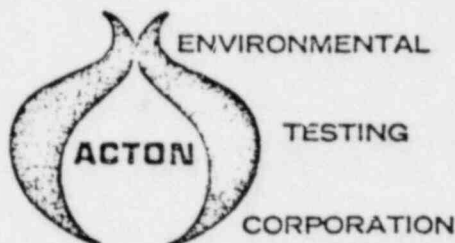


Test Report No. 11944-A

No. of Pages 32

Report of Test on

SEISMIC VIBRATION OF
ELECTRO. P/N 10KB2212C8
for
ELECTRO SWITCH CORPORATION
under
PURCHASE ORDER NO. 71400



Date November 14, 1975

	Prepared	Checked	Approved
By	K. Martini	R. Gilfooy	M. L. Tolf
Signed	<i>K. Martini</i>	<i>R. Gilfooy</i>	<i>M. L. Tolf</i>
Date	<i>11/14/75</i>	<i>14 Nov. 75</i>	<i>11/14/75</i>

MLT:KM/hmf

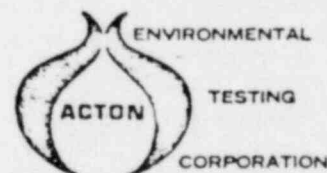
820430D177-

Administrative Data

- 1.0 Purpose of Test: Qualification seismic vibration of the Electro Switch Corporation electro switch specified below.
- 2.0 Manufacturer: Electro Switch Corporation
- 3.0 Manufacturer's Type or Model No: Electro P/N 10KB2212C8, Series 10K, 12 decks, 14 oz.
- 4.0 Drawing, Specification or Exhibit: The Electro Switch Corporation letter, dated September 8, 1975 to Acton Environmental Testing Corporation (AETC) from Mr. J.R.Qualey.
- 5.0 Quantity of Items Tested: One (1) electro switch
- 6.0 Security Classification of Items: None
- 7.0 Date Test Completed: October- 29, 1975
- 8.0 Test Conducted By: R.Gilfoy/C.Pilotte/D.McLaughlin
- 9.0 Disposition of Specimens: Returned to Electro Switch Corporation
- 10.0 Abstract: There was no evidence of mechanical damage or deterioration to the Electro Switch Corp. electro switch as a result of the seismic vibration test specified in para. 2.0 below. Refer to para. 3.0 for specific test results.

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Page 1



1.0 TEST REQUIREMENTS

The Electro Switch Corporation electro switch is required to pass the seismic vibration test specified in paragraph 2.0 below, without evidence of mechanical damage or deterioration.

2.0 TEST PROCEDURES

The electro switch was secured to a test fixture by its normal mounting means and the test fixture was securely bolted to the 45° biaxial moving table, with a biaxial seismic simulator, of the Acton Environmental Testing Corporation (AETC) seismic test facilities for seismic vibration testing in the first front-to-back biaxial direction.

Switch contacts were monitored for momentary openings and closures throughout the subsequent seismic vibration test with the AETC/Matrix Chatter Box calibrated for 10 micro-seconds. The closed circuits of the switches have been wired in series and the open circuits have been wired in parallel for monitoring switch circuit change during test.

Two monitoring accelerometers and one control accelerometer were placed on the test item/test fixture in the following locations:

ACCELEROMETER NO.

LOCATION

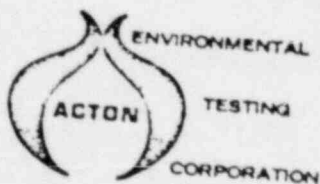
3 & 4

In a biaxial group at the rear of the switch: #3 vertical; #4 in the horizontal direction of excitation

12

Control at the base of the unit.

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The following resonance survey was performed first in the first front-to-back biaxial direction:

0.5 to 35 Hz, 0.28g's resultant, 1 octave/minute sweep

Following completion of the resonance survey in the first front-to-back biaxial direction, the unit was rotated 180° to the second front-to-back biaxial direction, and the above specified resonance survey was performed.

