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PASSIVE INFRARED MOTION SENSOR (PIMS). TEST PLAN.(U)
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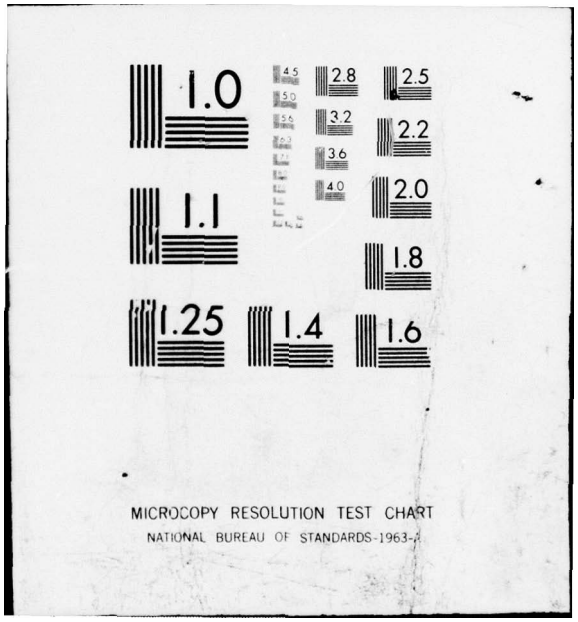
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(2)

TEST PLAN

(6) PASSIVE INFRARED
MOTION SENSOR
(PIMS), Test Plan.

(11) 22 Nov 76

(15) CONTRACT DAAG53-76-C-0158
TECHNICAL DATA ITEM A004

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1.0 SCOPE

The plan describes a sequence of tests designed to show that the Passive Infrared Motion Sensor (PIMS), complies with the requirements of the purchase description, and additionally functions correctly with regard to parameters not specifically described therein. The plan proposes a group of functional tests to which all deliverable equipment will be subjected, and a group of environmental tests to which randomly selected samples of the deliverable equipment will be subjected. All deliverable equipment is defined as Engineering Prototype Models (EPM) and will be tested as such in accordance with the requirements of the purchase description.

Group I - 2 units to be delivered in advance of the balance will be subjected to functional tests only as shown in Table II column 1.

Group II - 4 units will be subjected to all applicable tests of Table II column 2.

Group III - 10 units will be subjected to all applicable tests of Table II column 5.

2.0 FUNCTIONAL TEST (ALL UNITS)

2.1 Area of Coverage

The equipment will be set up in a rectangular open area 20 x 40 feet. The sensor will be located in the center of the 40 foot wall on one side of the area at a height of 7 feet from the floor. It will be shown that coverage exists within the enclosed volume by means of 17 narrow fields of view.

2.2 Target Velocity Range

Using a special test fixture consisting of a black body radiator emitting infrared energy through a moving aperture, it will be demonstrated that the sensor will detect targets within the velocity range of 0.1 to 15 ft./sec. Motion will persist for at least 1 second at the lowest target velocities.

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2.3 Interface

2.3.1 FIDS Compatibility

It will be demonstrated that the PIMS is compatible with the FIDS Control Unit.

2.3.1.1 Alarm Output

The intrusion alarm output will appear on pin 16 and the tamper alarm output will appear pin 17 of the Alarm Processor. No alarm will be a logic level 1 and alarm will be logic level 0.

2.3.1.2 Power

The sensor will draw power from the 9 to 11v regulated supply on pins 9 and 10 of the alarm processor. The current drain will not exceed 2 milliamperes per receiver.

2.3.1.3 Test Mode

It will be shown that when a logic level 1 (5v) appears at pin 28 of the Alarm Processor that an alarm output from both signal processors is required to produce an alarm output. It will be shown that the system remains inhibited from producing further alarms for 30 seconds after the test stimulus (on pin 28) is removed. The two step alarm logic is inhibited during the test mode.

