Test Report No. 14373-4 No. of Pages 61

Reference Electro Switch
Test Report No. 2392-10

Report of Test on

SEISMIC VIBRATION TESTING
OF SWITCHES, P/N 20KB-1124A4
FOR ELECTRO SWITCH CORPORATION
UNDER PURCHASE ORDER NO. 91014

ENVIRONMENTAL
ACTON TESTING
CORPORATION

Date November 14, 1978

	Prepared	Checked	Approved
By	R.Tervo	R.Gilfoy	M.L.Tolf
Signed			
Date		11/14/78	11/14/78

RT/bmf

Administrative Data

1.0 Purpose of Test: Qualification seismic vibration of the Electro Switch Corporation electro switches specified below.

2.0 Manufacturer: Electro Switch Corporation

3.0 Manufacturer's Type or Model No: (See Equipment Tested herein).

4.0 Drawing, Specification or Exhibit: Purchase Order No. 91014

5.0 Quantity of Items Tested: Three (3)
S/Ns 1, 2, 3

6.0 Security Classification of Items: Unclassified

7.0 Date Test Completed: October 2, 1978

8.0 Test Conducted By: C.Pilotte

9.0 Disposition of Specimens: Returned to Electro Switch Corporation.

10.0 Abstract: Refer to results section herein..

ACTON ENVIRONMENTAL TESTING CORPORATION

1.0 EQUIPMENT TESTED

Three samples of Electro P/N 20KD-1124A4, S/Ns 1, 2 & 3, Series 20K instrument & control switches were submitted for seismic vibration testing.

2.0 TEST REQUIREMENTS

The electro switches specified in para. 1.0 above are required to pass the seismic vibration test specified in para. 3.0 below, without evidence of mechanical damage, deterioration, contact chatter or false closure in excess of 2 milliseconds.

Report No. 14373 -4

3.0 TEST PROCEDURES

3.1 Test Conditions

The electro switches were tested at room temperature and pressure.

3.2 Test Mounting

The electro switches were mounted to a test fixture which was secured to the small biaxial table of the ATIC 45° biaxial seismic test facility.

3.3 Test Monitoring

When tested with the handle in the "1" position, as well as the "2" position, all normally closed contacts were monitored for chatter and all normally open contacts were monitored for false closure not to exceed 2 milliseconds.

One control accelerometer was used to control the table in the vertical direction

3.4 Multiple Frequency Test

A biaxial multiple frequency excitation was applied to the switches. The test input was recorded on a 14-channel tape recorder, each track having discrete frequency sine beats recorded at a different frequency and delay between beats. All frequencies were recorded at maximum levels.

The input was played back through a 14-channel tape recorder. The outputs of the 14-channels were then combined in a 14-channel mixer which results in a multiple frequency output.

The individual mixer channels have gain controls so that the level of each output tape channel passing through the mixer can be controlled. In this manner, the required test spectrum can be shaped by controlling the level of individual frequencies.

Qualification tests, consisting of biaxial periodic pseudo-random excitation were performed. The level of the periodic pseudo-random excitation was such that the Test Response Spectrum (TRS), from the control accelerometer would envelope the appropriate Required Response Spectra (RRS), shown in Figure 1.

The switches received the input six times in each of four biaxial directions of excitation as follows:

TEST NO.	SWITCH POSITION	BIAXIAL DIRECTION OF EXCITATION*
1	1	Front-to-back & Vertical
2	1	Right-to-left & Vertical
3	1	Back-to-front & Vertical
4	1	Left-to-right & Vertical
5	2	Left-to-right & Vertical
6	2	Back-to-front & Vertical
7	2	Right-to-left & Vertical
8	2	Front-to-back & Vertical

The test duration for each input was 30 seconds.

*Refer to the included photographs.

The level of the first five inputs in each biaxial direction was such that the TRS from the control accelerometer computed at Q=10(5% damping) would envelope the OBE RRS shown in Figure 1. The level of the sixth input in each biaxial direction was such that the TRS computed at Q=10 (5% damping) would envelope the SSE RRS also shown in Figure 1.

