

INSTALLATION AND OPERATION INSTRUCTIONS

PROX-WATCH Series II (Capacitance Proximity Sensor)

43180 Osgood Road
Fremont, CA 94539
Telephone (510) 249-1450
Fax (510) 249-1540

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CAPACITANCE PROXIMITY SENSOR

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PROPRIETARY INFORMATION

THE TECHNIQUES AND METHODS DISCUSSED IN THIS DOCUMENT ARE CONSIDERED TO BE PROPRIETARY TO PPI AND MUST NOT BE DISCLOSED IN WHOLE OR IN PART FOR ANY PURPOSE OTHER THAN FOR USE IN INSTALLATION, OPERATING, AND REPAIRING THE SYSTEM.

TABLE OF CONTENTS

WARRANTY.....	ii
PROPRIETARY INFORMATION.....	ii
1.0 GENERAL DESCRIPTION.....	1
1.1 DESCRIPTION OF SYSTEM OPERATION.....	1
1.2 TYPICAL PROTECTED OBJECTS.....	1
2.0 SPECIFICATIONS.....	2
3.0 TYPICAL METAL OBJECT OF CAPACITANCE.....	2
4.0 INSTALLATION PROCEDURES.....	3
5.0 TEST PROCEDURES.....	7
6.0 OPERATING PROCEDURES.....	8
7.0 SENSITIVITY ADJUSTMENT.....	10
8.0 CHANGING OBJECTS.....	10
9.0 TROUBLE SHOOTING.....	11

LIST OF FIGURES

Figure 1	Terminal Connection Strip.....	5
Figure 2	Object Connection Diagram.....	6
Figure 3	Sensitivity Control.....	9
Figure 4	Front Panel Controls.....	9

1.0 GENERAL DESCRIPTION

PROX-WATCH-II is a proximity/capacitance sensor system designed to protect multiple metal objects from the smallest file cabinet to several trucks or a small aircraft.

1.1 Description of System Operation

PROX-WATCH-II detects changes in the established capacitance to ground of a protected object. When the protected object is touched, there is a change in the capacitance, and an alarm is generated (PROX-WATCH) circuits measure the ratio between the charging current and the resultant rate of change of voltage with time).

1.2 Typical Protected Objects

PROX-WATCH-II will protect up to a 50,000 picofarad capacitive load. This would be equivalent to (e.g.) **50** 4-drawer cabinets; **50** metal office desks; **75** office safes; or **15** vans or small trucks (under cover).

Other metal ground isolated objects which can be protected by PROX-WATCH II might include:

- Supply Cabinets
- Open storage shelf racks
- Computer terminals
- Office Machines
- Display tables for art objects, etc.
- Storage sheds
- Electronic test equipment
- Blueprint storage cabinets
- Petty cash boxes
- Window screens
- Capacitance mats
- Air Ducts
- Tool Bins / Chests
- Vehicles

PROX-WATCH-II will also alarm when sizable objects are removed from a protected object (e.g. a protected metal desk with a typewriter). An alarm will generate when the typewriter is removed even though the desk is never touched.

2.0 SPECIFICATIONS

Max Protected Capacitance	50,000 picofarads
± of Change for Alarm	± 20 pf - (variable)
Automatic Balancing	Allow 3-4 min - depends on capacitive load
Alarm Output	Relay closure NC/NO, Minimum Duration 1 second
Power Requirements	16 VAC - transformer (furnished) @ 150 MA 12 VDC @ .30A
Contact Rating	130 VDC 0.075 Amps max. (current limiting resistor = 10 ohms)
Stand-by-power (optional)	12 VDC 1.0 OAH (Power Sonic PS-1212 or Equiv.) Gel Cell Battery. Provides up to 12 hours of stand by power.
Size	H 10"X W 8.25"X D 4"
Operating Conditions	Temperature: 32° F to 122° F (0° C to 50° C) Humidity 0 - 95% (Non Condensing)
Weight	Approximately 6 Pounds

3.0 TYPICAL METAL OBJECT CAPACITANCE

<u>ITEM</u>	<u>LOAD</u>	<u>LOCATION</u>
2 drawer file	300pf	carpet
2 drawer file	400 pf	cement
Desk	300pf	carpet
Desk	400pf	cement
Safe	300pf	carpet
Safe	400pf	cement
Metal Window	100pf	Not Grounded
Van	500pf	undercover on dry surface

4.0 INSTALLATION PROCEDURES

Installation note: The installer is responsible for ensuring that all interconnection cabling and system grounding meet the local building and electrical codes.

