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

ACTON ENVIRONMENTAL TESTING CORPORATION

Date November 14, 1975

	Prepared	Checked	Approved
By	K.Martini	R.Gilfoy	M.L.Tolf
Signed	K Martini	R. Gilfoy	M. L. Tolf
Date	11/14/75	14 Nov. 75	11/14/75

MLT:KM/hmf

8204300177

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.

ACTON ENVIRONMENTAL TESTING CORPORATION

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 microseconds. 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.

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.

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%	MV322	" "
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

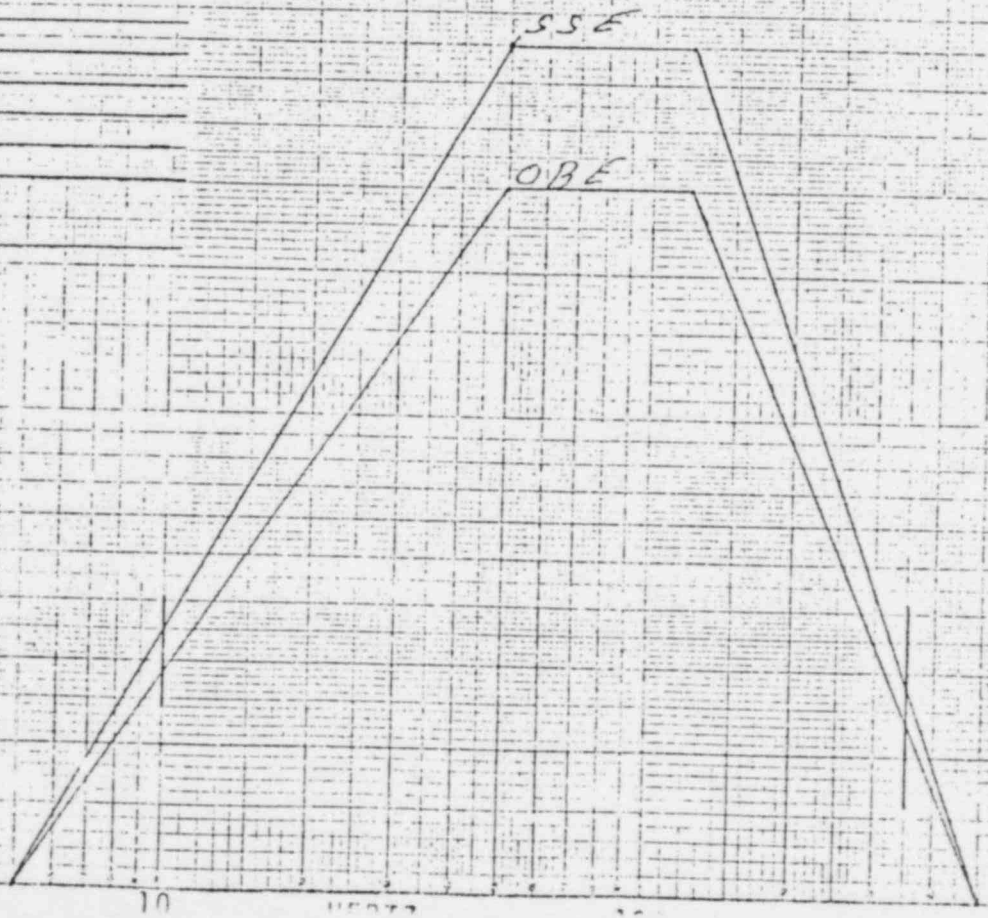
NAME	MFGR.	MODEL	SER.NO.	RANGE	ACCURACY	INV.#	CAL.F
Electronic Filter (dual)	SKL	302	498	20 Hz - 200 KHz	±5%	AM328	6 mont
Power Supply	BUBR	506/16	322	±15 VDC, 1 ADC	0.5%	PD372	" "
Visicorder	Honeywell	906	9-5235	DC - 2 KHz 12 channel	±1 DB	RE332	3 mont
Recorder	"	906C	99078	DC - 2 KHz 12 channel	±1 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

ENVIRONMENTAL TESTING CORPORATION

ACTON

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.

GRMS-



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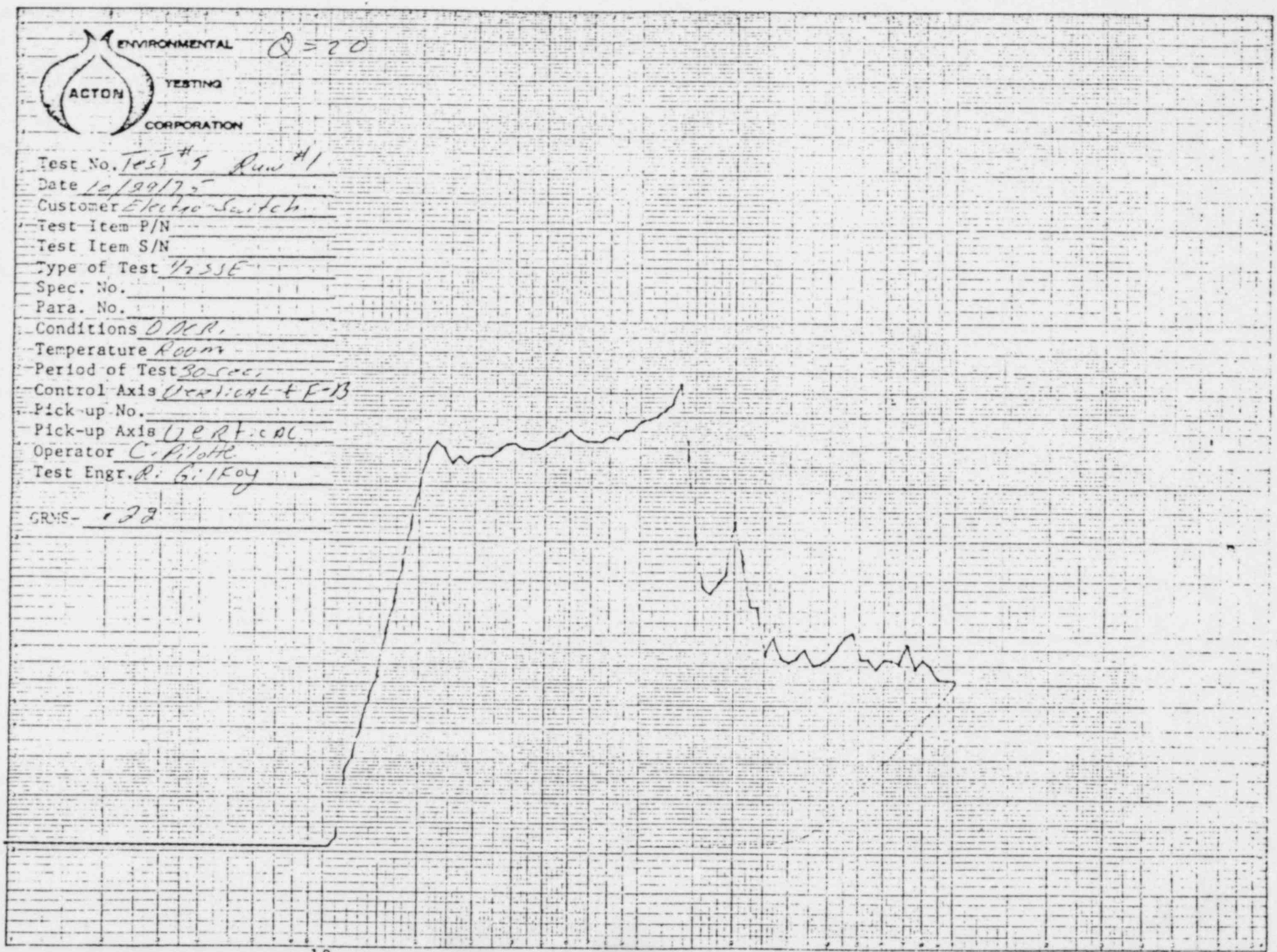
ENVIRONMENTAL TESTING CORPORATION