Following completion of the resonance survey in the second front-to-back biaxial direction, the unit was rotated 90° to the first side-to-side biaxial direction, and the above specified resonance survey was performed.

Following completion of the resonance survey in the first side-to-side biaxial direction, the unit was rotated 180° to the second side-to-side biaxial direction, and the above specified resonance survey was performed.

The AETC Seismic Simulator was then setup for biaxial seismic vibration with a random input. The equivalent random vibration level of the Electro Switch Corporation Specification Required Response Spectrum was computed. With the test item setup in the first front-to-back biaxial direction, five 1/2 SSE, 30-second random vibration exposures were performed.

Test Response Spectra at a Q of 20 were computed employing a Spectral Dynamic SD331 Shock Spectrum Analyzer fast fourier transform program. The spectra were compared to the Required Response Spectrum.

X-Y Plots of the TRS made with the SD331 are included with this report.

After performing five 1/2 SSE random vibration inputs in the first front-to-back biaxial direction, the test item was rotated 180° and the test was repeated in the second front-to-back biaxial direction. Again five 1/2 SSE 30-second random vibration exposures were performed.

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Following completion of the five 1/2 SSE in the second front-to-back biaxial direction, the test item was rotated 90° to the first side-to-side biaxial direction and five 1/2 SSE 30-seconds random vibration exposures were performed.

Following completion of the five 1/2 SSE in the first side-to-side biaxial direction, the test item was rotated 180° to the second side-to-side biaxial direction and five 1/2 SSE 30-second random vibration exposures were performed in the second side-to-side biaxial direction.

The test item/test fixture assembly was then rotated 90° to the first front-to-back biaxial direction and one full SSE 30-second random vibration exposure was performed.

Following completion of the one full SSE in the first front-to-back biaxial direction, the test item was rotated 180° to the second front-to-back axis and a full SSE 30 seconds random vibration exposure was performed.

The test item was then rotated 90° to the first side-to-side axis and a full SSE 30 seconds random vibration exposure was performed.

The test item was then rotated 180° to the second side-to-side axis and the full SSE 30 seconds random vibration exposure was performed.

This completed the testing of the electro switch.

During all the tests, outputs of all three accelerometers were displayed on oscillographic recorders.

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3.0 TEST RESULTS

No resonances of the electro switch were detected in the resonance survey in either the front-to-back biaxial direction or the side-to-side biaxial direction. No damage or deterioration occurred to the Electro Switch equipment as a result of resonance survey.

There was no evidence of mechanical damage or deterioration to the Electro Switch equipment as a result of the 1/2 SSE in any of the four biaxial directions.

No damage or deterioration occurred to the Electro Switch equipment as a result of the full SSE in any of the four biaxial directions.

No contact chatter occurred throughout the seismic vibration testing.

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Page 5

TEST EQUIPMENT LIST

NAME	MFGR.	MODEL	SER.NO.	RANGE	ACCURACY	INV.#	CAL.FREQ.
Accelerometer	PCB	302A	666	0.25 Hz - 5 KHz	+5%	AC375	3 months
"	"	"	667	" "	"	AC376	" "
"	"	"	668	" "	"	AC377	" "
"	"	"	669	" "	"	AC378	" "
"	"	"	670	" "	"	AC379	" "
"	"	"	671	" "	"	AC380	" "
"	"	"	672	" "	"	AC381	" "
"	"	"	673	" "	"	AC382	" "
"	"	"	565	" "	"	AC383	" "
"	"	"	694	" "	"	AC384	" "
"	"	"	697	" "	"	AC387	" "
VTVM	HP	403A		10 Hz-1 MHz, 0-300 volts 12 ranges	+3%	HV322	" "
Sweep Oscillator	SDY	SD-104-5	21A	0.005 Hz - 50 KHz	+1%	SG315	6 months
Random Noise Generator	GR	1381	927	2 Hz - 50 KHz	+1 db	SG337	" "
Hydraulic Actuator	MTS	204.63S		DC-300 Hz, 25K force lbs 25" DA max	+2%F +5%A	PE367	3 months
Controller	MTS	443.115		DC-2000 Hz	+1%	PE367	" "
Charge Amplifier	UD	D11MGSV	910	1-1000G 2 Hz-20 KHz	+2%	PE361	" "
Chatter Monitor	Matrix	202D	310	10 & 100 usec	+2%	PE370	6 months
False Contact Monitor	Matrix	202D	310	10 & 100 usec	+2%	PE371	6 months
Power Unit Conditioner	PCB	483A	273	Output-22 VDC 12 MA(used w/302A Accelerometers)	N/A	PE374	3 months