4.1 Mount the PROX WATCH control box to a flat and plumb surface.

4.2 Using one conductor of insulated wire (16 AWG recommended), run a ground wire from the local earth ground point (cold water pipe or ground rod) to the control box. Connect the ground conductor to TB1-11.

4.3 Using two conductors of insulated wire (16 AWG recommended), run 16 VAC 60 Hz power lines from the class 2, plug-in transformer provided to the control box, and connect the two 16 VAC conductors to TB1-13 and TB1-14. Do not energize the 16 VAC source until you are ready to perform the test and operating procedure.

4.4 Using a DMM, verify that all objects which are to be monitored by the PROX WATCH are electrically isolated from earth ground. This value should be an open (∞ Ohms) as measured by the DMM.

4.5 Calculate the length of sense wire cabling required to connect the objects which are to be monitored to the PROX WATCH. Using twisted pair wire (22 AWG recommended) as the sense wire and return, connect the sense wire to TB1-7. The return termination wire will be connected in step 9 as part of the continuity test.

4.6 Route the sense wire cabling to the first object to be monitored. Using figure 2 as a reference, attach the sense wire conductor to a clean and unpainted metallic point on the object which is to be monitored.

4.7 For each additional object connected to the PROX WATCH, connect in series (daisy chain) the sense wire conductor. Using figure 2 as a reference, allow a 2 inch space between the electrical attachment points on each object.

4.8 Install the 100K \pm 5% ohm termination resistor provided on the last object to be monitored between the sense wire and the return wire. Use figure 2 as a reference.

4.9 Using a DMM, measure the resistance between the sense line connected to TB1-7 and the return wire. This value should be 100K Ohms \pm 10 % (90-110 K Ohms). If this value is within the limits, connect the return wire to TB1-8, the sense wire is already connected. If this value is not within limits, check the interconnection of the sense wire on each object being protected for a resistive connection.

4.10 To comply with Underwriter's Laboratories (UL) requirements for protection of safes and vaults, the PROX-WATCH enclosure is electrically part of the protected object. Touching the PROX-WATCH will produce an alarm. To enable this option, install a 22 AWG wire jumper between TB1-7 and TB1-9, and make sure that enclosure is **NOT** directly mounted to a grounded surface. Plastic inserts are provided with each control box to isolate it from a grounded surface.

4.11 Connect alarm relay contacts to annunciation device. Wire TB1-5 and TB1-6 for normally closed (opens on alarm) contacts. Wire TB1-4 and TB1-6 for a normally open (closes on alarm) contacts.

4.12 Switch outputs are also available for external indications of ACCESS and DISABLE key switch modes. TB1-1 is switch-connected to TB1-2 when the key switch is in the ACCESS position. TB1-1 is switch-connected to TB1-3 when the key switch is in the DISABLE position.

