Inertia Crossbar System

®ADEMCO INSTALLATION INSTRUCTIONS

TYPE 970 (6V and 12V) ANALYZERS
using
TYPE 980 and/or 981 SENSORS

TABLE A: MODEL DESIGNATIONS					
TYPE 970 ANALYZERS			TYPE 980, 981 SENSORS*		
Cat. No.	Color	Voltage	Cat. No.	Color	Mounting
970WH6	WHITE	6VDC	980WH	WHITE	SURFACE
970BR6	BROWN		980BR	BROWN	SURFACE
970WH12	WHITE	12VDC	981WH	WHITE	FLUSH
970BR12	BROWN		981BR	BROWN	FLUSH

*May be used with any Type 970 Analyzer

INDEX:

Sections:

Tables and Diagrams:

GENERAL INFORMATION:

The Inertia Crossbar System Type 970 Analyzers accommodate any number of Type 980 and/or 981 Sensors (although a maximum of 30 is recommended for ease of servicing). 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.

Briefly, the system functions in this way. The analyzer will respond to blows applied to the surface(s) protected by the sensors. A succession of small shocks, a smaller number of larger shocks, a single "gross" attack or a fault in the sensor loop will trip the analyzer and place it in alarm. System reset is accomplished by interrupting the analyzer's power momentarily, unless optional automatic reset has been selected during installation.

The analyzer's alarm contacts can be connected to any alarm panel possessing a closed circuit protective loop.

The 6V Type 970 Analyzers require 6VDC (current: 60ma) for their operation. The 12V models require 12VDC (current: 40ma). Except where otherwise indicated, the information contained herein applies to both types.

DESCRIPTION:

Type 970 Analyzers:

Each analyzer is furnished in a tampered housing containing an LED (visible through the unit's cover), a "trip level" (sensitivity) adjustment potentiometer, and terminals for connection of: a) Two wire supervised sensor circuit with end-of-line resistor, b) separate tamper loop (if required), c) protective circuit (the unit's closed contacts open during alarm) and d) 6VDC power (or 12VDC as required). Also provided is a jumper which can be cut to select optional automatic reset.

The analyzer 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) or fault in the sensor loop will trip the system **immediately.** The time/pulse integrator circuit provides good immunity to lower level **occasional** shocks such as may be caused by building expansion or contraction or other transient occurrences.

When the analyzer's trip level is reached its alarm contacts will open and its LED will light. The unit will remain thus in alarm until reset by momentary interruption of power (if optional automatic reset has been selected the system will reset itself after about 5 seconds).

Type 980 (Surface Mounted) Sensors:

Each sensor's tampered housing contains a shock sensing module 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.

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 gold plated "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 analyzer's time/pulse integrator. If a series of shocks of sufficient intensity is sensed, the trip level will be reached and the unit will go into alarm.

Type 981 (Flush Mounted) Sensors:

Each Type 981 functions similarly to the Type 980 Sensors but is designed for flush mounting on **vertical** surfaces **only.** It is particularly useful where aesthetic considerations are of prime importance, such as in residences. The unit is provided with two leads for connection in the analyzer's sensor circuit. No tamper is necessary as the sensor is self-contained in a round molded housing. The unit requires a ⅞" diameter hole for mounting and a small dot on its face enables orientation for NORMAL (dot at top) or DAMPED (dot at bottom) mode of operation. See Diagram 3.

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, but Table B gives general guidelines as to the diameter of protection (DP) that might be obtained under ideal conditions for each sensor when mounted on various materials.

Any number of sensors may be connected to a single analyzer but a maximum of 30 is recommended for better operation and ease of servicing.

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 ½ 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 1½ 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 5b for mounting information.

8. **Wherever possible, divide the installation into separate zones, using several analyzers.** This allows greater control and aids in troubleshooting.
9. **Where a wide variety of surfaces and materials must be protected,** that would make setting difficult, consider using Type 982 Latching Sensors in conjunction with a Type 972 Latching Monitor or Type 973 Zoned Latching Monitor. The individual sensitivity of *each* sensor can then be adjusted for optimum performance.

Installation Procedure:

1. **Mount the analyzer** either *near* the main protective system's control panel or *within* it (double sided foam tape can be used).
2. **Run wiring between the control panel, analyzer and selected 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 analyzer as indicated in Diagram 5 or 6** but DO NOT CONNECT DC VOLTAGE TO THE ANALYZER until the sensors have been installed and all other connections have been made.