2.3.1.4 Two Step Detection Logic

It will be shown that if the two step detection mode is selected by means of a jumper on the Alarm Processor, that two detections will be required to produce an intrusion alarm output. By means of another jumper selection, these events must occur within a one minute or five minute time interval.

2.3.2 JSIIDS Compatibility

It will be shown that by means of the J-SIIDS Adaptor Unit that the PIMS is compatible with the J-SIIDS Control Unit.

2.3.2.1 Alarm Output

The intrusion alarm output and the tamper alarm output will appear at the appropriate terminals of the barrier strip located in the Adaptor Unit. The no alarm condition will be a closed relay contact current protected by a series 100 ohm resistor. The alarm condition will be an open (greater than 100k ohms) circuit between the appropriate contacts.

2.3.2.2 Power

It will be demonstrated that the PIMS will operate from 18 to 22Vdc as supplied by the J-SIIDS Control Unit.

2.3.2.3 Tamper Switch Tolerance Test

The continuity of the adaptor unit tamper switch will be monitored with the cover in place. As any edge of the cover is lifted until continuity is lost, the contacts will be shown to open with not less than 1/8 inch or more than 1/4 inch of movement and before the cover flange is disengated. With the cover off pulling up plunger will close the tamper contacts.

3.0 ENVIRONMENTAL TESTS (GROUP II, 4 UNITS)

The group II units will be subjected to the following environmental tests.

1) Low Temperature

2) High Temperature

3) Shock Test

4) Vibration Test

5) Humidity Test

The tests will be performed in accordance to the applicable requirements of MIL-STD-810, either at Aerospace Research, Inc., or at the facilities of Associated Testing Laboratories, Burlington, Mass.

3.1 Operational Check

Before, during and after each test, the PIMS will be subjected to an operational check to verify continuing system performance. The test will consist of generating intrusion alarms by means of an infrared source within the field of view.

3.2 Low Temperature Test

The PIMS equipment will be subjected to low temperature testing in accordance with Method 502, Procedure I of MIL-STD-810, as follows:

(a) The system will be placed in the test chamber and fully interconnected. The system will then be subjected to the operational check (3.1) to determine that no malfunction or damage was caused due to faulty installation or handling.

(b) The internal chamber temperature will be lowered to -50°F and maintained for 48 hours. While still at -50°F the units will be visually inspected through the chamber window.

(c) The chamber will be returned to room ambient conditions and the units will be visually inspected to determine if any deterioration, corrosion, or other damage has taken place which would constitute a failure of the unit to withstand the test conditions.

(d) The internal chamber temperature will be lowered to +10°F and maintained for 2 hours. While at +10°F, the system will be subjected to the operational check of 3.1.

(e) The internal chamber temperature will be lowered to -40°F and maintained for 2 hours. While at -40°F, the system will be subjected to the operational check of 3.1.

(f) The chamber will be returned to room ambient conditions and stabilized for 2 hours. The system will then be tested by the operational check of 3.1.

3.3 High Temperature Test

The PIMS equipment will be subjected to high temperature testing in accordance with Method 501, Procedure II of MIL-STD-810B, as follows:

(a) The system will be placed in the test chamber and fully interconnected. The system will then be subjected to the operational check (3.1) to determine that no malfunction or damage was caused due to faulty installation or handling.

(b) The internal chamber temperature will be raised to +120°F and maintained for 6 hours.

(c) The internal chamber temperature will be raised to +150°F within a time period of 1 hour and maintained for 4 additional hours.

(d) The internal chamber temperature will be lowered to +120°F within a time period of 1 hour.

(e) Steps b, c, and d above will be repeated two additional times, making a total of three 12-hour cycles.

(f) The internal chamber temperature will be raised to +125°F and maintained for 2 hours. While at +125°F, the system will be subjected to the operational check of 3.1.

(g) The internal chamber temperature will be raised to +150°F and maintained for 2 hours. While at +140°F, the system will be subjected to the operational check of 3.1.