TEST EQUIPMENT LIST

NAME	MFGR.	MODEL	SER.NO.	RANGE	ACCURACY	INV.#	CAL.F
Electronic Filter (dual)	SKL	302	498	20 Hz - 200 KHz	+5%	AM328	6 mont
Power Supply	BUBR	506/16	322	+15 VDC, 1 ADC	0.5%	PD372	" "
Visicorder	Honeywell	906	9-5235	DC - 2 KHz 12 channel	+1 DB	RE332	3 mont
Recorder	"	906C	99078	DC - 2 KHz 12 channel	+1 db	RE335	" "
X-Y Plotter	MFE	715	42167	RENTAL			
X-Y Display	Spec.Dyn	13116-2A	327	Display Indicator			in use
Shock Analyzer	" "	13231	17	.1 Hz - 10 KHz			in use
Transient Memory	" "	13192	18	Storage			in use



Test No. _____

Date _____

Customer _____

Test Item P/N _____

Test Item S/N _____

Type of Test _____

Spec. No. _____

Para. No. _____

Conditions _____

Temperature _____

Period of Test _____

Control Axis _____

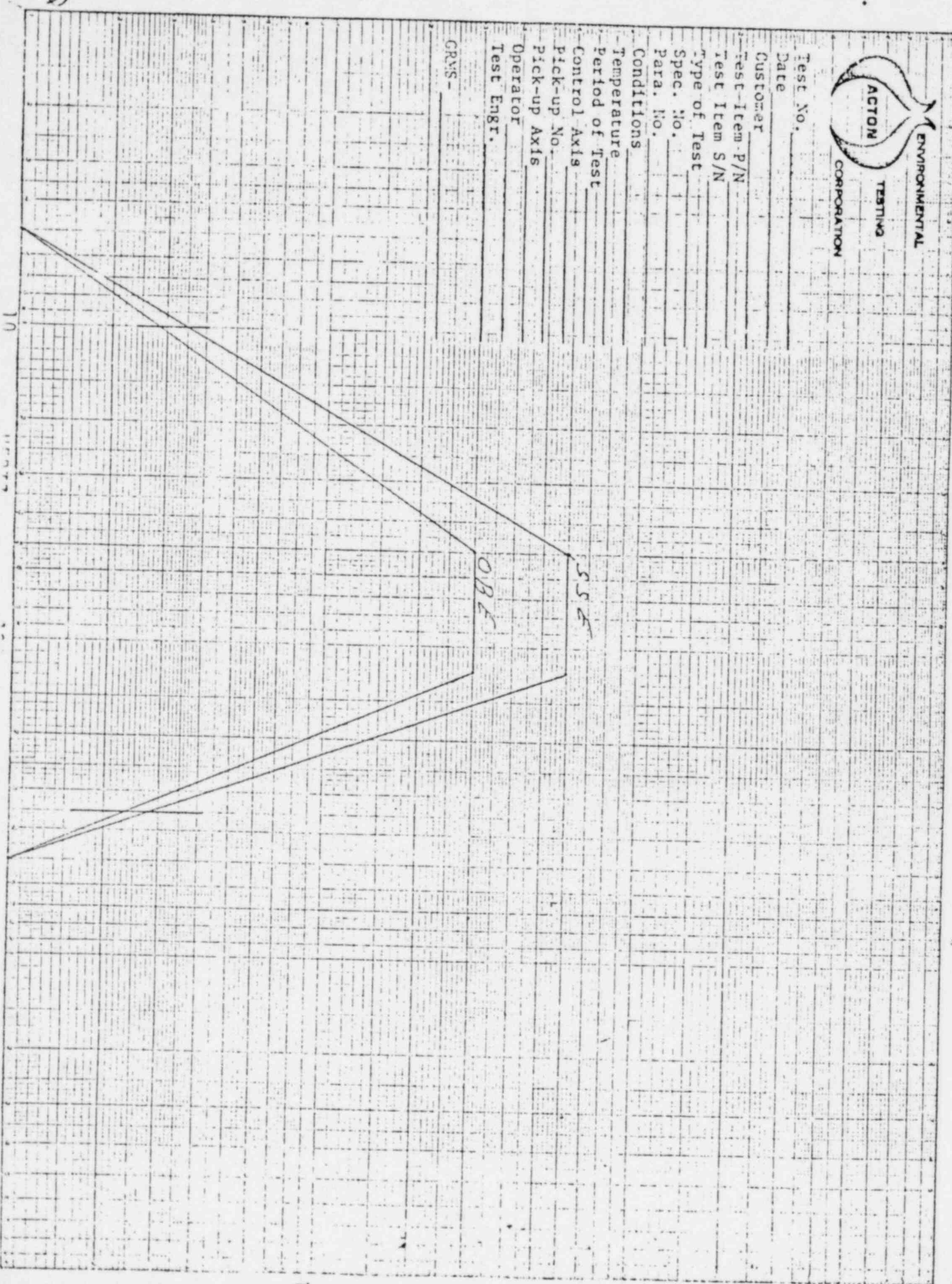
Pick-up No. _____

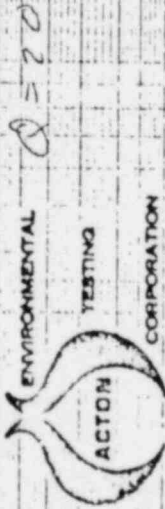
Pick-up Axis _____

Operator _____

Test Engr. _____

GRVS- _____





Test No. Test #5 Run #1

Date 12/19/72

Customer Elenco Switch