   Note: The reset switch shown in Diagrams 5 and 6 will **not** be required if the voltage will be otherwise interruptible for reset or if optional automatic reset is selected as described in Step 4.
4. **Optional automatic reset may be selected if desired** by cutting the jumper at the upper right of the analyzer's circuit board. **With the jumper intact,** reset requires momentary interruption of DC power via the reset switch or otherwise. **With the jumper cut,** the system will reset automatically after about 5 seconds. In either case, the system will reset only if the sensor loop is intact and undisturbed at the time. After reset the system will be ready to respond to subsequent conditions.
5. **Mount and connect the sensors.**

   TYPE 980 (SURFACE MOUNTED) SENSORS:

   a. **Remove the cover** by releasing the center screw.

   b. **Mount the backplate** via the two mounting holes provided.
   IMPORTANT: The backplate must be in close contact with the mounting surface and not resting on small projections such as an electrical outlet. Where the surface is unavoidably rough, make sure that high points are close to and touching the area behind the sensing module.

   When mounting on glass, remove the identification label from the rear of the sensor and mount with double sided foam tape (not thicker than 1/16") to clean, dry glass.

   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.

   TYPE 981 (FLUSH MOUNTED) SENSORS:

   Connect and install in accordance with Diagram 3. The mounting surface must be vertical (axis of unit horizontal). Orient the unit in its NORMAL (dot toward top) or DAMPED (dot toward bottom) position as desired.
6. **Connect the required DC voltage to the analyzer.** Observe polarity! Incorrect polarity could blow the fuse or circuit breaker in the power source.

   The voltage should be provided from a source that can supply 60ma at 6VDC (40ma at 12VDC) and that has at least 4 hrs. standby in the event of AC power failure.
7. **Proceed with TESTING AND ADJUSTMENT.**

TESTING AND ADJUSTMENT:

With the required DC voltage applied to the analyzer and the sensor loop closed, the analyzer's LED should be off and its alarm contacts should be closed.

Note: If the tampers have been connected in the sensor loop (Diagram 5), connect a temporary jumper across terminals 7 and 8 so that testing and adjustment may be accomplished with the analyzer cover removed.

1. **Place a momentary short across the sensor loop.** The analyzer's LED should light steadily and its alarm contacts should open. Reset by operating the reset button or otherwise interrupting the voltage momentarily (unless optional automatic reset has been selected).
2. **Open the sensor loop momentarily** (if the tampers have been connected in the sensor loop, this may be accomplished by removing a sensor cover momentarily). The same alarm conditions should occur as in Step 1. Reset the system (unless optional automatic reset has been selected).
3. **Turn the arrow on the analyzer's sensitivity adjustment pot. to the suggested initial setting range indicated in Table B** for the type of surface being protected by the sensors.

4. **Tap the area near a sensor with a hard object** (such as a screwdriver handle or small hammer) about once per second until the analyzer goes into alarm.

   The LED will light when the alarm trip level is reached. Reset the system (if required) and repeat several times at different points near the sensor.

   As explained earlier, if the analyzer 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 analyzer'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 readjust the analyzer's sensitivity pot. accordingly. Conversely, a sensor with low sensitivity while in the DAMPED (D) mode may require operation in the NORMAL (N) mode.

5. **Repeat Step 4 for each sensor.** Keep in mind that the final setting used for the analyzer's sensitivity pot. must be satisfactory for the system's least and most sensitive sensors.

6. **Remove the jumper across analyzer terminals 7 and 8 (if one was added) and replace the analyzer's cover.**

GENERAL SPECIFICATIONS:

Physical:	**Type 970 Analyzers**	**Type 980 Sensors**	**Type 981 Sensors**
Width:	2⅛" (5.4 cm)	2⅛" (5.4 cm)	⅞" (2.2 cm) Diameter
Height:	3¼" (8.3 cm)	2⅛" (5.4 cm)	
Depth:	1⅛" (2.8 cm)	1⅛" (2.8 cm)	1¼" (3.2 cm)

Electrical:	**Type 970 Analyzers**	
	6V Models	**12V Models**
Input Voltage:	6VDC (nominal)	12VDC (nominal)
Input Current:	60ma (nominal)	40ma (nominal)
Alarm Contacts:	2A, 120V, 20W (maximum ratings)	
Tamper Contacts:	2A, 250V, 30W (maximum ratings)	
Sensor Loop:	60 ohms permissible resistance (plus 1K ohm end-of-line resistor)	

	Type 980, 981 Sensors
Sensor Ratings:	30ma, 50V, 100mW (max., non-inductive)
Tamper Ratings (Type 980 only):	500ma, 50V, 10W (max., non-inductive)

TO THE INSTALLER

Regular maintenance 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 to insure the system's proper operation at all times.