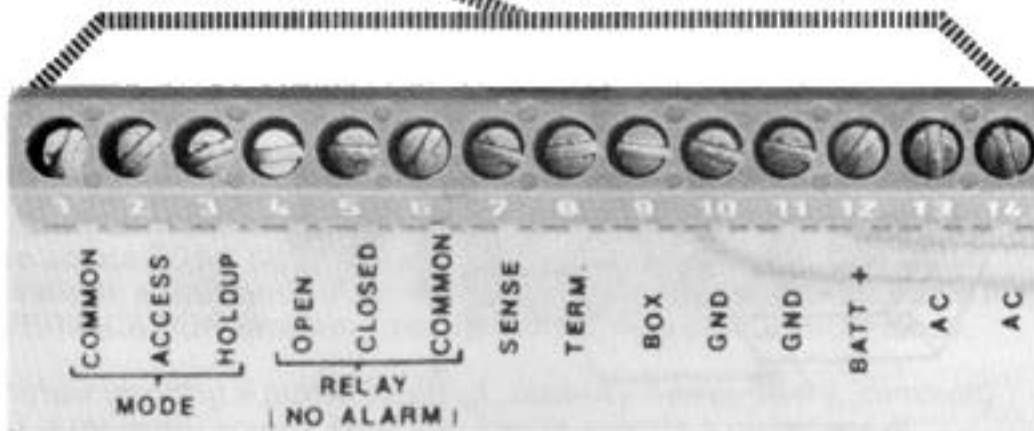
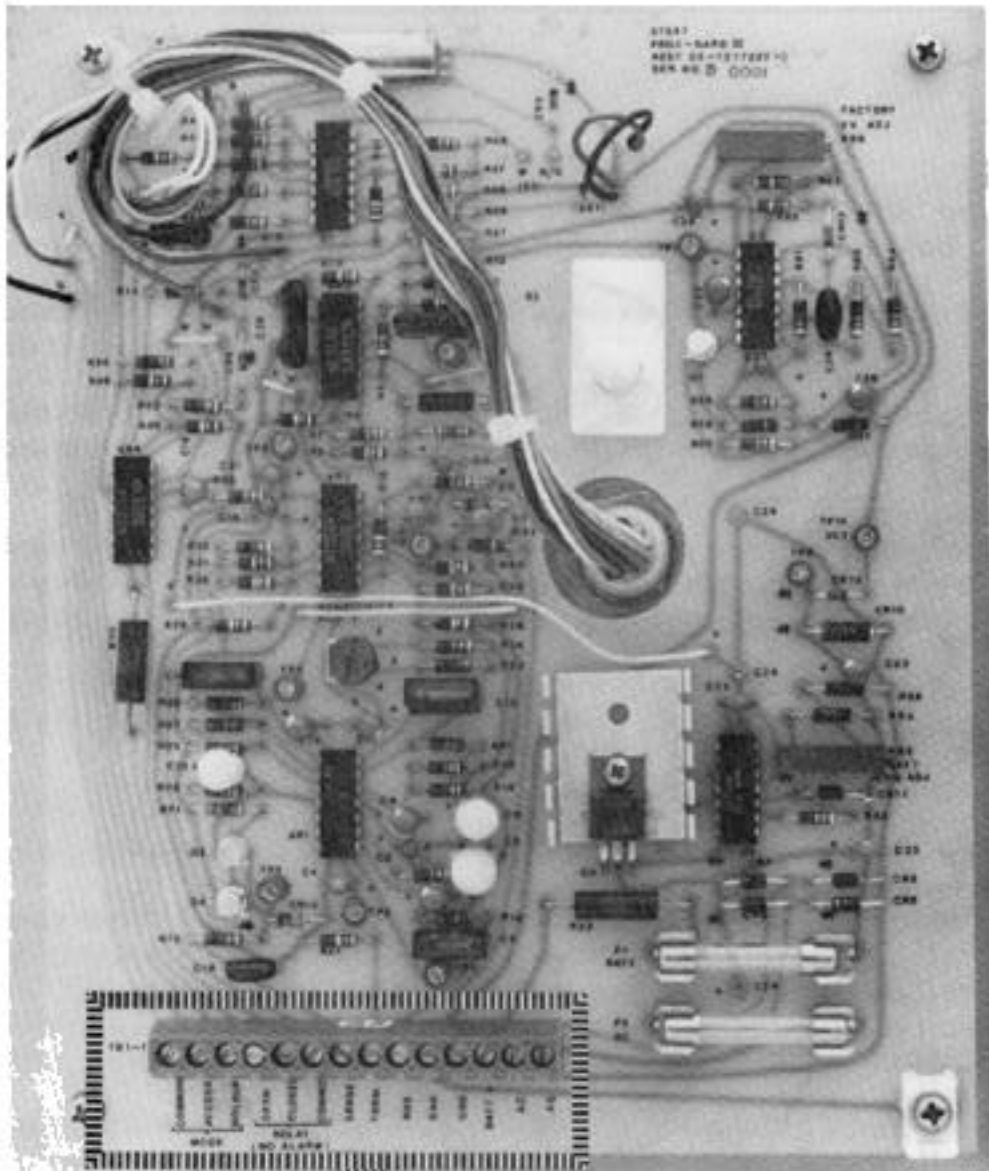