Test Item P/N

Test Item S/N

Type of Test 1/2 SE

Spec. No.

Para. No.

Conditions DAAR

Temperature Room

Period of Test 30 sec

Control Axis Vertical + F-B

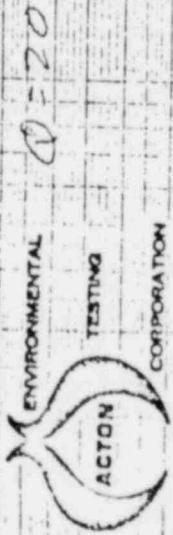
Pick-up No.

Pick-up Axis Vertical

Operator C. Pilote

Test Engr. R. G. Foy

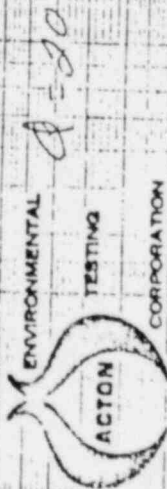
GRVS- 22



Test No. Test #5 Run #2
Date 10/19/77
Customer ELIAC - Semi Tech
Test Item P/N
Test Item S/N
Type of Test 1/2 SSE
Spec. No.
Para. No.
Conditions Over
Temperature Room
Period of Test 30 seconds
Control Axis Vertical + FB
Pick-up No.
Pick-up Axis Vertical
Operator C. M. He.
Test Engr. R. Bilfoy

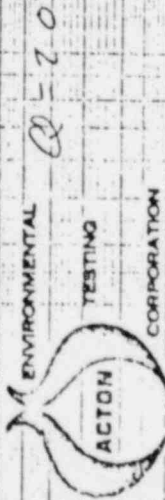
GRMS - 22





Test No. Test 5 Run # 3
Date 10/29/72
Customer Electronic Switch
Test Item P/N
Test Item S/N
Type of Test Vib SE
Spec. No.
Para. No.
Conditions Oper.
Temperature Room
Period of Test 30 sec.
Control Axis Vertical & FB
Pick-up No.
Pick-up Axis Vertical
Operator C. R. H. H.
Test Engr. P. G. H. H.