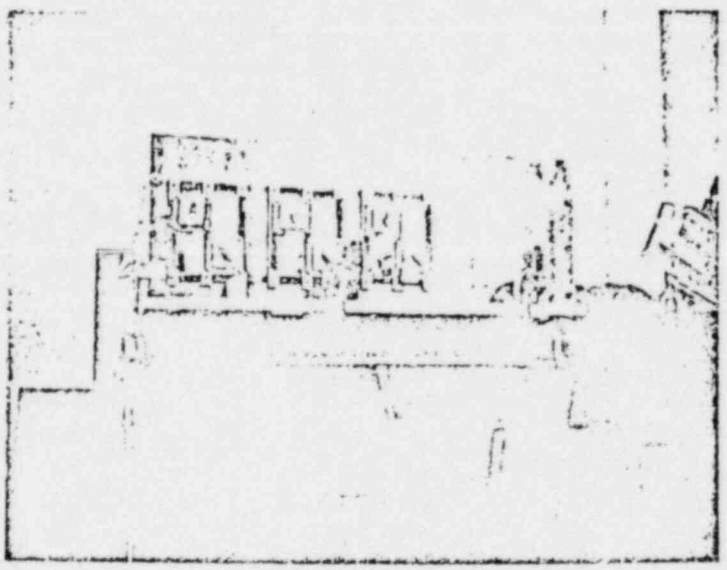
4.0 RESULTS

There was no evidence of mechanical damage or deterioration to the electro switches nor was there any contact chatter or false closure in excess of 2 milliseconds as a result of the simulated seismic event.

Report No. 14373-4

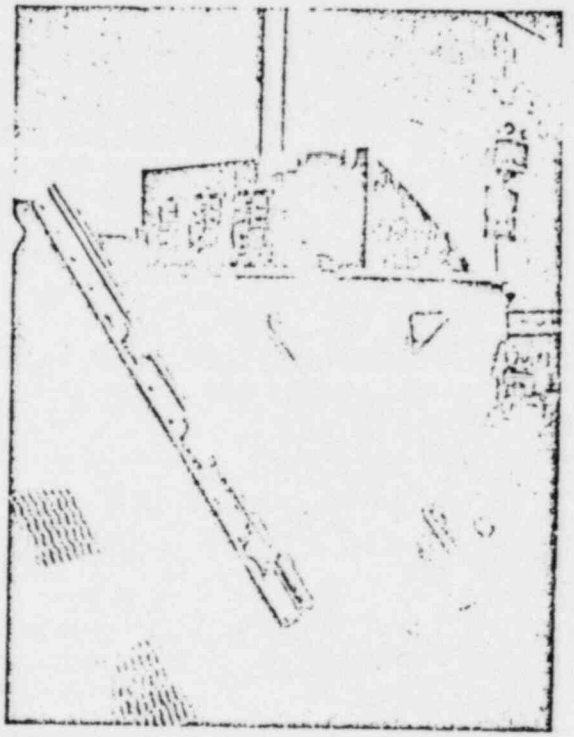
TEST EQUIPMENT LIST

NAME	MFGR.	MODEL	SER.NO.	RANGE	ACCURACY	INV.#	CAL.FREQ.
Accelerometer	PCB	302A	2852	1 Hz - 5 KHz	±5%	AC394	3 months
Decade	Scot	140SC	-----	1-3.5 MHz 20 volts output	±1%	AM310	6 months
Voltmeter DC	Weston	81		0-0.25/1/2.5/5/10/25/50/100/250/1000V	±1%	ML325	3 months
Scope	Tektronix	561	685	2 mv - 100 v 6 decades	±3%	OS306	3 months
Power Supply	Sorenson	40-2	102	0-40 VDC 0-2 Amp	.005%	PD318	6 months
Power Supply	Sorenson	QR840-.75	571	0-40 VDC 0-.75 Amp.	.01%	PD339	6 months
Power Supply	Sorenson	QR840-2	519	0-40 VDC 0-2 Amp	.01%	PD341	6 months
Hydraulic Actuator	MTS	204.63S		DC-300 Hz, 25K force lbs. 25" DA max.	±2%F ±5%A		
Controller	MTS	443.115		DC-2000 Hz	±1%	PE367	6 months
Chatter Monitor	Matrix	202D	310	Detection: 10 & 100 usec	±2%	PE370	6 months
Falst Contact Monitor	Matrix	202D	310	Detection: 10 & 100 usec	±2%	PE371	6 months
PowerSupply Rack	PCB	483A	299	22 VDC 12 MADC 12 channel	N/A	PE379	6 months
Shock Spectrum Analyzer	Spec.Dyn.	SD321	18	Input: 0.1 Hz-10 KHz Sens. 31.6 MV-100V F.S.	±0.5db	PE381	6 months
Recorder X-Y	MFE	715E	70154	Input:1-10-100 MV 1-10V both channels	±0.5%	RE342	3 months
Recorder Tape	Honeywell	5600E	01410CE76	1" tape 7 speeds 14 channel	N/A	RE345	3 months
False Contact Monitor	AETC	124	85	3 channel 2.0 MS Normally opened input 50 VDC	±5%	WA389	6 months