ACTON

Q = 20

Test No. Test #5 Run #1
Date 12/29/72
Customer Electro-Switch
Test Item P/N
Test Item S/N
Type of Test Y2 SSE
Spec. No.
Para. No.
Conditions OBE.
Temperature Room
Period of Test 30 sec.
Control Axis Vertical + E-W
Pick-up No.
Pick-up Axis VERTICAL
Operator C. Pilotte
Test Engr. R. Gilroy

GRMS- 1.22



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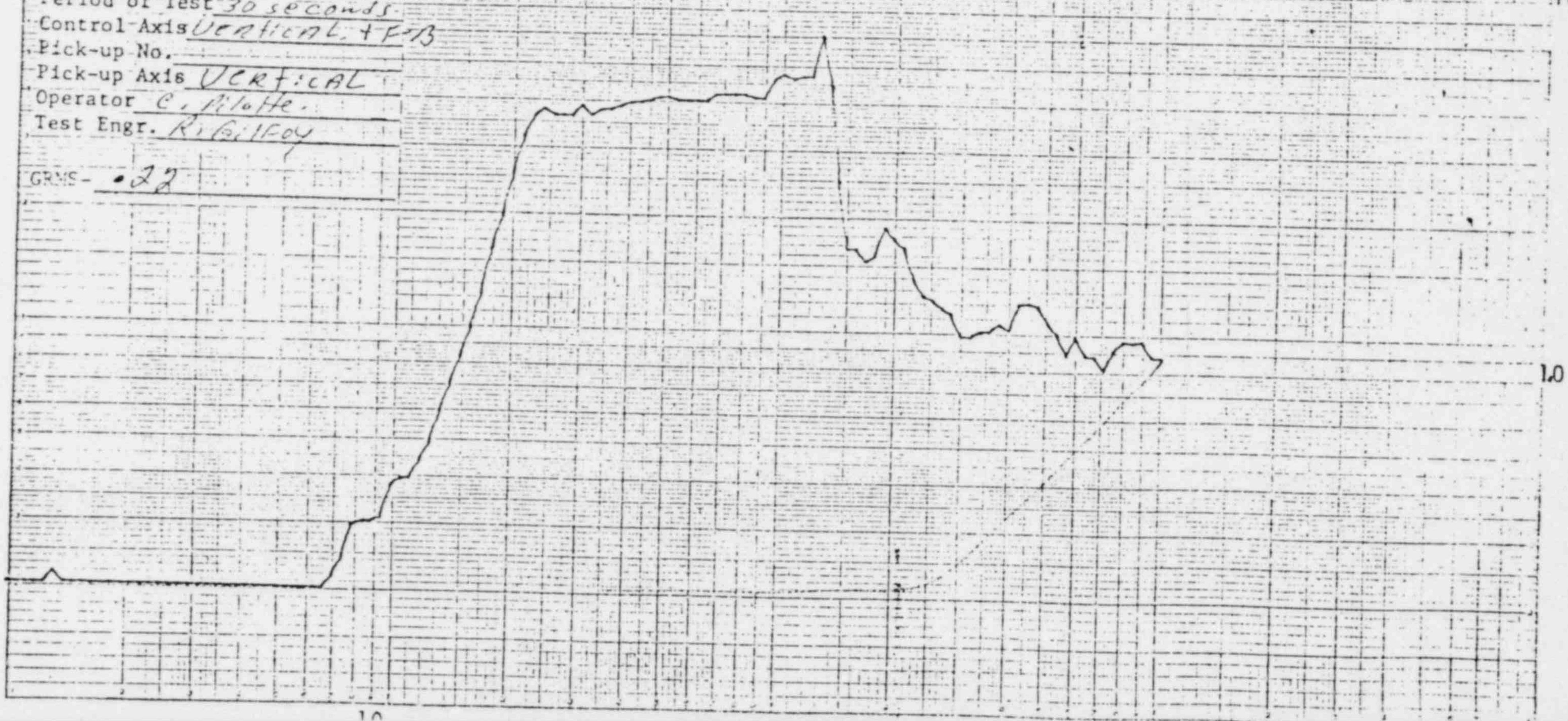
ENVIRONMENTAL TESTING CORPORATION — ACTON

Q = 20

Test No. Test #5 Run #2
Date 10/29/75
Customer Elektro-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 seconds
Control Axis Vertical + F-B
Pick-up No.
Pick-up Axis Vertical
Operator C. Nlotte
Test Engr. R. Gilfoy