(h) The chamber will be returned to room ambient conditions and stabilized for 2 hours. The system will then be tested by the operational check of 3.1.

Humidity Test

The PIMS equipment will be subjected to humidity testing in accordance with Method 507, Procedure I of MIL-STD-810, as follows:

(a) The system will be placed in the test chamber and fully interconnected. The system will then be subjected to the operational check (3.1) to determine that no malfunction or damage was caused due to faulty installation or handling.

(b) The internal chamber temperature will be raised to +160°F and the relative humidity brought to 95% (wet bulb depression 2°F) over a period of 2 hours, and then maintained for 6 hours.

(c) The internal chamber temperature will be reduced to +82°F over 16 hours, while relative humidity is maintained at 85% or greater.

(d) The test items will be removed from the chamber and allowed to stabilize at room temperature, 28±10°C (82°F). The test items will be subjected to the operational check of 3.1. Prior to operation, excess moisture may be removed from exterior surfaces by turning the test item upside-down, or by wiping external surfaces only.

(e) Steps b, c and d above will be repeated four more times, for a total of 120 hours.

(f) The chamber will be returned to room ambient humidity conditions and stabilized for 2 hours at +82°F. The system will then be tested by the operational check of 3.1.

(g) Deterioration, corrosion, or physical change which impairs the mechanical integrity of the system, or change in the tolerance limits in any internal or external component which would prevent the system from meeting operational requirements, will provide reason to consider the item as having failed to withstand the conditions of this test. Evidence of delamination or water penetration in integrated circuits or printed circuit boards after the humidity test will be a failure.

3.4 Shock Test

The PIMS equipment will be subjected to shock tests in accordance with Method 516.1, Procedure I, Basic Design Test as follows:

(a) The shock machine will be calibrated using dummy loads representing the signal processor and sensor units rigidly attached to the shock machine table. The dummy loads will receive two consecutive shocks to produce sawtooth waveforms of 20 g's peak and 11 ms duration within the tolerances of Figure 516.1.1, Procedure I.

(b) The signal processor and sensor units will be attached to the machine table and interconnected as in a typical installation. The system will then be operated to determine that no malfunction or damage was caused due to faulty installation or handling.

(c) While non-operating, the units will receive three shocks in each direction along three mutually perpendicular axes.

(d) At the conclusion of the test the system will be tested according to Section 3.1 and the results compared with those obtained prior to the shock test.

(e) The units will be inspected for any evidence of physical damage.

3.4.1 Bench Handling

The PIMS equipment will be subjected to shock test in accordance with Method 516.1, Procedure V, Bench Handling Test, as follows:

(a) The unit enclosures will be opened as for servicing, and placed in a suitable position on a horizontal, solid wooden bench top at least 1-5/8 inches thick.

(b) Using one edge as a pivot, opposite edges of each unit will be lifted until one of the following conditions occurs (whicever occurs first):

1. The unit forms an angle of 45° with the horizontal bench top.

2. The lifted edge of the unit has been raised 4 inches above the horizontal bench top.

3. The lifted edge of the unit is just below the point of perfect balance.

The unit will be allowed to fall back freely on the bench top. The drop will be repeated using other practical edges of the same horizontal face as pivot points, for a total of four drops.

(c) The preceding test will be repeated with the unit resting on other faces until it has been dropped for a total of four times on each face on which it could be placed practicably during servicing. The unit will not be operating during the test. At the conclusion of the test, the system will be tested and the results compared with the data obtained in accordance with Section 3.7.

(d) The units will then be inspected according to determine if any physical damage has resulted from the test.

3.5 Vibration Test

The PIMS equipment will be subjected to vibration tests in accordance with Method 514.1, Procedure X, Curves AY (aircraft) and AW (track, semi-trailer and railroad) as follows:

(a) The signal processor units and corresponding sensors units will be attached to the vibration exciter table by normal mounting means or by means of a fixture capable of transmitting the vibration conditions.