FRONT-TO-BACK & VERTICAL
DIRECTION OF BIAXIAL EXCITATION
TESTS 1 & 8

Report No. 14373-4



RIGHT-TO-LEFT & VERTICAL
DIRECTION OF BIAXIAL EXCITATION
TESTS 2 & 7

Report No. 14373-4

ENVIRONMENTAL TESTING CORPORATION
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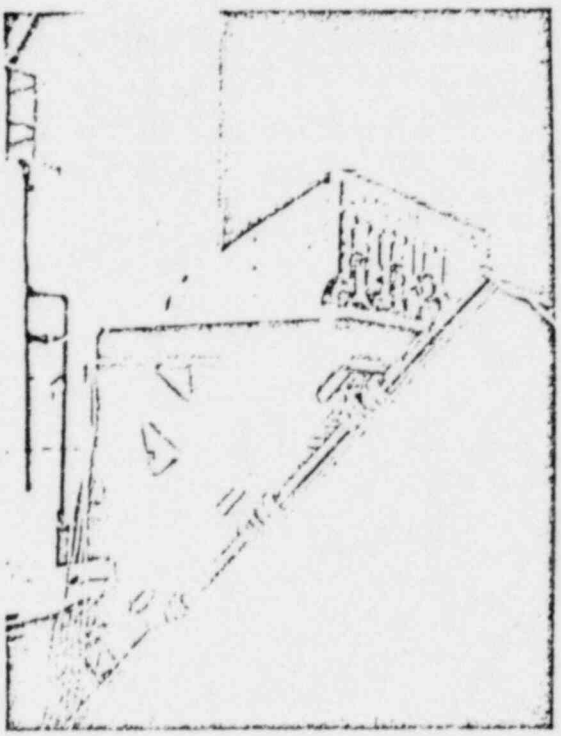
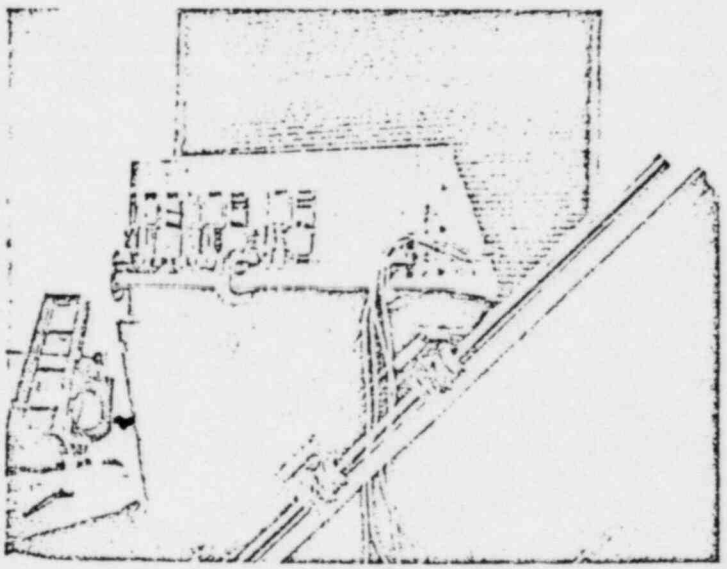


BACK-TO-FRON & VERTICAL
DIRECTION OF BIAXIAL EXCITATION
TESTS 3 & 6

Report No. 14373-4

ACTON ENVIRONMENTAL TESTING CORPORATION



LEFT-TO-RIGHT & VERTICAL
DIRECTION OF BIAXIAL EXCITATION
TESTS 4 & 5

Report No. 14373-4

ACTON ENVIRONMENTAL TESTING CORPORATION

Q = 10 5% DAMPING

Test No. RRS FOR REPORT #14373-4
Date 11-8-78
Customer ELECTRO SWITCH
Test Item P/N
Test Item S/N
Type of Test
Spec. No.
Para. No.
Conditions
Temperature
Period of Test
Control Axis VERTICAL
Pick-up No.
Pick-up Axis
Operator
Test Engr.