Figure 1. Terminal Connection Strip

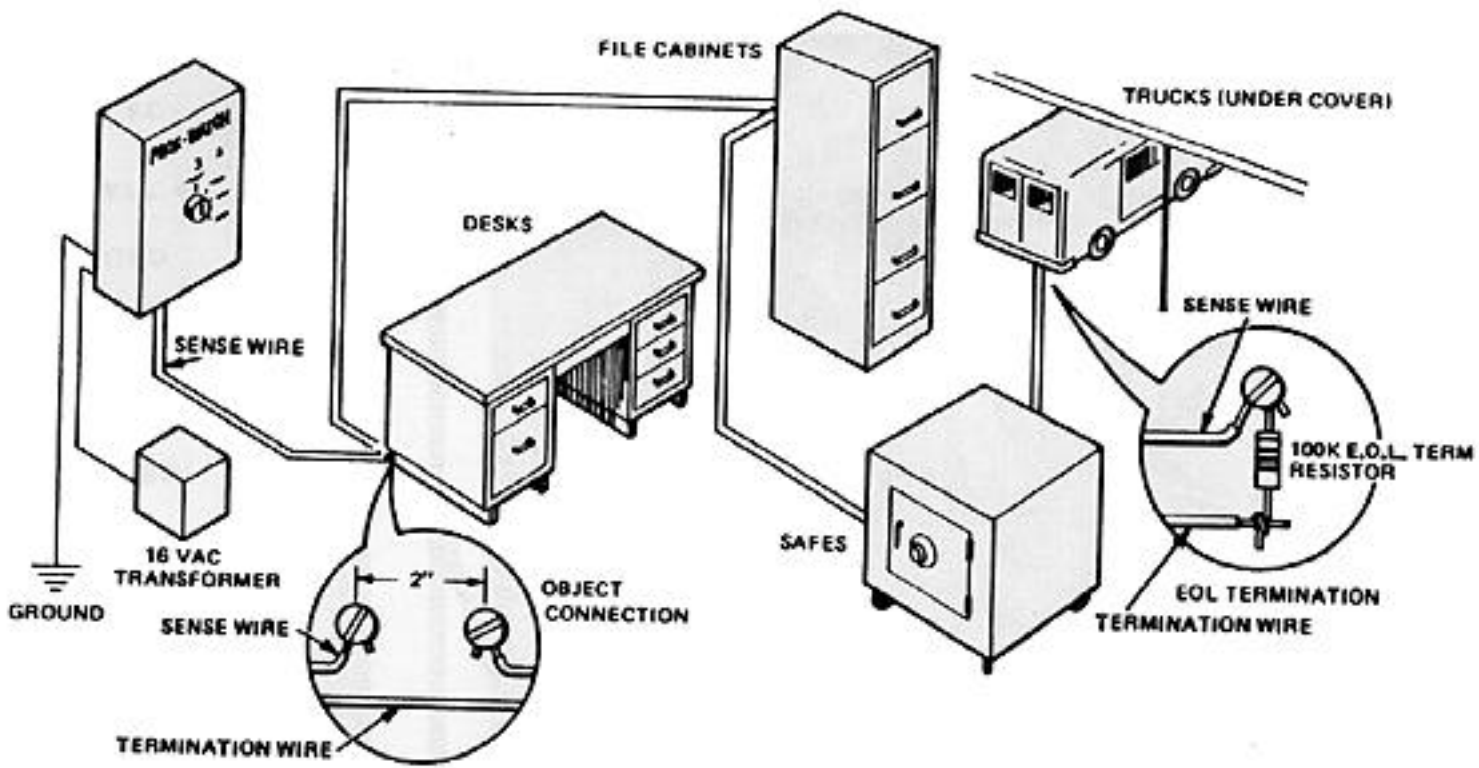


Figure 2. Object Connection Diagram

5.0 TEST PROCEDURES

Test procedure note: Prior to starting this procedure, all steps in the installation section of this manual must have been successfully completed.

