mounted around wide opening.



f. Sensors mounted on high wall.

Diagram 4: TYPICAL SENSOR LOCATIONS

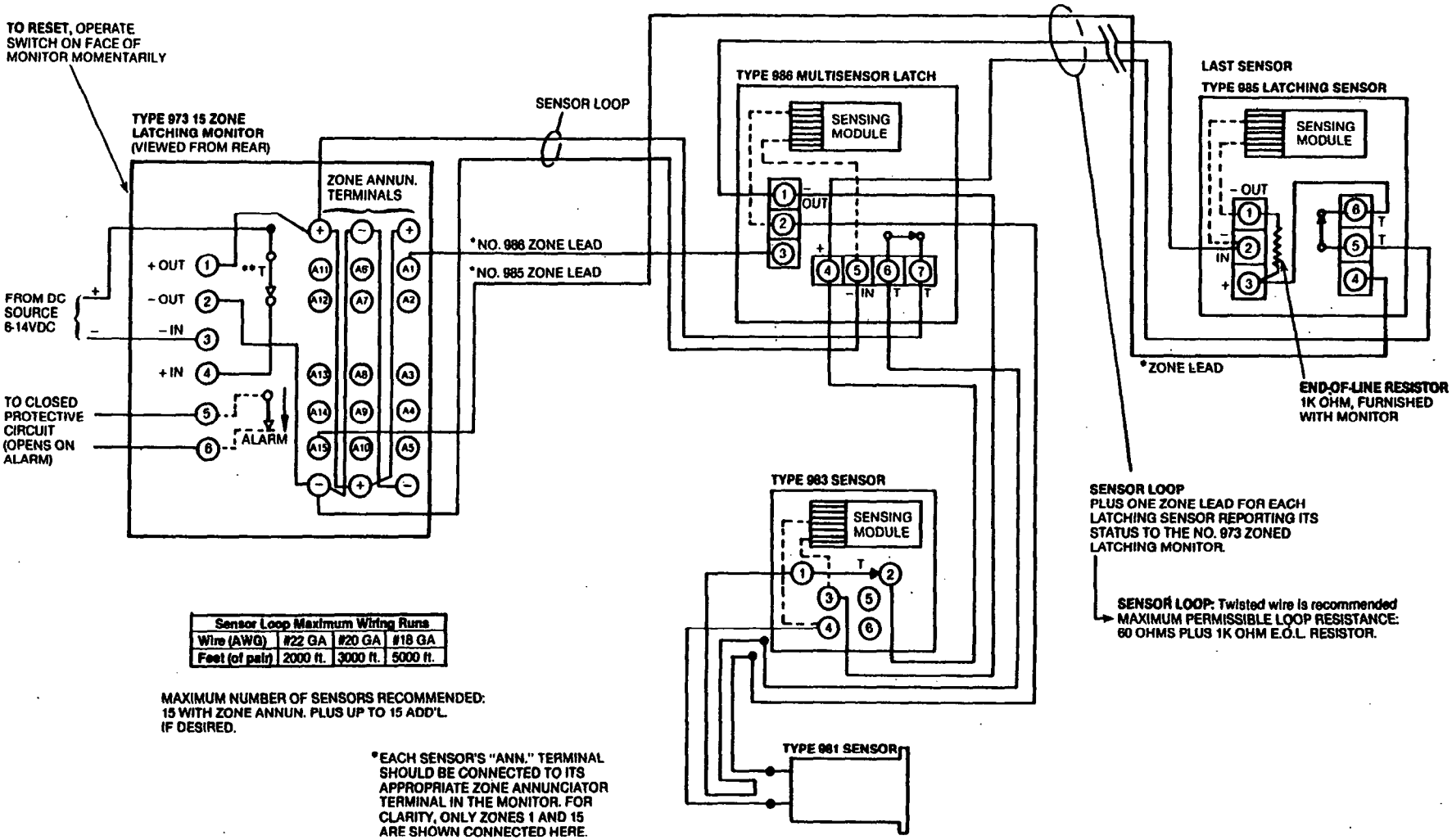


Diagram 5: FIELD CONNECTIONS, *WITHOUT* SEPARATE TAMPER LOOP