GRMS - .22



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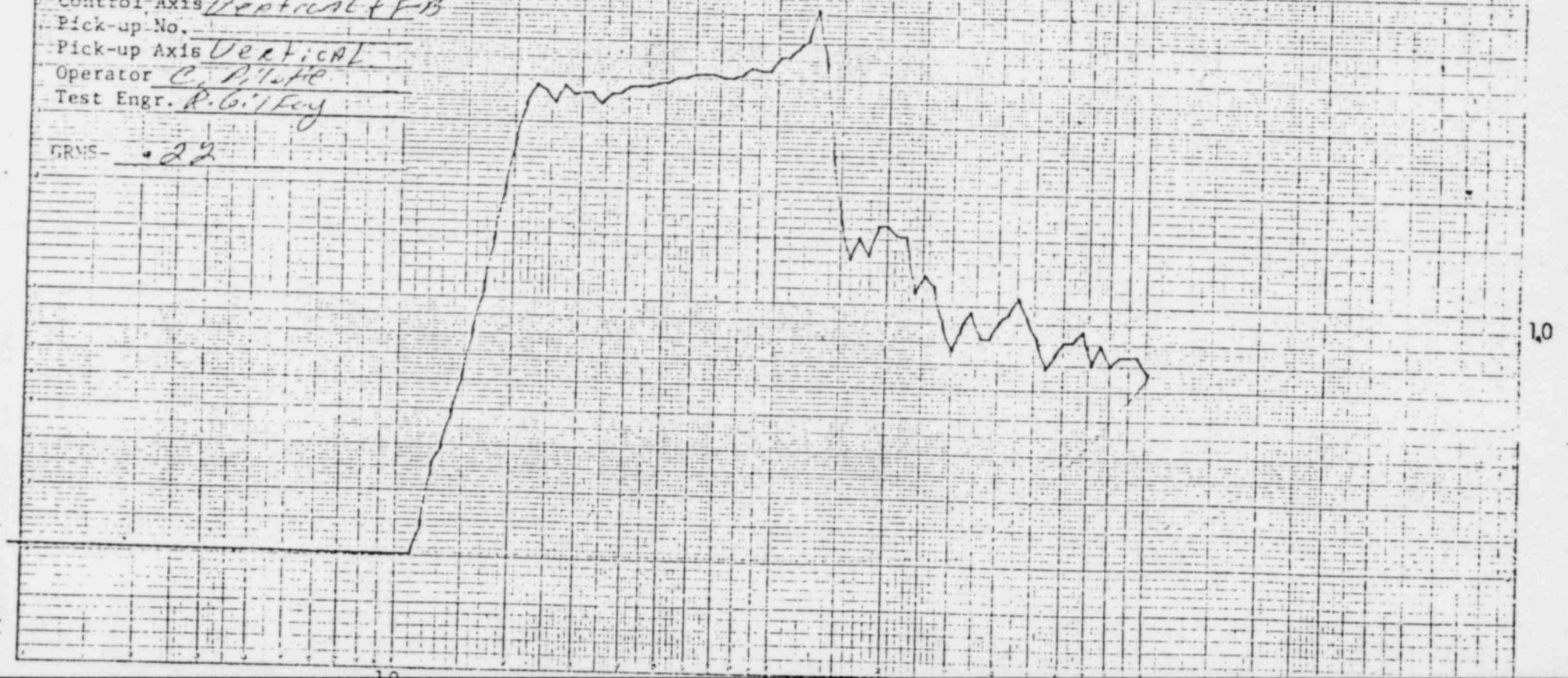
ACTON

Q=20

Test No. Test 5 Run #3
Date 10/29/73
Customer Electro Switch
Test Item P/N
Test Item S/N
Type of Test Y2SSE
Spec. No.
Para. No.
Conditions OpER.
Temperature Room
Period of Test 30 sec.
Control Axis Vertical + F-B
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS- .22



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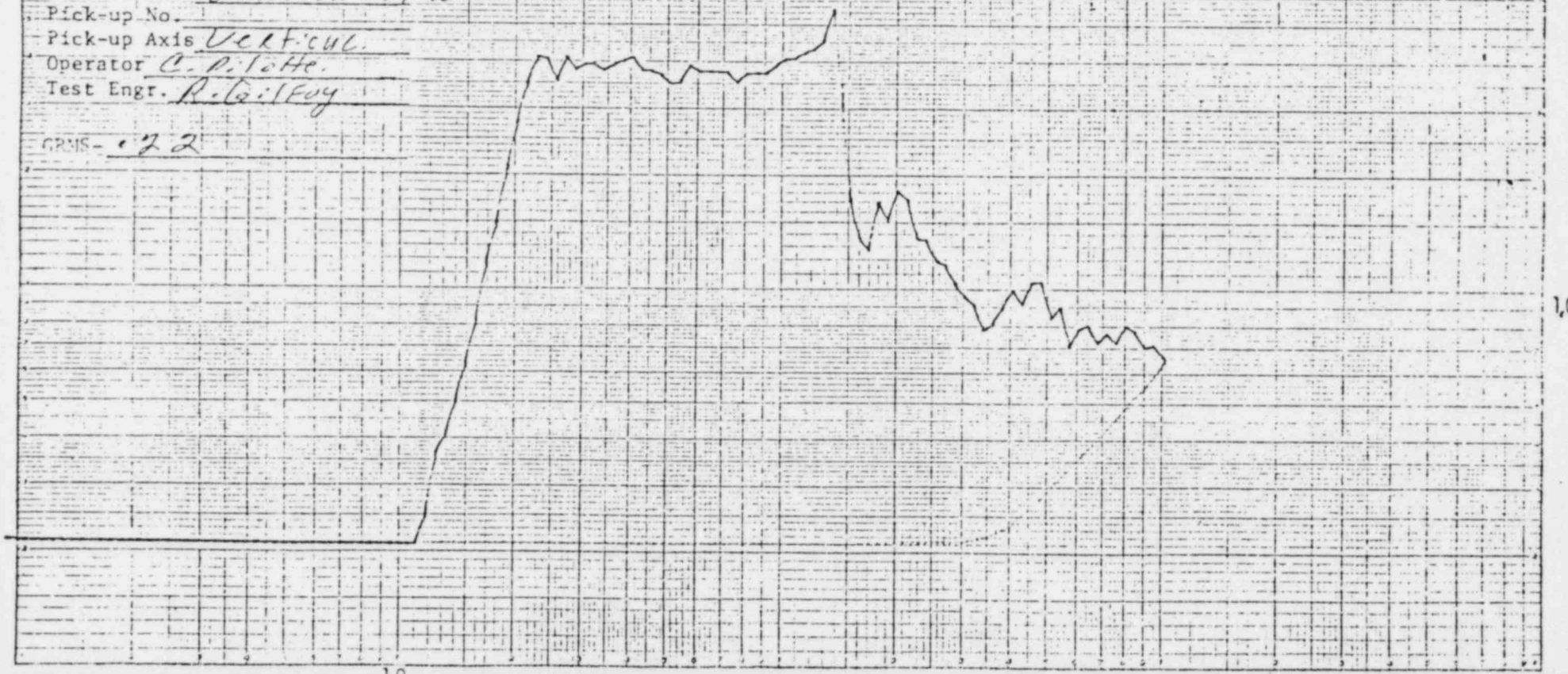
Q = 20

Test No. Test #5 Run #4
Date 10/29/75
Customer Electro-Switch
Test Item P/N
Test Item S/N
Type of Test 4/2 SSE
Spec. No.
Para. No.
Conditions OPER.
Temperature Room
Period of Test 30 sec.
Control Axis Vertical F&B
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS - .22