*TABLE B: COVERAGE AND SENSITIVITY ADJUSTMENT GUIDELINES			
MATERIAL	DIAMETER OF PROTECTION (DP)		SENSITIVITY POT.
	NORMAL (N) MODE	DAMPED (D) MODE	SUGGESTED INITIAL ADJUSTMENT "O'CLOCK" SETTING RANGES (SHADED AREAS)
Heavy Metal Sheet Metal	15 ft 10 ft	9 ft 7 ft	A MIN. STOP MAX. STOP
Plate Glass Wood Paneling Hardboard	12 ft 8 ft 8 ft	8 ft 6 ft 6 ft	B MIN. STOP MAX. STOP
Multi-Pane Glass Plaster Board	10 ft 8 ft	7 ft 5 ft	C MIN. STOP MAX. STOP
Concrete Block (Hollow) Cinder Block (Hollow) Concrete (Solid) Cinder Block (Solid) Brick	12 ft 12 ft 10 ft 10 ft 9 ft	8 ft 8 ft 7 ft 7 ft 6 ft	D MIN. STOP MAX. STOP

*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 conditions and will not necessarily fall within the boundaries shown here.

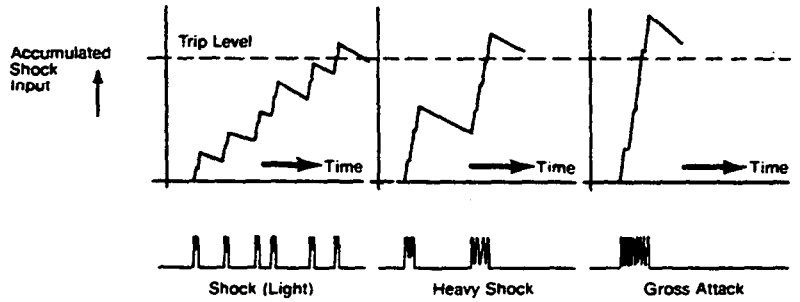


Diagram 1: TYPE 970 ANALYZER'S TIME/PULSE INTEGRATOR SHOCK RESPONSE

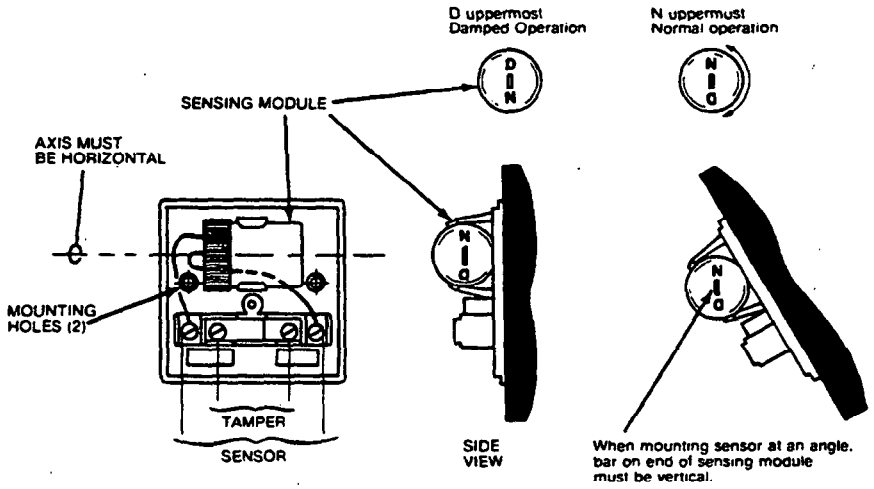


Diagram 2: TYPE 980 SENSOR, INSTALLATION DETAILS

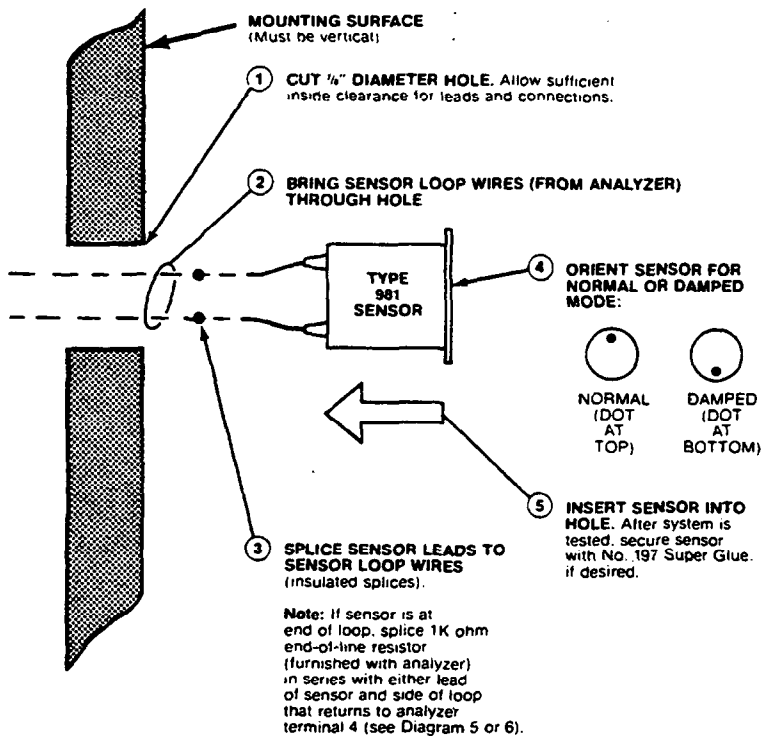
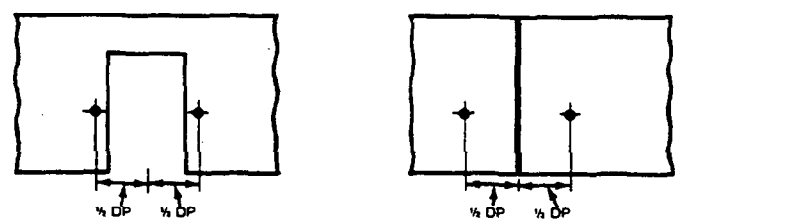
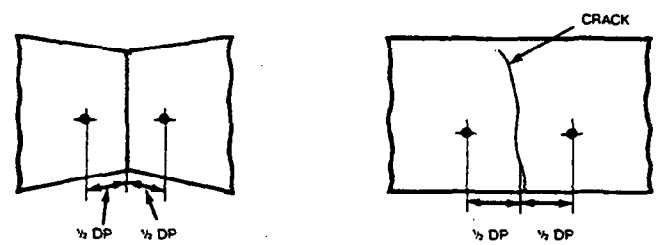


Diagram 3: TYPE 981 SENSOR, INSTALLATION DETAILS



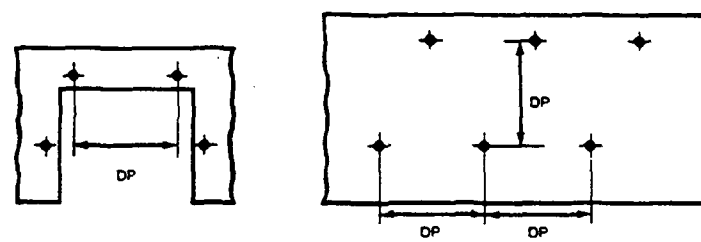
a. Sensors mounted to either side of door opening.