GRVS - 22



ENVIRONMENTAL Q-20

TESTING

CORPORATION

Test No. Test #5 Run #4

Date 10/30/75

Customer Electro-Sonic

Test Item P/N

Test Item S/N

Type of Test 12-55

Spec. No.

Para. No.

Conditions OPR.

Temperature Room

Period of Test 30 sec.

Control Axis Vertical + FB

Pick-up No.

Pick-up Axis Vertical

Operator A. P. Little

Test Engr. R. G. Hugg

GRMS - 22





$R=20$

Test No. 10575 Run 5
 Date 12/30/75
 Customer Electro Switch
 Test Item P/N _____
 Test Item S/N _____
 Type of Test 1/2 SEC
 Spec. No. _____
 Para. No. _____
 Conditions OADR
 Temperature Room
 Period of Test 30 sec
 Control Axis Vertical + F-B
 Pick-up No. _____
 Pick-up Axis Vertical
 Operator A. H. Little
 Test Engr. R. Gilkey

GRMS - 22



ENVIRONMENTAL Q 20

TESTING

CORPORATION

TEST NO. 1037-6 Rev #1
DATE 10/29/73
CUSTOMER Electric Switch

TESTED BY

TEST TECH S/N

TYPE OF TEST 12555

SPEC. NO.

DATE

TESTING APPR.

TESTED BY

TESTED AT TESTED ON

CONTROL AXIS VERIFICATION

TESTED BY

TESTED AT

TESTED ON

TESTED BY

TESTED AT

TESTED ON





ENVIRONMENTAL
Q-70

TESTING

CORPORATION

Test No. 6 442

Date 10/29/77

Customer Electro-Switch

Test Item P/N

Test Item S/N

Type of Test 1/2 SST

Spec. No.

Para. No.

Conditions Wet

Temperature Room

Period of Test 30 sec.

Control Axis Vertical + R-F

Pick-up No.

Pick-up Axis Vertical

Operator C. P. G. He.

Test Engr. R. Gilkey

GRMS - .22



Q-20



Test No. 101 Rev. 3

Date 10/29/75

Customer Electro Switch

Test Item P/N

Test Item S/N

Type of Test 1/2 SSE

Spec. No.

Para. No.

Conditions Open

Temperature Room

Period of Test 30 sec

Control Axis Vertical A+B-F

Pick-up No.

Pick-up Axis Vertical

Operator C. P. H. Jr

Test Engr. R. G. H. Jr

CPMS - 122





Q = 20

Test No. 6 Rev 4
 Date 10/29/75
 Customer Electro-Switch
 Test Item P/N _____
 Test Item S/N _____
 Type of Test 1/2 SSE
 Spec. No. _____
 Para. No. _____
 Conditions Open
 Temperature Room
 Period of Test 30 sec
 Control Axis Vertical A-B-F
 Pick-up No. _____
 Pick-up Axis Vertical
 Operator C. P. Helle
 Test Engr. R. G. Helle

GRVS - 22

10

10



Q-20

Test No. Test #6 Run 5
Date 10/29/25
Customer Electric Switch
Test Item P/N
Test Item S/N
Type of Test 1/2 SS E
Spec. No.
Para. No.
Conditions OPER
Temperature Room
Period of Test 30 sec.
Control Axis Vertical to F
Pick-up No.
Pick-up Axis Vertical
Operator C. White
Test Engr. R. Gilfoy

SPS-122





Test No. 7. Part 1

Date 11-28-75

Customer Electro Switch

Test Item P/N

Test Item S/N

Type of Test 1/2 JSE

Spec. No.

