



INSTALLATION INSTRUCTIONS

**TYPE 971 (6V and 12V)
MULTI-COUNT ANALYZERS**
using
**TYPE 980 and/or 981
SENSORS**

TABLE A: MODEL DESIGNATIONS					
TYPE 971 MULTI-COUNT ANALYZERS			TYPE 980, 981 SENSORS*		
Cat. No.	Voltage		Cat. No.	Color	Mounting
971-6	6VDC		980WH	WHITE	SURFACE
971-12	12VDC		980BR	BROWN	SURFACE
			981WH	WHITE	FLUSH
			981BR	BROWN	FLUSH

*May be used with No. 971-6 or 971-12 Multi-Count Analyzer

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GENERAL INFORMATION:

The Inertia Crossbar System Type 971 Multi-Count 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 multi-count analyzer will respond to blows applied to the surface(s) protected by the sensors. A preset number of lower level shocks (field programmable from one to nine), a single "gross" attack or a fault in the sensor loop will place the multi-count analyzer in alarm. System reset is accomplished by pressing the reset switch on the analyzer's cover, unless optional automatic reset has been selected during installation.

The multi-count analyzer's alarm relay contacts can be connected in any alarm panel's closed circuit protective loop.

The No. 971-6 Multi-Count Analyzer requires 6VDC (current: 60ma) for its operation. The No. 971-12 requires 12VDC (current: 40ma). Except where otherwise indicated, the information contained herein applies to both models.

DESCRIPTION:

Type 971 Multi-Count Analyzers:

Each analyzer is furnished in a tampered housing with an ALARM LED and a RESET pushbutton on its hinged cover. The unit contains a potentiometer for adjusting gross attack trip level (sensitivity to lower level multi-count shocks is fixed) and pins for programming the count number at which the unit will trip. Terminals are provided for connection of: a) Two wire supervised sensor loop with end-of-line resistor, b) Protective circuit (the unit's closed alarm relay contacts open during alarm) and c) 6VDC power (or 12VDC as required). The RESET pushbutton is pre-connected to two terminals. Optional automatic reset may be obtained by disconnecting this switch.

The multi-count analyzer's trip level is reached upon the sensing of the field-programmed number of lower level shocks (one to nine) at intervals of one second or more within a fixed time period of approximately 30 seconds. A gross attack (very large single shock) or fault in the sensor loop will trip the system immediately. See Diagram 1.

While a succession of shocks (e.g.: from the gentle prying of a door or window or hitting or pounding on the building structure) will be detected, the system has good immunity to lower level occasional shocks such as may be caused by building expansion or contracting or other transient occurrences.

Whenever a lower level shock is seen by the sensor loop, the analyzer's LED will light momentarily. When the trip level is reached the LED will light steadily and the alarm contacts will open. The unit will remain thus, in alarm, until reset by the pressing (for approximately 5 seconds) of the RESET switch on its cover (if optional automatic reset has been selected the system will reset itself after about 5 seconds).

Note: The analyzer has an alarm memory. If a momentary interruption of power occurs while the system is in alarm, the LED will relight and the alarm contacts will remain open when power resumes until subsequently reset manually (or automatically).

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 designated 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 multi-count analyzer. If the programmed number of shocks (or a single shock of sufficient intensity) is sensed, the trip level will be reached and the analyzer 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 2 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 7/8" 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 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. Located 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. Beam 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 6b, 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.** The individual sensitivity of each sensor can then be adjusted for optimum performance.

Installation Procedure:

1. **Mount the analyzer near the main protective system's control panel.**
2. **Run wiring between the control panel, the analyzer and the location(s) selected for the sensor(s)** as indicated in Diagram 5 or 6, whichever is applicable. Use of twisted wiring is recommended for the sensor loop 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 (Step 7).
4. **Optional automatic reset may be selected, if desired** by disconnecting the RESET switch connected to terminals 5 and 6. **With the switch connected, reset requires pressing of the RESET switch on the unit's cover for approximately 5 seconds. With the switch disconnected, 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. **Program the "shock count" number at which it is desired that the unit go into alarm by moving the analyzer's selector pin jumper to the appropriate pair of numbered pins on the PC board (see Diagram 5 or 6).**
Note: If the selector pin jumper is omitted, the multi-count analyzer will respond similarly to a No. 970 Analyzer. The system will trip after a sequence of shocks of sufficient intensity bring the unit to the trip level corresponding to the unit's sensitivity pot. setting.