- 5.1 Insert the PROX WATCH security key in the key switch and position the key switch to the TEST position.
- 5.2 Gain access to PROX WATCH circuit card assembly (CCA) by removing the enclosure cover retaining screw located on the right side of the enclosure box.
- 5.3 Open the enclosure cover and disable the tamper alarm by pulling out on the TAMPER switch (1/4" to 3/8" movement). Position the cover so that is almost closed while allowing the tamper switch to be disabled (pulled out).
- 5.4 Locate control pot R23 on the CCA. R23 is a single turn pot used to adjust the sensitivity of the PROX WATCH. Adjust R23 to its midrange position.
- 5.5 Apply 16 VAC 60 Hz power to the PROX WATCH unit. Verify that the TEST VERIFICATION lamp illuminates red. The TEST VERIFICATION lamp should extinguish within 3-4 minutes of applying power to the unit.
- 5.6 When the TEST VERIFICATION lamp is extinguished, test the system sensitivity by touching the object which is to be protected. The TEST VERIFICATION lamp should illuminate red when the object is touched. If the TEST VERIFICATION lamp does not illuminate, adjust the sensitivity by rotating R23 in small amounts in a clockwise direction.
- 5.7 Disconnect the annunciation device interconnection wires from TB1.
- 5.8 Using a DMM measure across TB1-6 (common) and TB1-5 (normally closed). The DMM should indicate a resistance of approximately 10 ohms.
- 5.9 Using a DMM measure across TB1-6 (common) and TB1-4 (normally open). The DMM should indicate a resistance of approximately 1 Meg ohm or greater. Turn key switch to SECURE/ON position.
- 5.10 Touch an object under protection by the PROX-WATCH. Using a DMM measure across TB1-6 (common) and TB1-5 (normally closed). The DMM should indicate a resistance of approximately 1 Meg ohm or greater. Note that TEST VERIFICATION lamp does not light on alarm in SECURE/ON mode.
- 5.11 While touching a protected object, measure across TB1-6 (common) and TB1-4 (normally open). The DMM should indicate a resistance of approximately 10 ohms.

6.0 OPERATING PROCEDURES

- 6.1** As power is initially applied with key switch in TEST position, the Test Verification lamp will light for up to 3 - 4 minutes then go out. When TEST VERIFICATION lamp goes out, turn key switch to SECURE/ON position. The system is in the secure mode and is monitoring the objects connected between TB1-7 and TB1-8. The alarm relay will change state whenever a protected object is touched or the 100K ohm resistor is removed or shorted.
- 6.2** System sensitivity is adjusted with the control pot R23. See section 7.0.
- 6.3** Putting key switch in ACCESS/OFF position allows protected objects to be touched without causing alarms. Tamper conditions (open or shorted 100K ohm resistor or open enclosure) will still be indicated by alarm relay.
- 6.4** Putting key switch in TEST position locks alarm relay in the secure condition to allow system test. As TEST is selected with key switch, the TEST VERIFICATION lamp will light briefly and then go out. Push the TEST ACTIVATE button to simulate someone touching a protected object. The TEST VERIFICATION lamp will light and then go out within about a minute of releasing TEST ACTIVATE button.
- 6.5** Selecting DISABLE position with key switch disables the alarm lamp only. The alarm relay is still operational and panic switch contact -(if used) is closed.
- 6.6** Return key switch to SECURE/ON position to resume normal operation.
- 6.7** Monitor relay state or TEST VERIFICATION lamp, depending on which key switch position is used, to confirm that alarm is indicated when protected objects are touched. Wait approximately 1 minute between tests.