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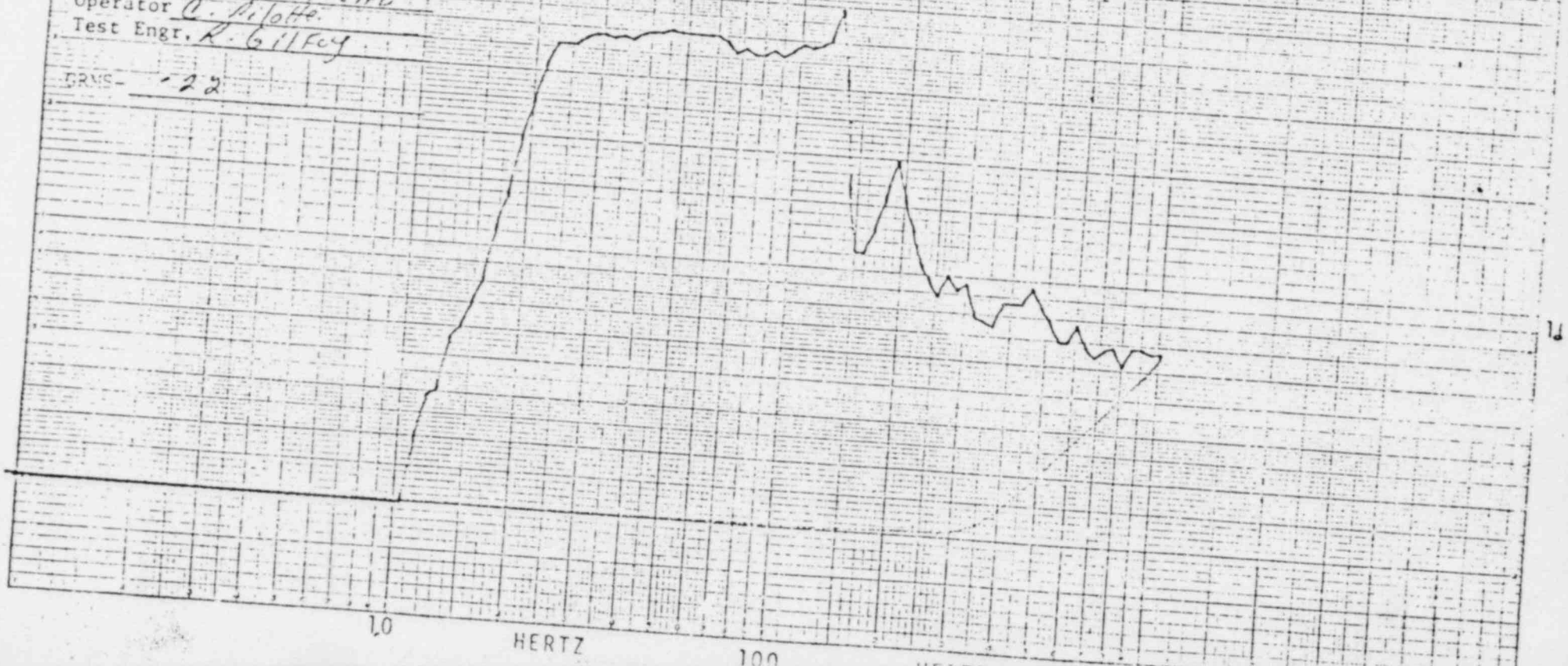
ACTON ENVIRONMENTAL TESTING CORPORATION

Q=20

Test No Test 5 Run 5
Date 12/29/75
Customer Electro Switch
Test Item P/N
Test Item S/N
Type of Test 1/2 SINE
Spec. No.
Para. No.
Conditions OAER.
Temperature Room
Period of Test 30 sec
Control Axis Vertical + E-W
Pick-up No.
Pick-up Axis VERTICAL
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS- 22