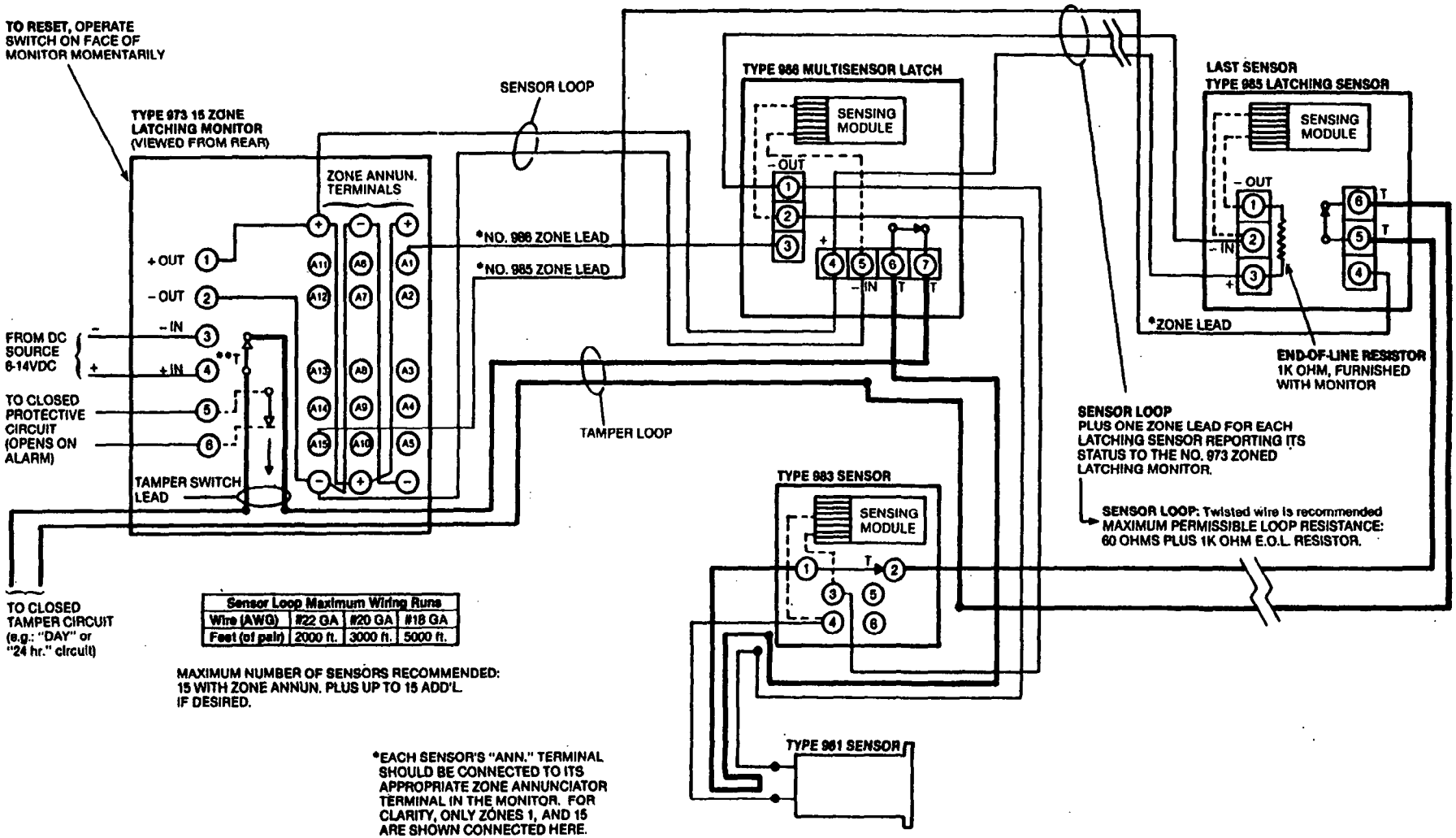
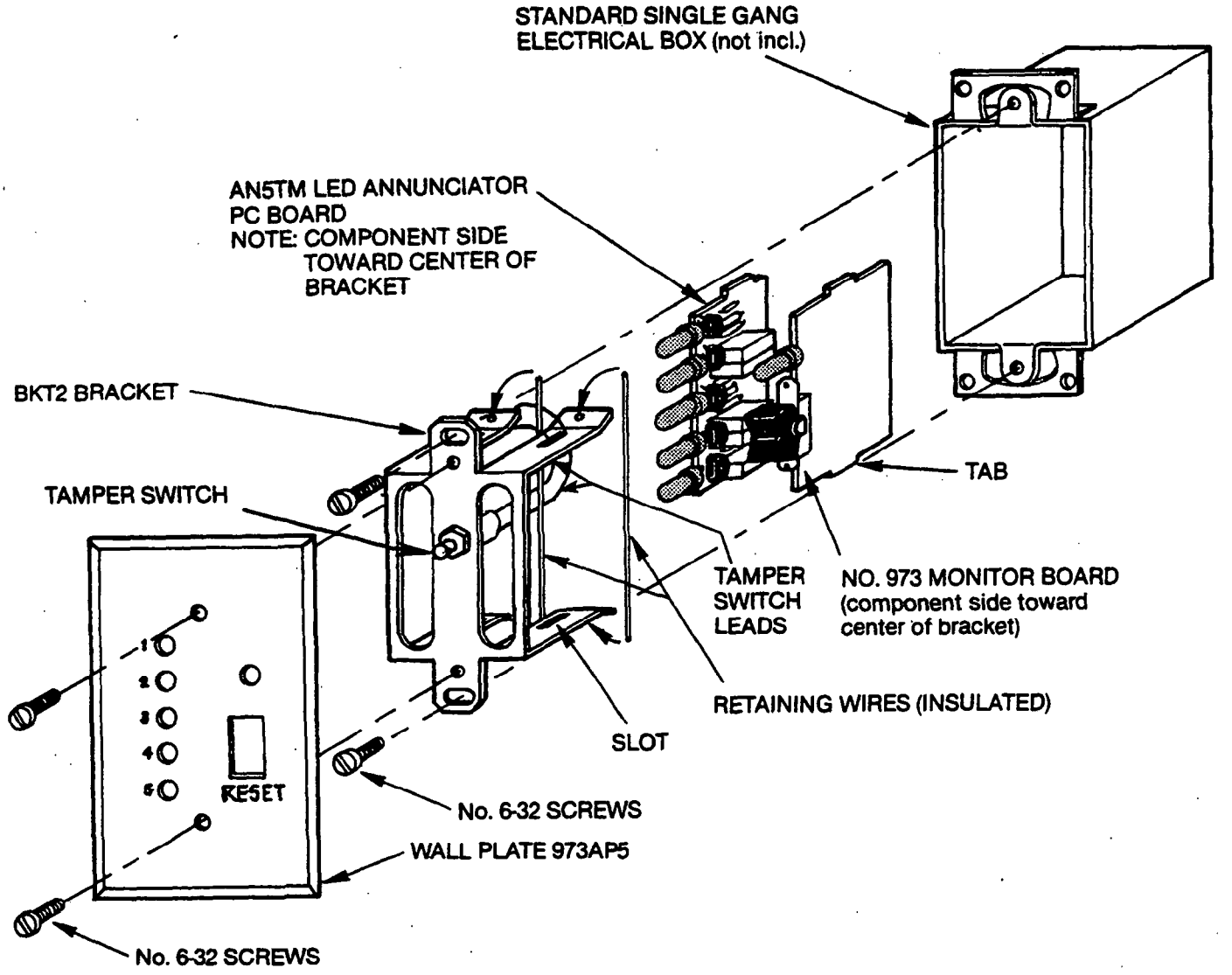