6. 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.

7. **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 provide 60ma at 6VDC (40ma at 12VDC) and that has at least 4 hrs. standby in the event of AC power failure.
8. **Proceed with TESTING AND ADJUSTMENT.**

TESTING AND ADJUSTMENT:

With the required DC voltage applied to the analyzer and the sensor loop closed and undisturbed, the ALARM LED should be off and the alarm relay contacts should be closed.

Note: If the tampers have been connected in the sensor loop (Diagram 5), the analyzer's cover tamper activator arm should be temporarily taped down to permit testing and adjustment with the analyzer's cover open. **Caution: Do not forget to release the activator when testing is complete.**

1. **Place a momentary short across the sensor loop (terminals 3 and 4).** the analyzer's LED should light steadily and its alarm contacts should open. Reset by operating the RESET pushbutton for approximately 5 seconds (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 (this will occur automatically if 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. This adjusts only the gross attack sensitivity of the system. Lower level multi-count sensitivity is fixed.
4. Test the system's multi-count response by tapping 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 momentarily whenever a shock is detected by one of the sensors (alarm contacts will not open) and will light steadily when the programmed count is reached and the unit goes into alarm. Reset the system and repeat several times at different points near the sensor.
5. Test the system's gross attack response by applying heavy blows near a sensor (take care not to damage the protected surface). A single heavy blow should place the system in alarm.
If necessary, readjust 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.
6. Repeat Steps 4 and 5 for each sensor. Keep in mind that the final setting used for the analyzer's sensitivity pot. must be satisfactory for a gross attack on the system's least and most sensitive sensors.
7. Release the analyzer's tamper switch actuator arm (if it was taped down in Step 1) and replace the analyzer's cover.

GENERAL SPECIFICATIONS:

	Type 971		Type 980 Sensors	Type 981 Sensors
Physical	Multi-Count Analyzers			
Width:	4 1/4" (10.8 cm)		2 1/8" (5.4 cm)	7/8" (2.2 cm)
Height:	5 1/8" (14.9 cm)		2 1/8" (5.4 cm)	Diameter
Depth:	1 1/2" (3.8 cm)		1 1/8" (2.8 cm)	1 1/4" (3.2 cm)
Electrical:	Type 971 Multi-Count Analyzers			
	No. 971-6	No. 971-12		
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:	100 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 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 annually) to insure the system's proper operation at all times.

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

***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.

The sensitivity pot, normally adjusts "gross attack" trip level only (multi-count sensitivity is fixed); however, if the multi-count jumper is not in place, response to lower level shocks will also be affected, similarly to a Type 970 Analyzer.