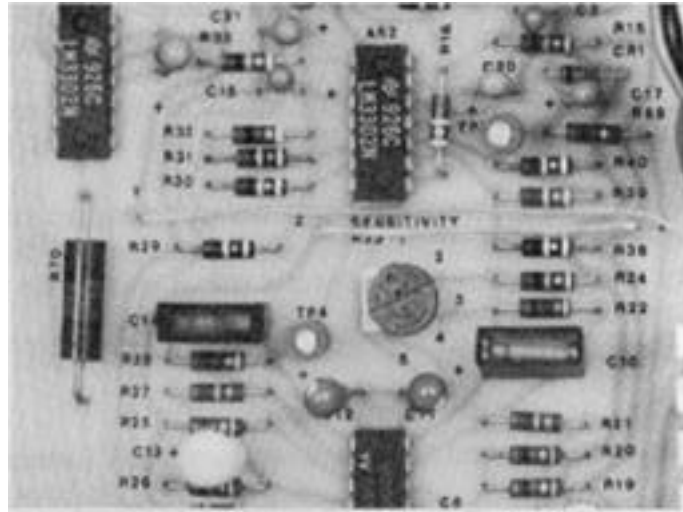


Figure 3. Sensitivity Control



Figure 4. Front Control Panel

7.0 SENSITIVITY ADJUSTMENT

With key switch in SECURE/ON or TEST position, open enclosure door and pull tamper switch out (this disables the door tamper). The sensitivity control pot (R-23) adjusts the capacitance load change (+ or -) required to create and alarm. (See Figure 3) Clock-wise adjustment for MAXIMUM sensitivity; Counter-clockwise adjustment for MINIMUM sensitivity

8.0 CHANGING PROTECTED OBJECTS

Items may be added or deleted from the items being protected usually with no adjustment to the system sensitivity. Alarms will be generated during the changing of objects, therefore the alarm control panel should be placed in "TEST" to prevent annunciation of alarms.

8.1 Adding Objects:

- a. Disconnect last protected item, and remove 100K terminating resistor.
- b. Connect the new object as described in step 4.7.
- c. Run the spliced sense wire to new "added" object and connect the termination resistor (100K) to the last object being protected.

8.2 Deleting Objects:

Disconnect desired item and ensure proper sense wire splicing. 100K termination resistor must always be installed at the last protected item.

9.0 FAULT ISOLATION MATRIX

will The PROX-WATCH II is a relatively simple device which requires no preventive maintenance. However, like any electronic device, malfunctions can occur which require corrective action. The matrix and procedures following have been prepared to aid in "trouble shooting" a faulty system.

NOTE: When cover is open, the tamper switch must be pulled out to the maintenance position.

FAULT ISOLATION MATRIX

<u>ALARM SYMPTOMS</u>	<u>CAUSES AND POSSIBLE SOLUTION</u>								
	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>	<u>G</u>	<u>H</u>	<u>I</u>
Intermittent Operation	X			X	X		X		
High False Alarms	X			X			X	X	
Constant Alarms	X	X		X	X	X		X	X
Will Not Alarm		X		X	X	X		X	X
Poor Sensitivity	X	X		X	X		X	X	X
System Inoperative		X		X	X	X	X	X	X
No Operation During Power Failure		X	X		X				X

9.1 Trouble Shooting Procedures

A. Check for proper connection of earth ground connected to TB1-10 or TB1-11.

B. Check for presence of 16 VAC applied to TB1-13 and TB1-14. Check condition of fuses F2 & F1.

C. Check standby battery condition by removing the interconnecting wires from the battery and measuring the voltage at the battery terminals. The voltage should be between 11.5 & 12.5 volts. While the battery is disconnected, check battery charge voltage between TB1-12(+) and TB1-11(-) voltage should be 13.7 to 13.9 VDC. Reconnect battery.

D. Check for proper connection and continuity of interconnect cable to the protected objects. The resistance between the sense wire and the termination wire when removed from TB1-7 and TB1-8 is 100K ohms \pm 10%.

E. Check for the presence of the voltages shown below:

<u>From</u>	<u>To</u>	<u>Voltage</u>
TP8	TB1-11	13.7 to 13.9 VDC
TP10	TB1-11	13.0 to 13.4 VDC
TP9	TB1-11	8.89 TO 9.2 VDC

NOTE: TP (Test Point) are located on the circuit card assembly

F. To aid in trouble shooting, a 100K \pm 10% resistor can be substituted for the interconnect cable connected between TB1-7 and TB1-8.

G. The capacitive load make up of the protected objects may exceed the capability of the range of the PROX-WATCH II. Decrease the load capacitance in increments by removing protected objects and recheck system operation.

H. Check the system gain level (R23) and set for the desired level of sensitivity.

I. The resistance should be as shown when the system is operating properly in the secure mode.

<u>From</u>	<u>To</u>	<u>Resistance</u>
TB1-6	TB1-5	9 to 12 ohms
TB1-6	TB1-4	Greater than 1 Meg ohm