(b) The units will be interconnected and operated to determine that no malfunction or damage was caused due to faulty installation or handling.

(c) While non-operating, the units will undergo resonance search, resonance dwell, and sinusoidal cycling according to the level and time durations specified in Procedure X for land transportation of 3000 miles. If serious resonances are observed, the use of slip-sync movies will be considered as an aid to corrective action.

(d) The system will then be tested according to Section 3.1 and the results compared with those obtained prior to the test.

(e) The units will then be inspected to determine if any physical damage resulted from the test.

3.6 Burn-in

The Group III units will be subjected to a burn in test of at least 50 hours duration. For purely practical reasons it is proposed that the units will be set up in an open area where they will be energized and recorders set up to record all alarm activity. During the day time the units will be activated frequently by persons moving about in the test area going about their normal business. At night, conditions should be quiet and no alarm activity should be evident. Twice a day the recordings will be inspected and any unit not performing normally will be examined, repaired, and put back into test for a further 50 hour period. After units have successfully completed the burn-in, they will be tested using the functional test described in Section 2, prior to the shipment.

TEST DATA SHEET

FUNCTIONAL TEST

AREA OF COVERAGE

Check unit responds to stimulus in all 17 fields of view

1 ( )	2 ( )	3 ( )	4 ( )
5 ( )	6 ( )	7 ( )	8 ( )
9 ( )	10 ( )	11 ( )	12 ( )
13 ( )	14 ( )	15 ( )	16 ( )
17 ( )			

TARGET VELOCITY RANGE

With unit set up in test fixture and exciting field of view #1 check that alarms can be generated at the following target velocities:

0.1 ft/sec. ( )
1.0 ft/sec. ( )
5.0 ft/sec. ( )
10.0 ft/sec. ( )
15.0 ft/sec. ( )

Test fixture conditions will be:

(a) Water bath 96°F Good temp

(b) Curtain, at room temperature

(c) Single stroke mode

(d) Standard aperture, range 10 feet

ALARM OUTPUT

Set unit for FIDS operation and stimulate intrusion and tamper alarms. Check status on alarm output terminals in both states:

		Alarm		No Alarm
Intrusion Alarm	( )	0.0-0.4v	( )	2.4-5.0v
Tamper Alarm	( )	0.0-0.4v	( )	2.4-5.0v

Set unit for J-SIIDS operation

Intrusion Alarm	( )	>100k ohm	( )	< 1k ohm
Tamper Alarm	( )	>100k ohm	( )	< 1k ohm

POWER

Set unit for FIDS operation

Record current ( ) <12 mA

Set unit for J-SIIDS operation

Record current ( ) <12 mA

TEST MODE

Set unit for FIDS operation and stimulate according to the following matrix. Record data

In matrix 0 = no stimulus applied
1 = stimulus applied
A = ALARM
N = NO ALARM

TEST SIGNAL	0	0	0	1	1	1
STIMULUS CH1	0	1	0	0	1	1
STIMULUS CH2	0	0	1	0	0	1
ALARM OUTPUT	N	A	A	N	N	A
Check if true	( )	( )	( )	( )	( )	( )

Upon release of TEST SIGNAL check that unit is inhibited from producing alarms for approximately 30 seconds. Record time.
( ) 25 to 35 seconds

TWO STEP DETECTION MODE

Set unit for two-step detection and check that unit does not alarm on a single stimulus ( ). Check unit does alarm on further stimulus within the two-step window ( ). Check time of windows. Record times.

1 minute window ( ) 50 to 70 seconds
5 minute window ( ) 270 to 330 seconds

TAMPER SWITCH TOLERANCE

Set unit for J-SIIDS operation. Record measured delta ( ) should be 1/8" to 1/4".

TEST DATA SHEET

Operational Test

With unit set up for environmental test. Check that unit is not in alarm condition ( ).

Apply test stimulus. Check unit alarms ( ).