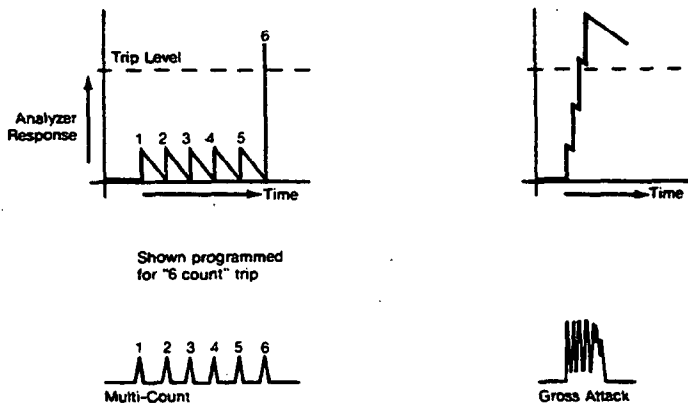


Diagram 1: TYPE 971 MULTI-COUNT ANALYZER, SHOCK RESPONSE

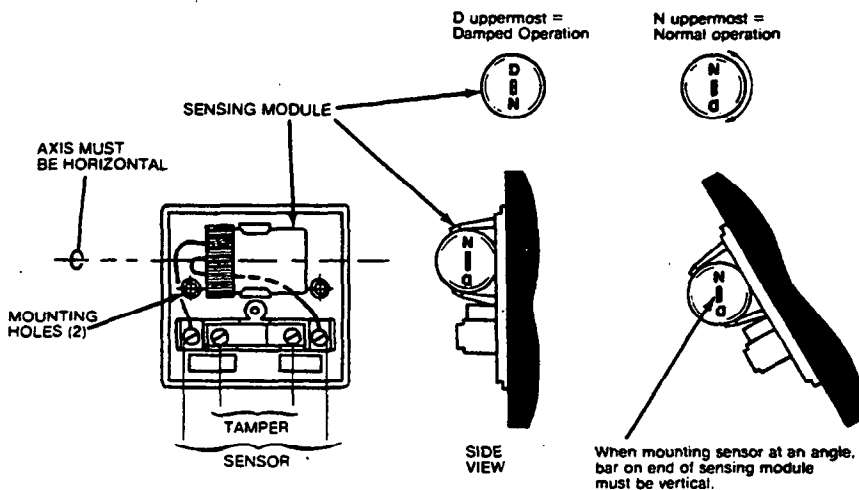


Diagram 2: TYPE 980 SENSOR, INSTALLATION DETAILS