REQUIRED RESPONSE SPECTRA

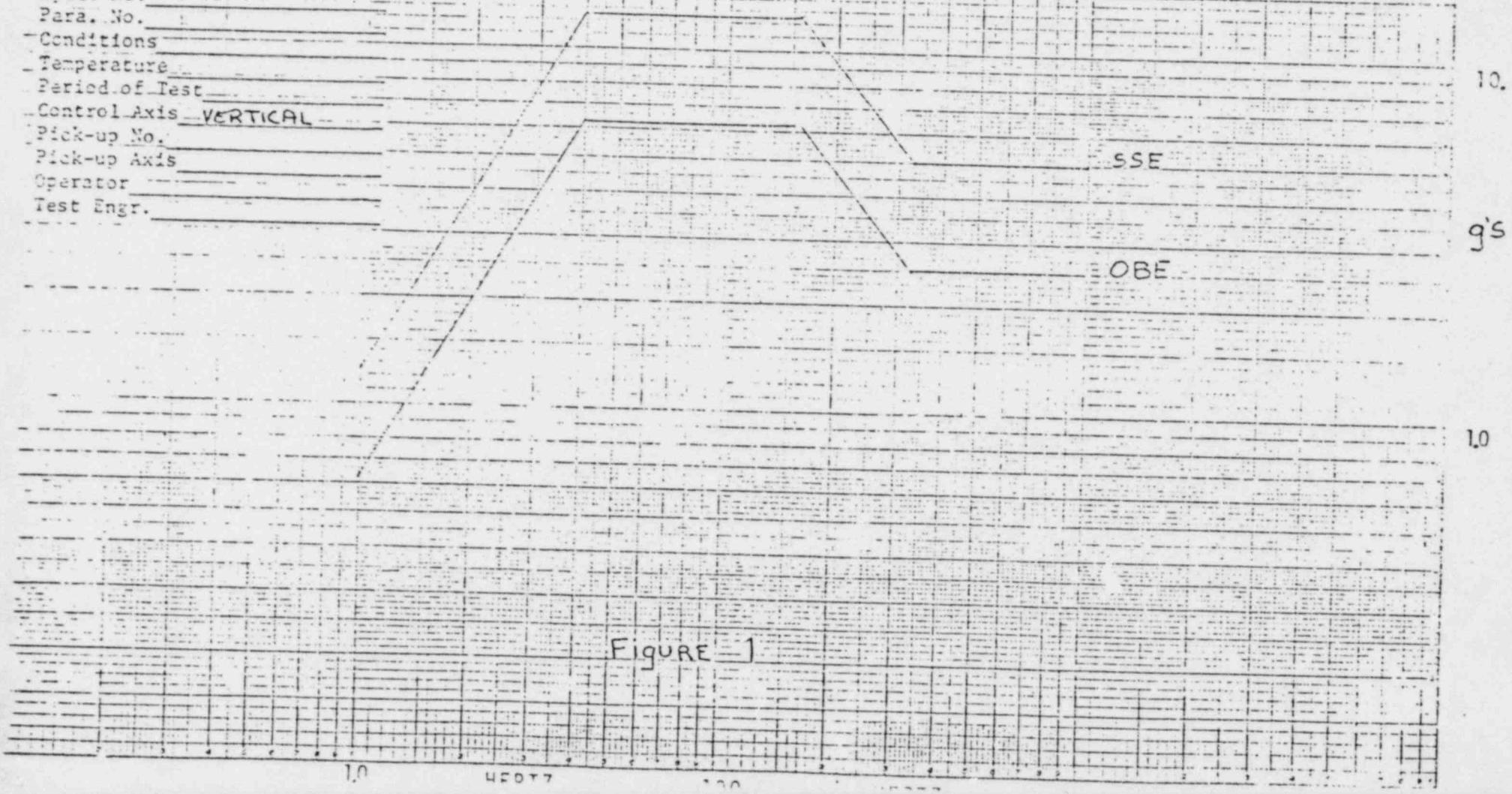


FIGURE 1

ENVIRONMENTAL TESTING CORPORATION

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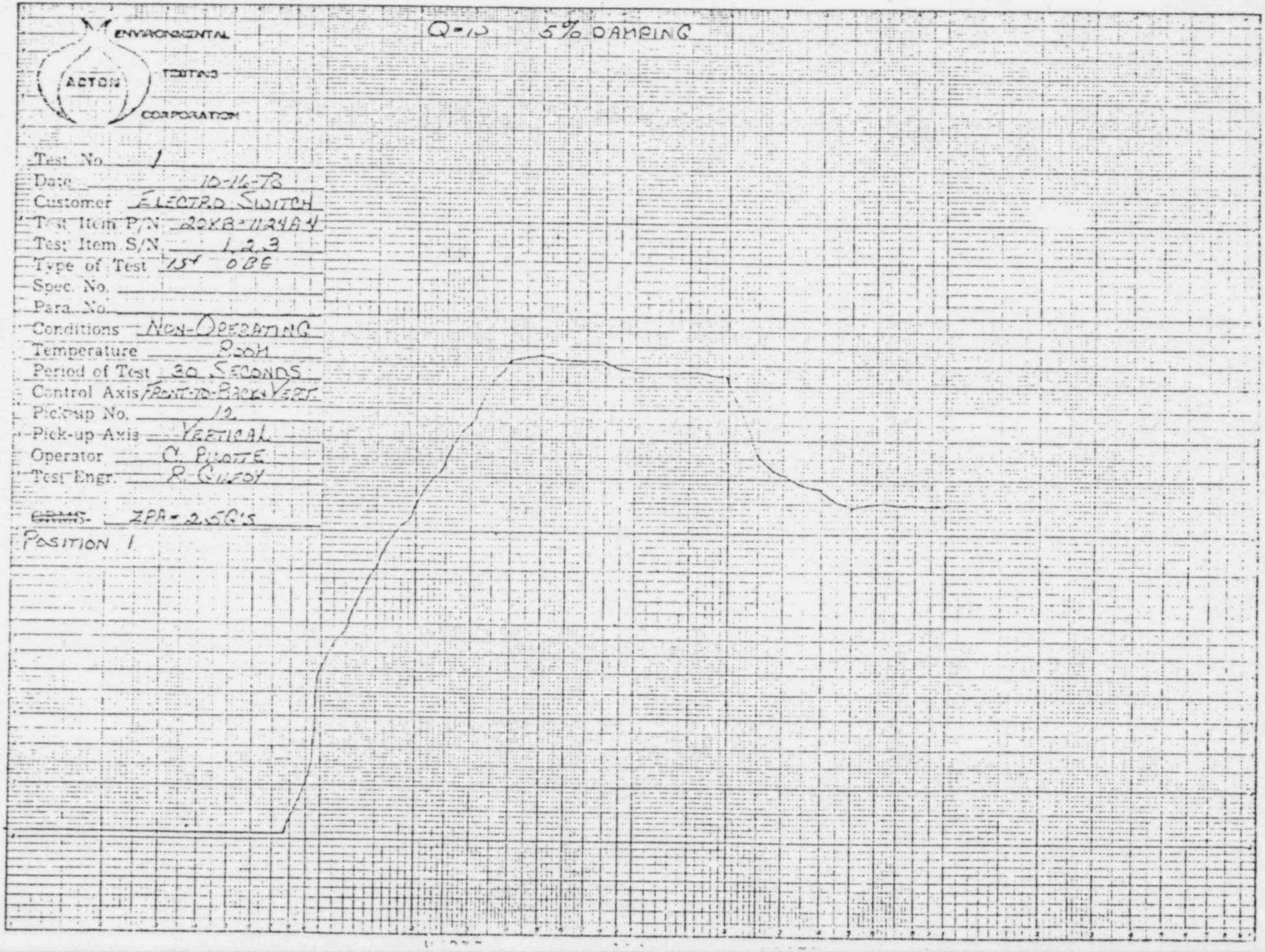
Q-12 5% DAMPING

Test No. 1
Date 10-14-78
Customer ELECTRO SWITCH
Test Item P/N 20XB-11R4A4
Test Item S/N 1, 2, 3
Type of Test 1ST OBE
Spec. No.
Para. No.
Conditions NON-OPERATING
Temperature R.T.
Period of Test 30 SECONDS
Control Axis FORE-TO-BACK VERT.
Pick-up No. 12
Pick-up Axis VERTICAL
Operator C. PILOTTE
Test Engr. R. GUZOY
~~GRMS~~ ZPA - 2.5 G's
POSITION 1



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Q=10 5% DAMPING

Test No. 1
Date 10-16-78
Customer ELECTRO SWITCH
Test Item P/N 2DK3-1124A4
Test Item S/N 1, 2, 3
Type of Test SSE
Spec. No.
Para. No.
Conditions NON-OPERATING
Temperature ROOM
Period of Test 30 SECONDS
Control Axis FRONT-TO-BACK/VERT
Pickup No. 12
Pick-up Axis VERTICAL
Operator C. PULLTE
Test Engr. R. GILROY

~~GRMS~~ ZPA = 5G'S
POSITION 1