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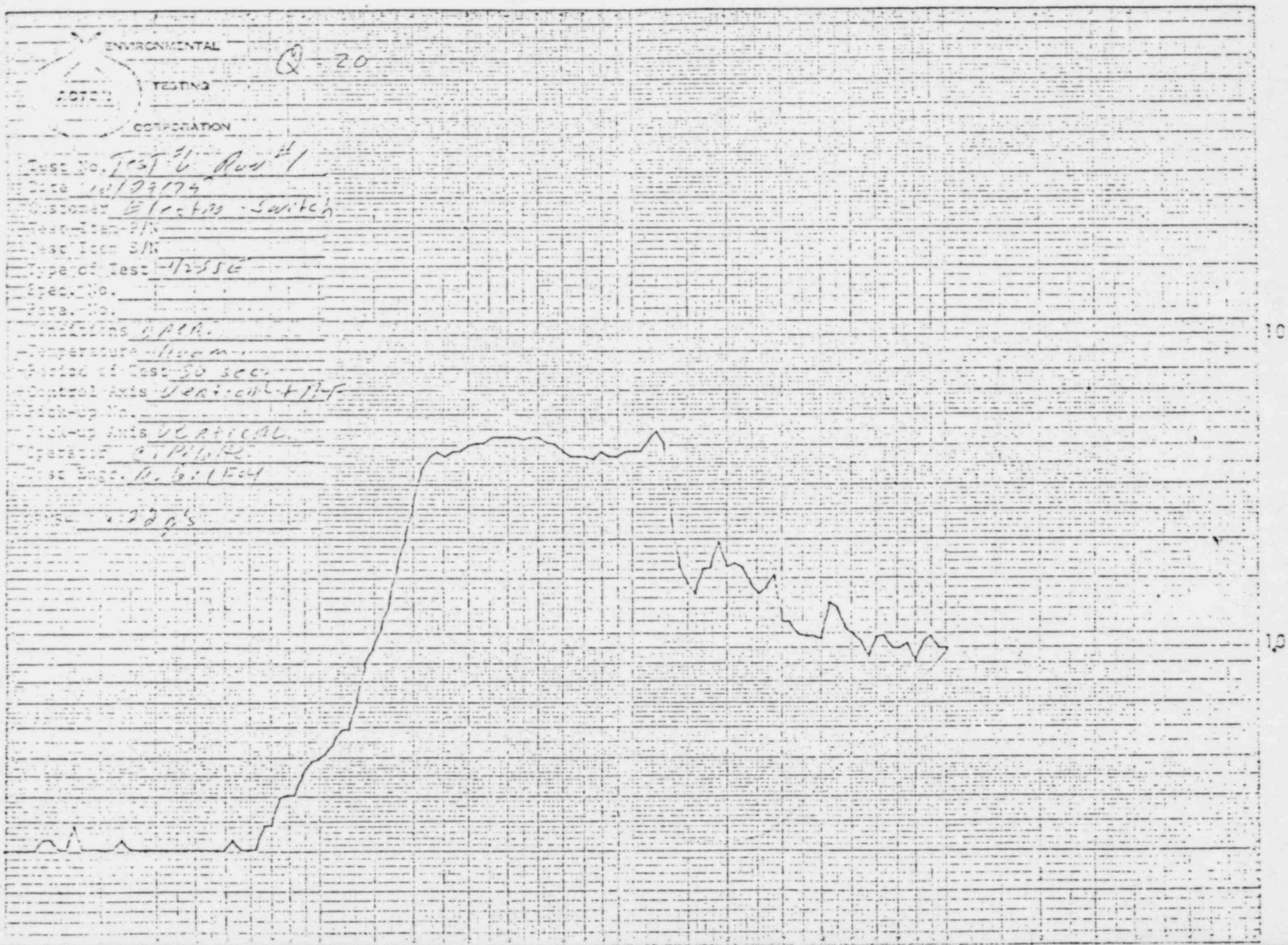
ENVIRONMENTAL
TESTING
CORPORATION
Q-20
Test No. Test 6 Run #1
Date 10/23/74
Customer Electro Switch
Test Item P/N
Test Item S/N
Type of Test 1/2 SSG
Spec. No.
Para. No.
Conditions open
Temperature Room
Period of Test 30 sec
Control Axis Vertical +F/B
Pick-up No.
Pick-up Axis VERTICAL
Operator
Test Engr.
10.
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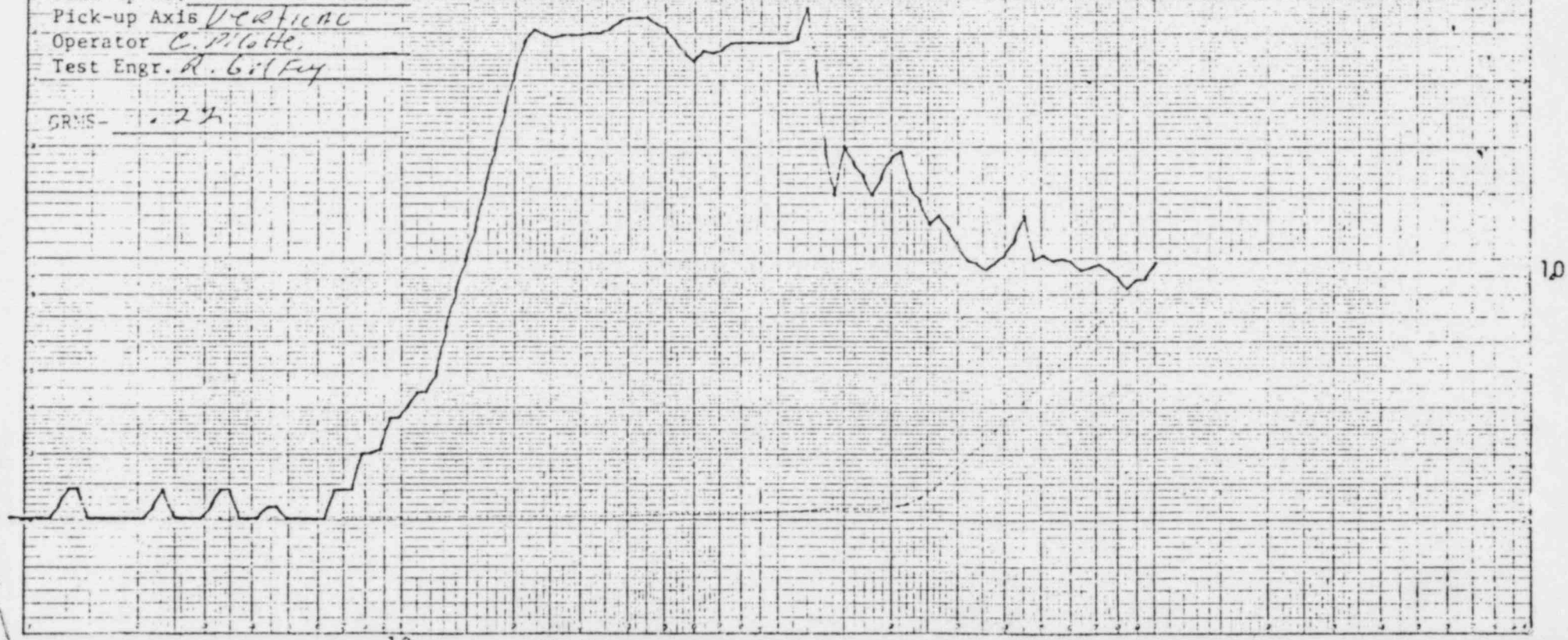
Q = 20

Test No. 6 4 of 7
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 ONER
Temperature Room.
Period of Test 20 sec.
Control Axis Vertical T/P
Pick-up No.
Pick-up Axis Vertical
Operator C. Plothe.
Test Engr. R. Gilfoy

GRMS- 1.24



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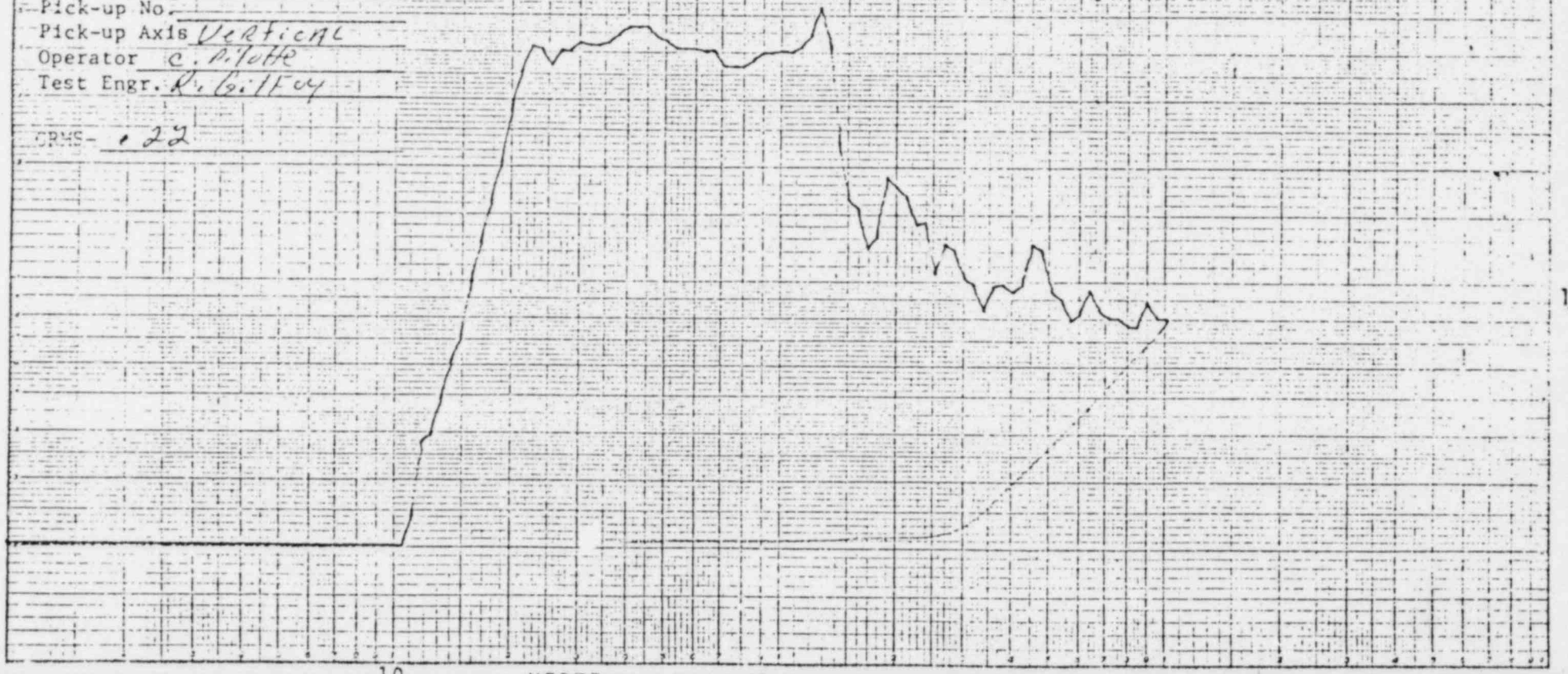
ACTON