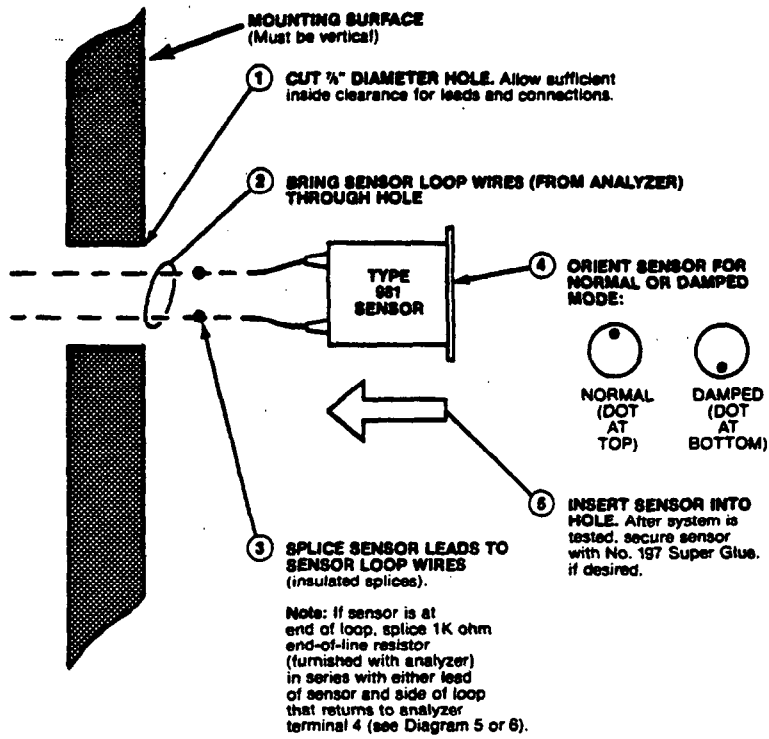


Diagram 3: TYPE 981 SENSOR, INSTALLATION DETAILS

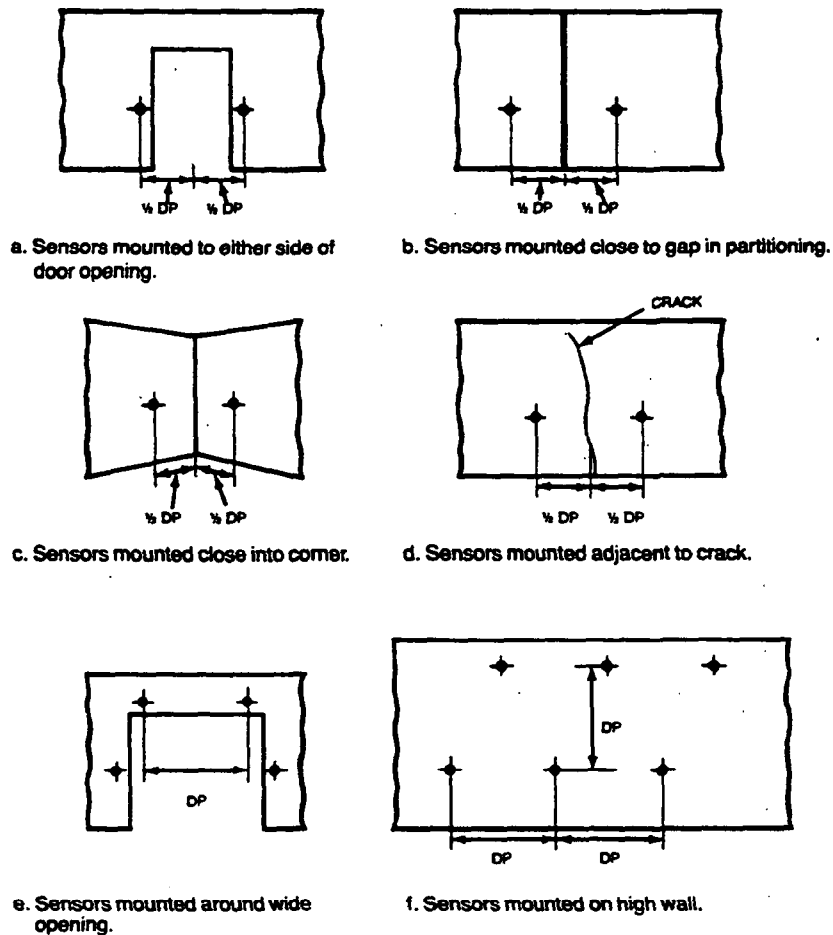


Diagram 4: TYPICAL SENSOR LOCATIONS