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

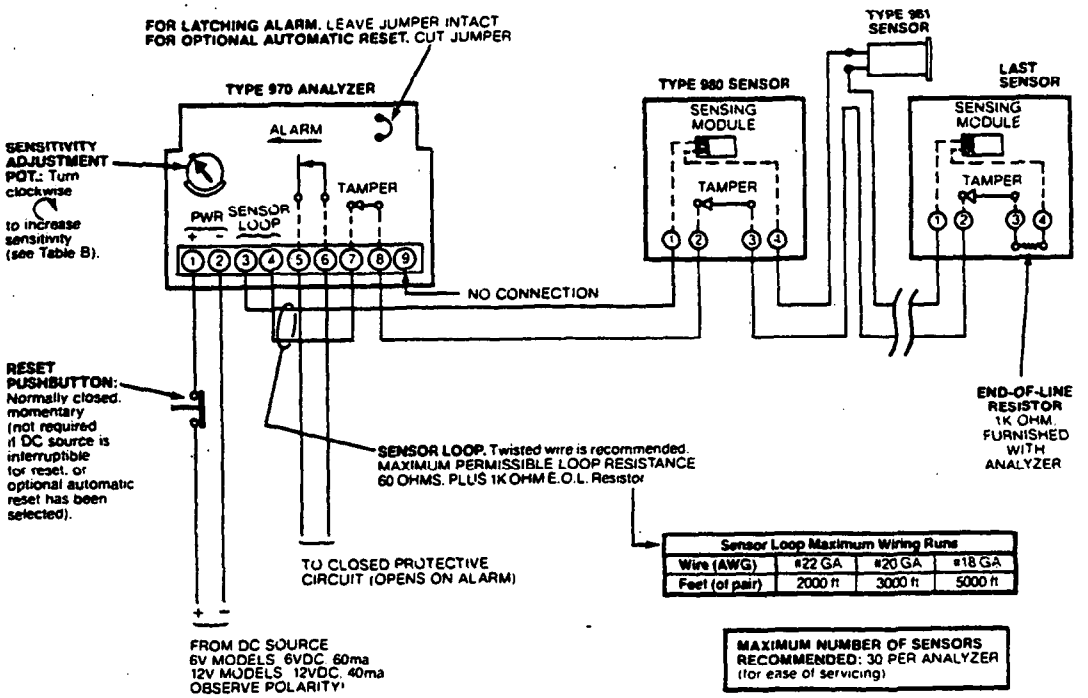


Diagram 5: FIELD CONNECTIONS, *WITHOUT* SEPARATE TAMPER LOOP

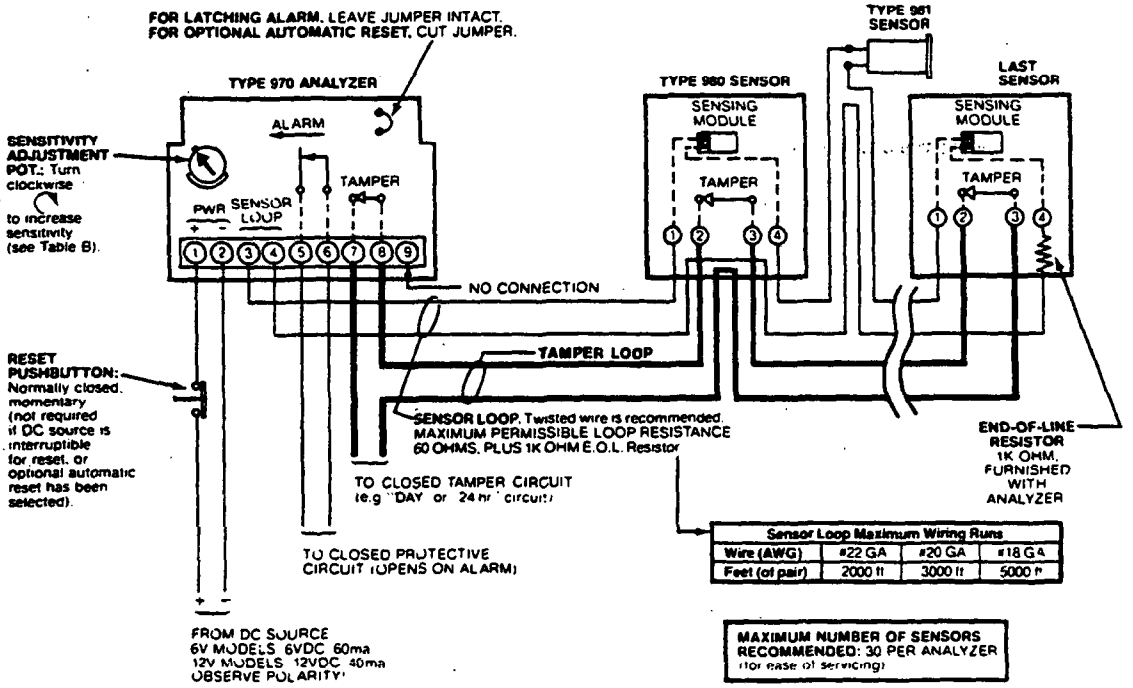


Diagram 6: FIELD CONNECTIONS, *WITH* SEPARATE TAMPER LOOP