Q = 20

Test No. 6 Run 3
Date 10/29/75
Customer Electro-Switch
Test Item P/N
Test Item S/N
Type of Test Y/Z SSE
Spec. No.
Para. No.
Conditions OPER.
Temperature Room
Period of Test 30 sec.
Control Axis Vertical B-F
Pick-up No.
Pick-up Axis Vertical
Operator C. Nolte
Test Engr. R. Griffey

GRMS - .22



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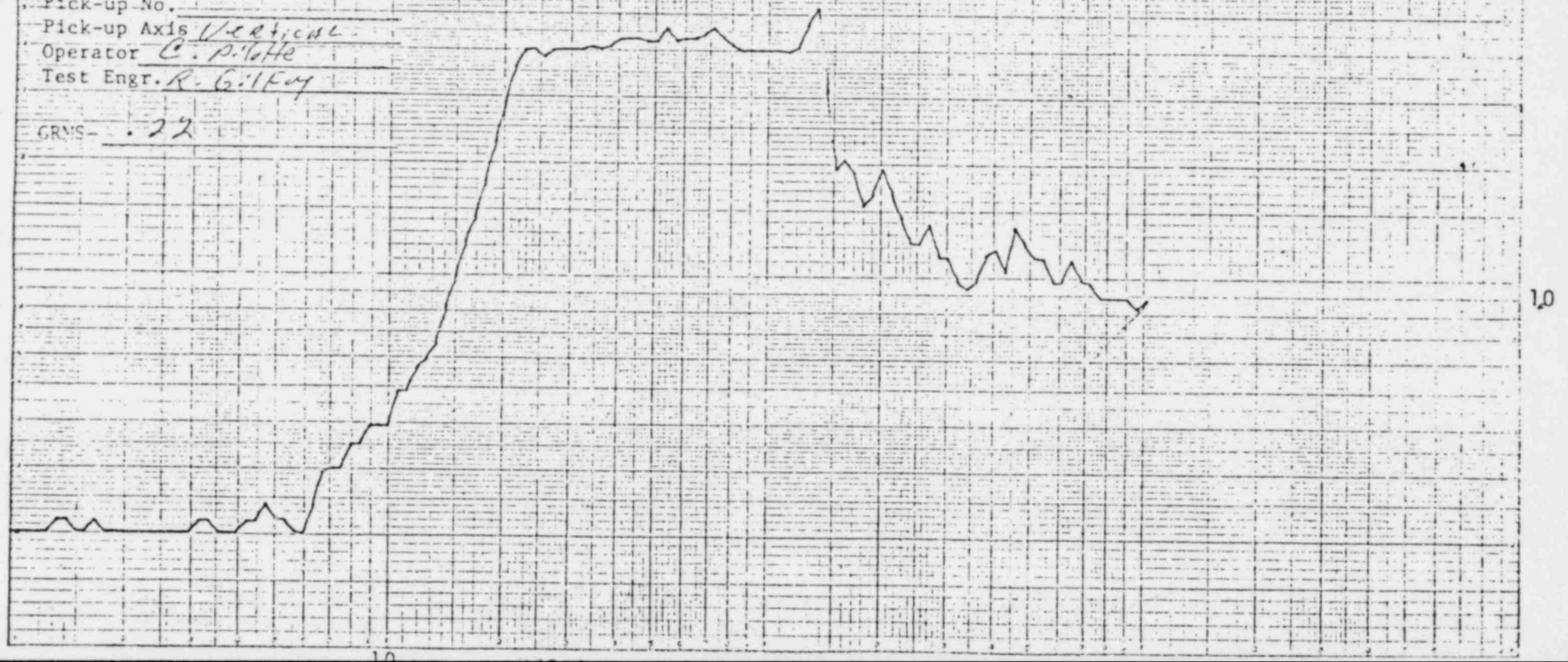
ACTON

Q = 20

Test No. 6 Run 4
Date 10/29/75
Customer Electro-Switch
Test Item P/N
Test Item S/N
Type of Test 7/255E
Spec. No.
Para. No.
Conditions Open
Temperature Room
Period of Test 30 sec
Control Axis Vertical A-F
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS- .22



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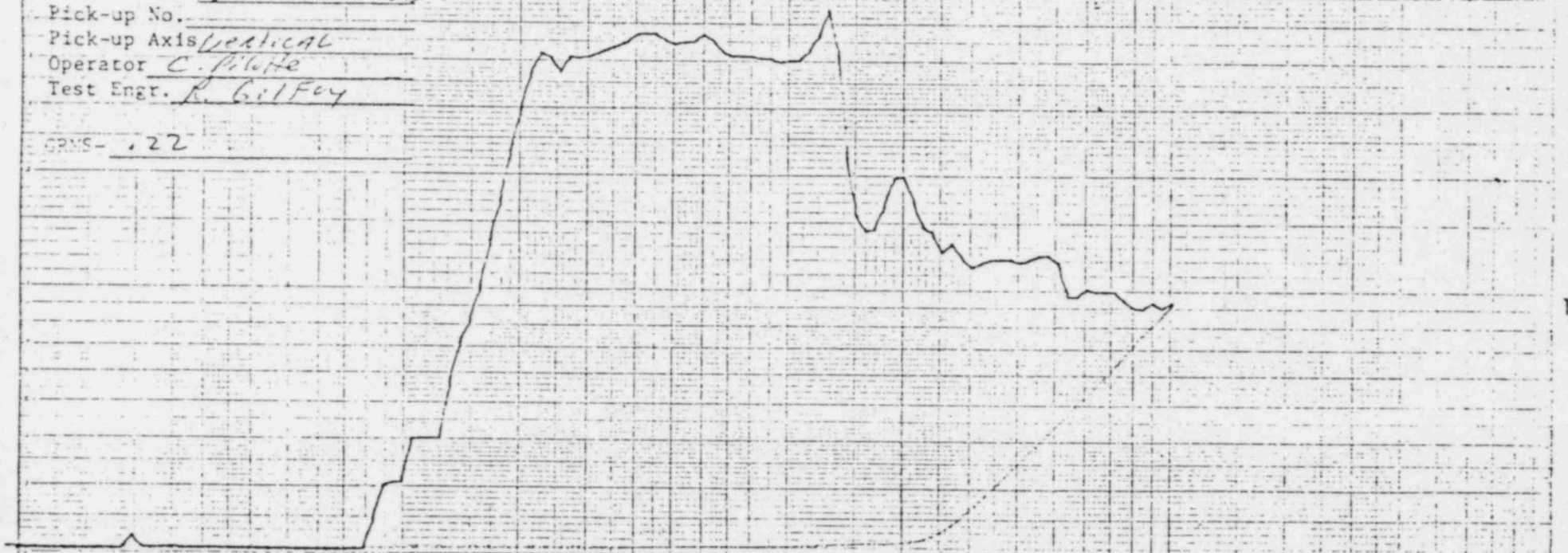
ACTON