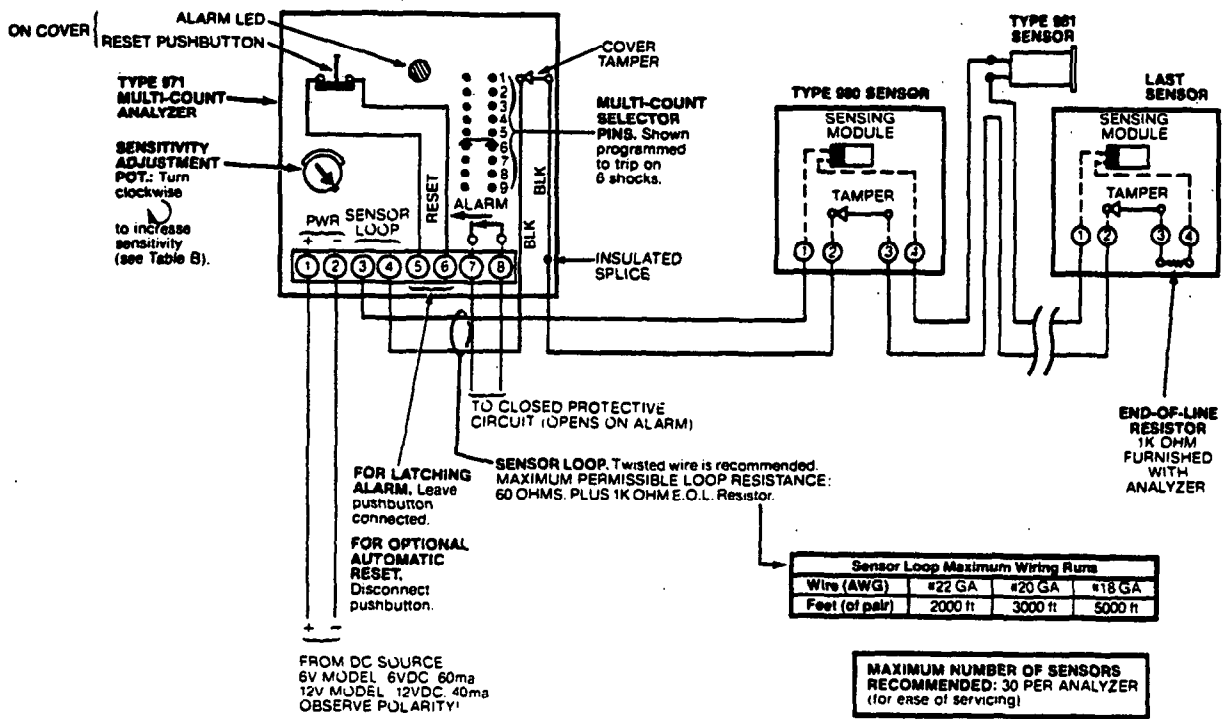


Diagram 5: FIELD CONNECTIONS, WITHOUT SEPARATE TAMPER LOOP

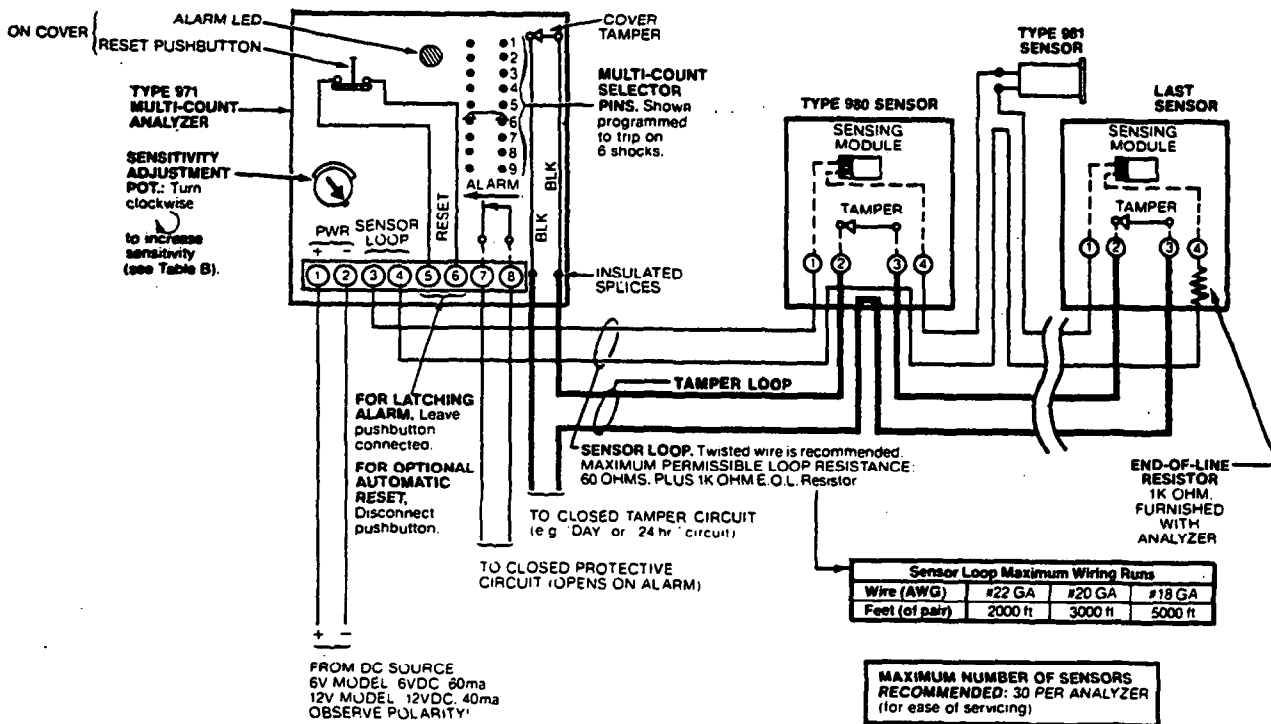


Diagram 6: FIELD CONNECTIONS, WITH SEPARATE TAMPER LOOP