Diagram 6: FIELD CONNECTIONS *WITH* SEPARATE TAMPER LOOP



NOTE: 973-15 requires a BKT-1 and two AN5TM Annunciator Boards in addition to the components shown.
A 973AP15 must be used in place of the 973AP5 Faceplate shown.
A ganged electrical box is required.

See Diagram 8

973-25 requires two BKT-1 brackets and four AN5TM boards in addition to the components shown.
A 973AP25 Faceplate must be used in this configuration.

Diagram 7: 973-5 INSTALLATION

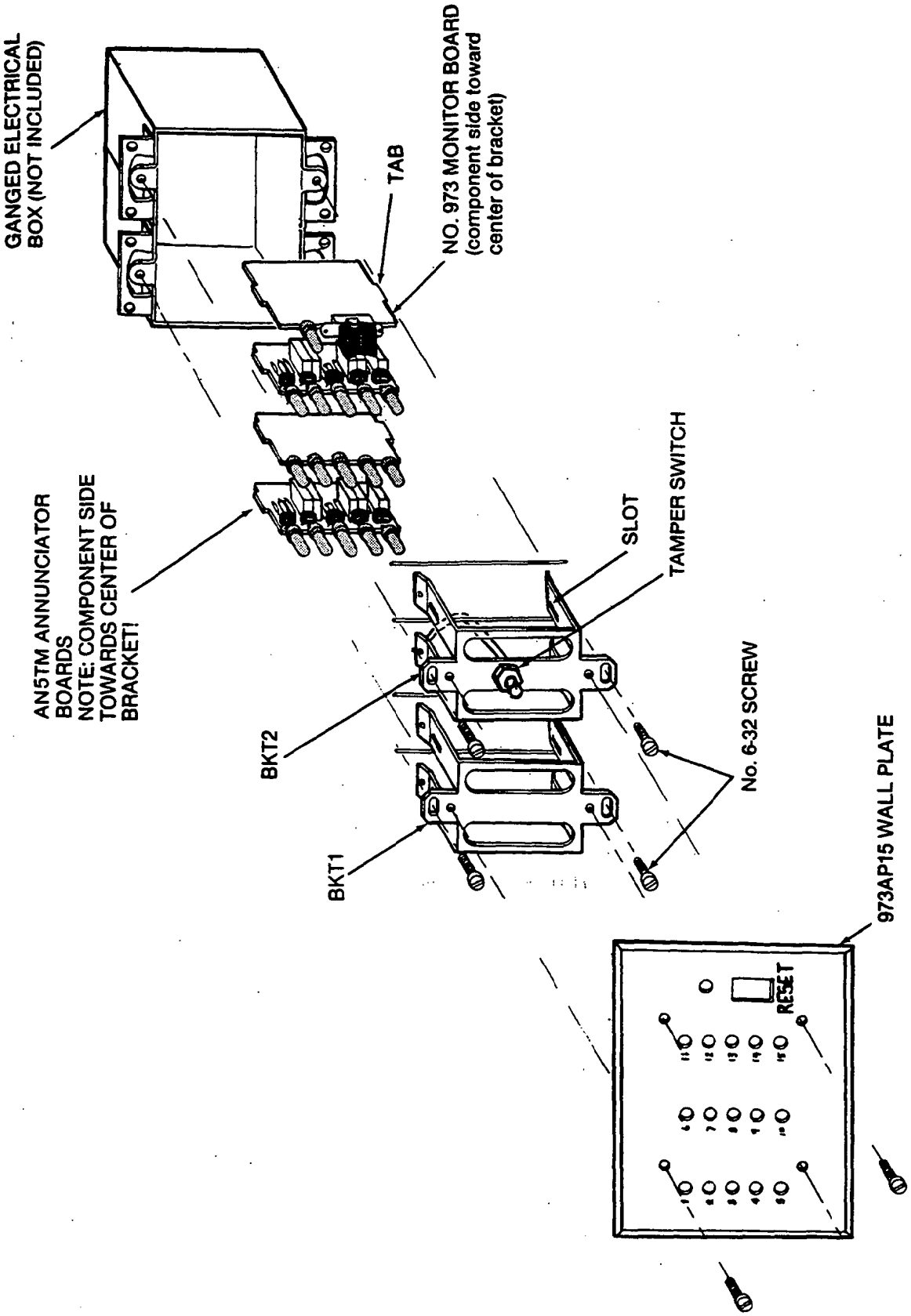


Diagram 8: 973-15 INSTALLATION (INSTALLATIONS WITH FEWER OR MORE ANNUNCIATORS FOLLOW SIMILAR PATTERN)

ADEMCO
ALARM DEVICE MANUFACTURING CO.
A DIVISION OF PITTWAY CORPORATION
165 Eileen Way, Syosset, New York 11791
P9629 5/84