Para. No.

Conditions OPER.

Temperature Room

Period of Test 30 sec.

Control Axis Vertical & Horizontal

Pick-up No.

Pick-up Axis Vertical

Operator E. R. W. H.

Test Engr. R. G. H. G.

Sheet 1 of 2

10-20

10-

10



Q-20

Test No. 2 Run 2

Date 10/29/75

Customer Electric - Switch

Test Item P/N

Test Item S/N

Type of Test 1/2 SSE

Spec. No.

Para. No.

Conditions OPER.

Temperature ROOM

Period of Test 30 Sec.

Control Axis 5-5 of Operating (and Horiz)

Pick-up No.

Pick-up Axis Vertical

Operator C. McHale

Test Engr. R. Giffey

GRNIS - 032





$Q = 20$

Test No. 7 Rev 3

Date 10/24/75

Customer Electra-Switch

Test Item P/N _____

Test Item S/N _____

Type of Test 1/2 sec

Spec. No. _____

Para. No. _____

Conditions Over

Temperature Room

Period of Test 30 sec

Control Axis 1-5 + Vent (3rd-Hood)

Pick-up No. _____

Pick-up Axis Vertical

Operator C. P. H.

Test Engr. R. C. Fey

GRIS- 22

10

10

Q-20



Test No. 7 Run 4

Date 12/29/75

Customer Electric Switch

Test Item P/N

Test Item S/N

Type of Test 72.55C

Spec. No.

Para. No.

Conditions Open

Temperature Room

Period of Test 30 sec

Control Axis 1-5 + Vertical (3rd Hoar)

Pick-up No.

Pick-up Axis Vertical

Operator E. A. McHe

Test Engr. R. G. Fay

GRMS - 0.22





Q = 20

Test No. 74 Aug 5

Date 11/9/77

Customer Electro-Switch

Test Item P/N

Test Item S/N

Type of Test 1/2 SS

Spec. No.

Para. No.

Conditions DCR

Temperature Room

Period of Test 30 sec.

Control Axis 5-4 vent (3rd Floor)

Pick-up No.

Pick-up Axis Vertical

Operator C. Albee

Test Engr. R. Gilfoy

CRIS - 22

10.

1.0



Q-20

Test No. 8 Run 1

Date 10/29/75

Customer Electric Switch

Test Item P/N

Test Item S/N

Type of Test Vibration

Spec. No.

Para. No.

Conditions Oper.

Temperature Room

Period of Test 30 Sec

Control Axis 5-5 Vert. (44 Power)

Pick-up No.

Pick-up Axis Vertical

Operator C. H. H.

Test Engr. R. L. Foley

GRVS - 72





Q-20

Test No. E Run 2

Date 10/30/75

Customer Electro-Switch

Test Item P/N

Test Item S/N

Type of Test Pass

Spec. No.

Para. No.

Conditions Open

Temperature Room

Period of Test 30 sec.

Control Axis 5-54000 (4th Hour)

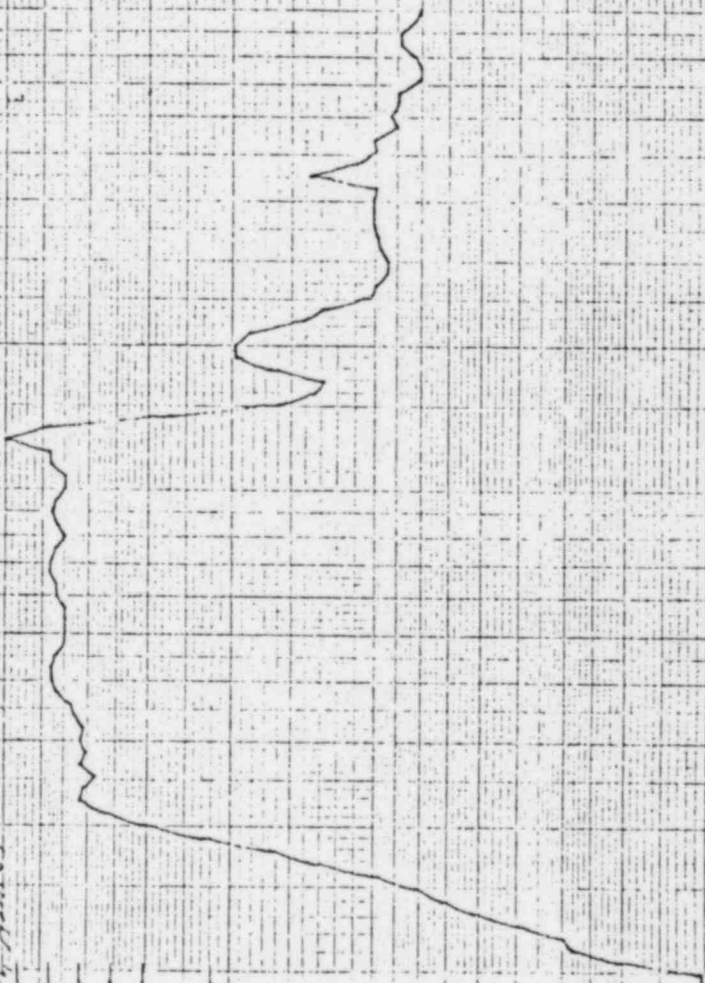
Pick-up No.

Pick-up Axis Vertical

Operator C. H. H. H.

Test Engr. R. G. 1 Fey.

CRIS - 22





Q-20

Test No. 8 Run 3

Date 10/29/75

Customer Electro-Switch

Test Item P/N

Test Item S/N

Type of Test 1/2 Sec

Spec. No.

Para. No.

Conditions Over R

Temperature Room

Period of Test 30 sec

Control Axis 5-5 + 100% (4th Hour)

Pick-up No.

Pick-up Axis Vertical

Operator C. R. Holt

Test Engr. R. G. Gage

GRMS - 22





Test No. 5 Run 4
Date 10/30/75
Customer Elanco-Switch
Test Item P/N
Test Item S/N
Type of Test Vibration
Spec. No.
Para. No.
Conditions OPER.
Temperature Room
Period of Test 30 Sec.
Control Axis 5 + Vert. (4th Harmonic)
Pick-up No.
Pick-up Axis Vertical
Operator C. R. He
Test Engr. R. G. Fay

GRMS - 0.22



Q-20

10.

10



ENVIRONMENTAL $\sigma = 20$

TESTING

CORPORATION

Test No. 7 Run 5

Date 12/29/75

Customer Electro-Switch

Test Item P/N

Test Item S/N

Type of Test 42.55

Spec. No.

Para. No.

Conditions Q.P.R.

Temperature Room

Period of Test 30 sec.

Control Axis 5-5 + Vert (4th Hour)

Pick-up No.

Pick-up Axis Vertical

Operator C. R. Toth

Test Engr. R. Bilkey

GRMS - 0.22



ENVIRONMENTAL $\phi = 20$



Test No. 9

Date 10/24/75

Customer Electro-Switch

Test Item P/N

Test Item S/N

Type of Test FULL SE

Spec. No.

Para. No.

Conditions OPER

Temperature Room

Period of Test 30 sec.

Control Axis S-S + Vert (94460000)

Pick-up No.

Pick-up Axis Vertical

Operator C. P. H.

Test Engr. R. G. Fry

GENS- 4 g Rms

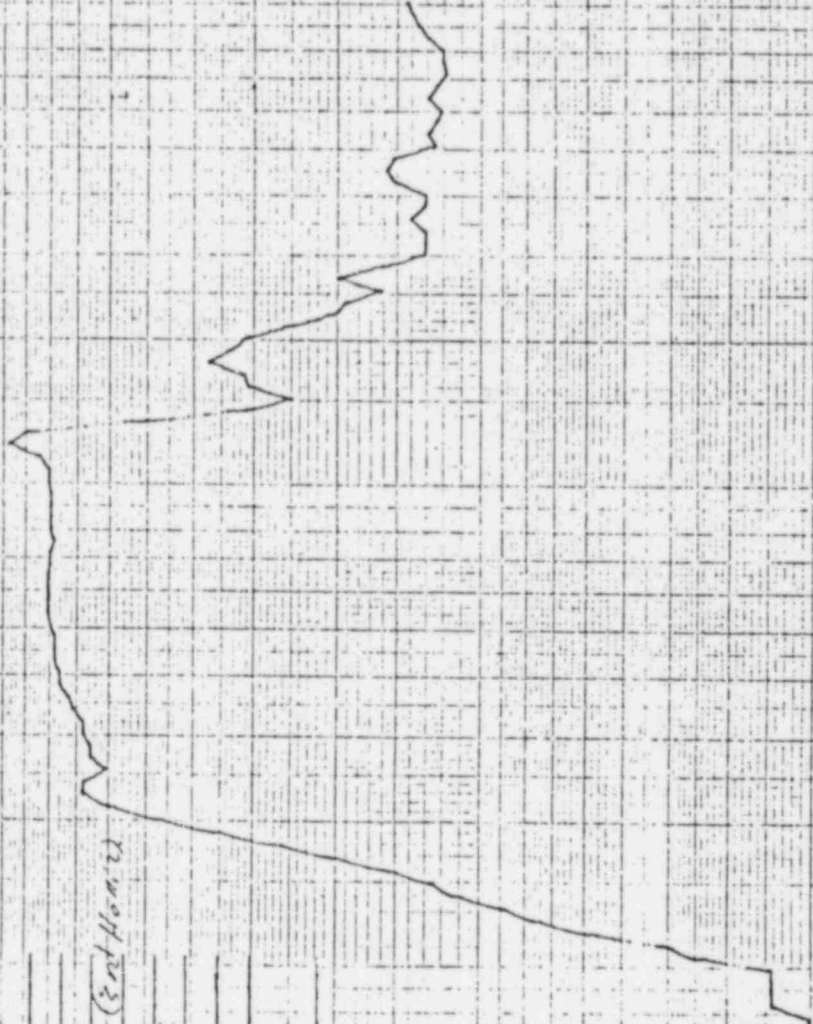


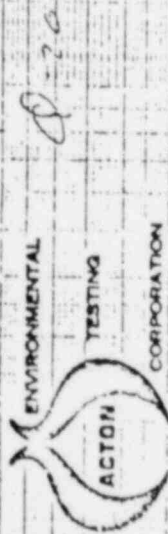


Q=20

Test No. 10
Date 10/29/75
Customer Elmta Switch
Test Item P/N
Test Item S/N
Type of Test Full SSE
Spec. No.
Para. No.
Conditions Oper.
Temperature Room
Period of Test 30 Sec.
Control Axis 5-st Unit (Ent Hous.)
Pick-up No.
Pick-up Axis Vertical
Operator C. A. W. H.
Test Engr. R. Giffey

GRS - 419 Kms.





Test No. 11
Date 10/27/75
Customer Electro-Sonic
Test Item P/N _____
Test Item S/N _____
Type of Test Fall SSE
Spec. No. _____
Para. No. _____
Conditions OPR
Temperature Room
Period of Test 30 sec
Control Axis Vertical
Pick-up No. _____
Pick-up Axis Vertical
Operator C. Gilkey
Test Engr. R. Gilkey

SPMS - 4.9 RMS





ENVIRONMENTAL

TESTING

CORPORATION

$Q=20$

Test No. 12

Date 10/29/75

Customer Efracton - Switch

Test Item P/N

Test Item S/N

Type of Test Fall SE

Spec. No.

Para. No.

Conditions OPEN

Temperature Room

Period of Test 30 seconds

Control Axis Para + Centric

Pick-up No.

Pick-up Axis Vertical

Operator C. H. H.

Test Engr. R. Giffey

GRMS - 36 gRMS