Q = 20

Test No. Test #6 Run 5
Date 12/29/25
Customer Electro Switch
Test Item P/N
Test Item S/N
Type of Test Vibe
Spec. No.
Para. No.
Conditions OPER
Temperature Room
Period of Test 30 sec.
Control Axis Vertical Eff-F
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS- .22



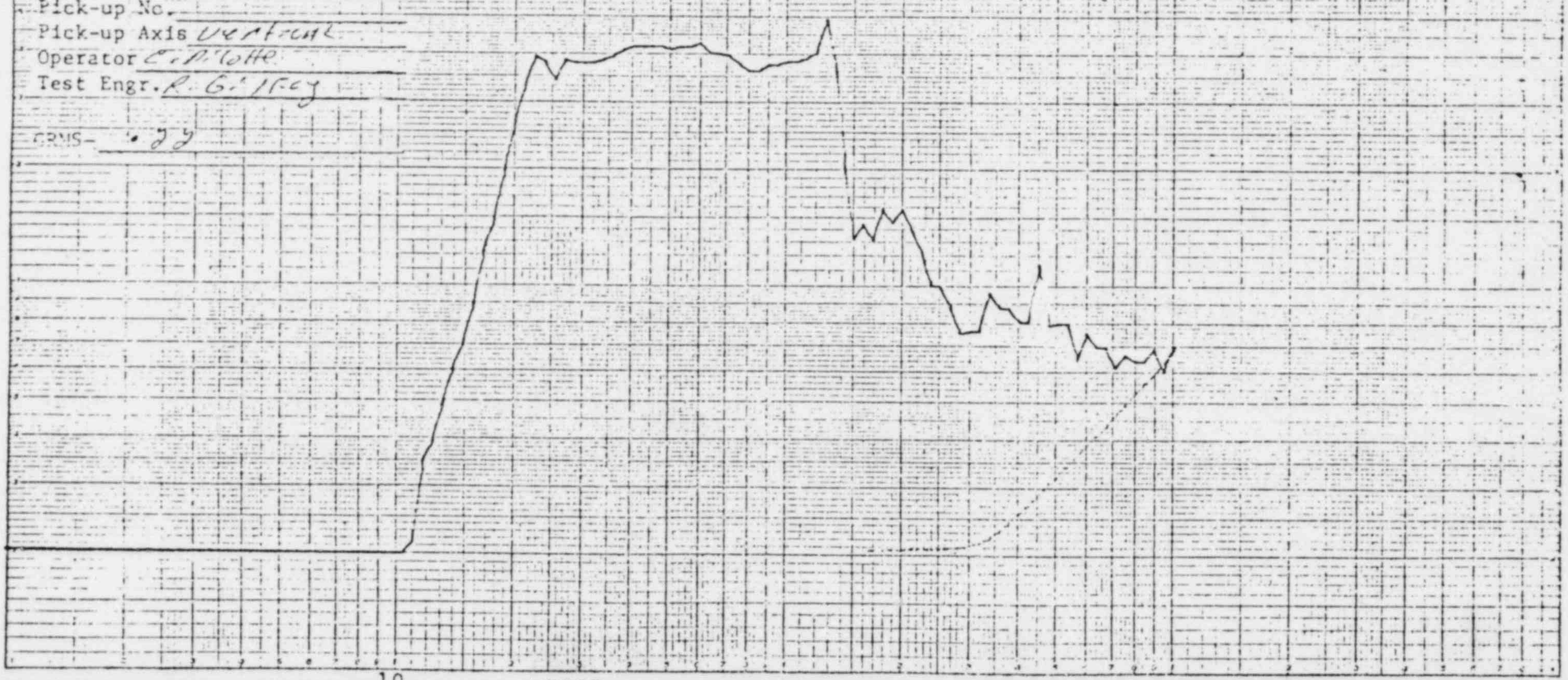
S/

D-20

ENVIRONMENTAL
ACTON TESTING
CORPORATION

Test No. 7 Run 1
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 OPER.
Temperature Room
Period of Test 30 sec.
Control Axis Vertical + S-S (3rd Horiz)
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilroy

GRMS- .77



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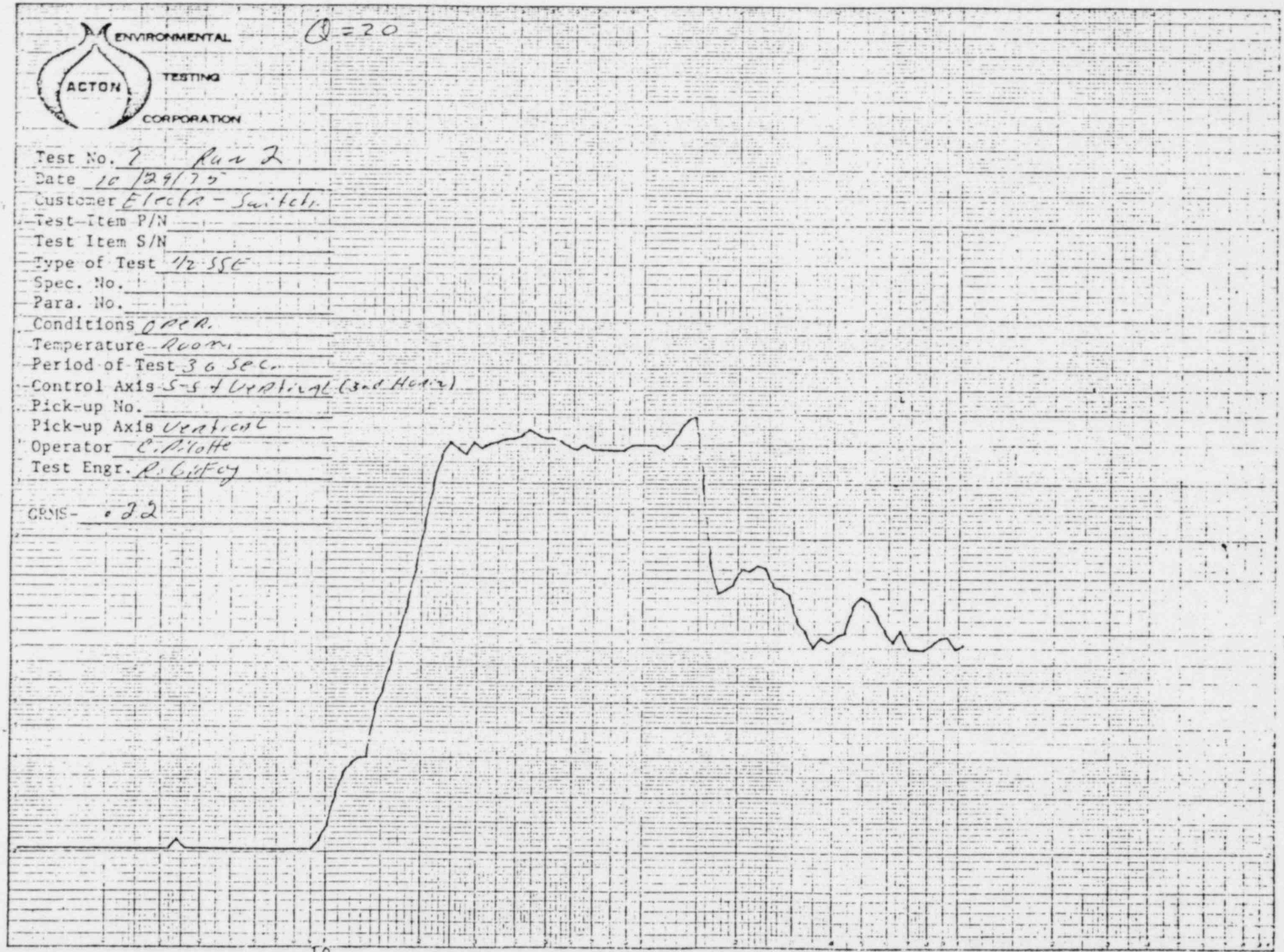
ACTON ENVIRONMENTAL TESTING CORPORATION

Q = 20

Test No. 7 Run 2
Date 10/29/75
Customer Electra - 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 S-S + Vertical (3rd Head)
Pick-up No.
Pick-up Axis Vertical
Operator E. Pilotte
Test Engr. R. Gifford

GRMS - .22



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ENVIRONMENTAL ACTON TESTING CORPORATION

Q = 20

Test No. 7 Run 3
Date 10/24/75
Customer Electra-Switch
Test Item P/N
Test Item S/N
Type of Test 1/2 SSC
Spec. No.
Para. No.
Conditions OPER.
Temperature Room
Period of Test 30 SEC
Control Axis 1-S + VERT (3rd Horiz)
Pick-up No.
Pick-up Axis VERTICAL
Operator C. PIOTTE
Test Engr. R. GIFFEY

GRMS - .22

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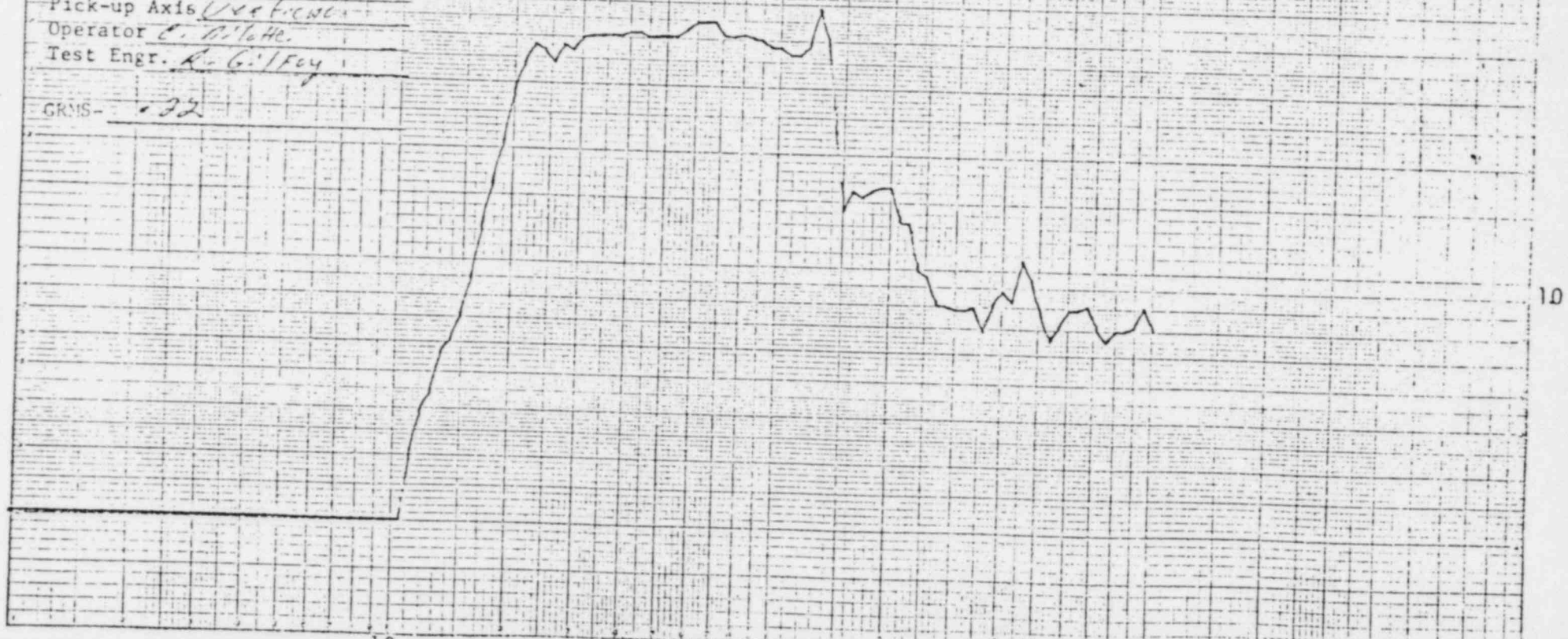
ACTON

Q=20

Test No. 7 Run 4
Date 10/29/75
Customer Electra Switch
Test Item P/N
Test Item S/N
Type of Test Resse
Spec. No.
Para. No.
Conditions Oper.
Temperature Room.
Period of Test 30 sec.
Control Axis 1-5 Vertical (3rd Hodiak)
Pick-up No.
Pick-up Axis Vertical
Operator C. Wilhelm
Test Engr. K. Gilfoy

GRMS- .22



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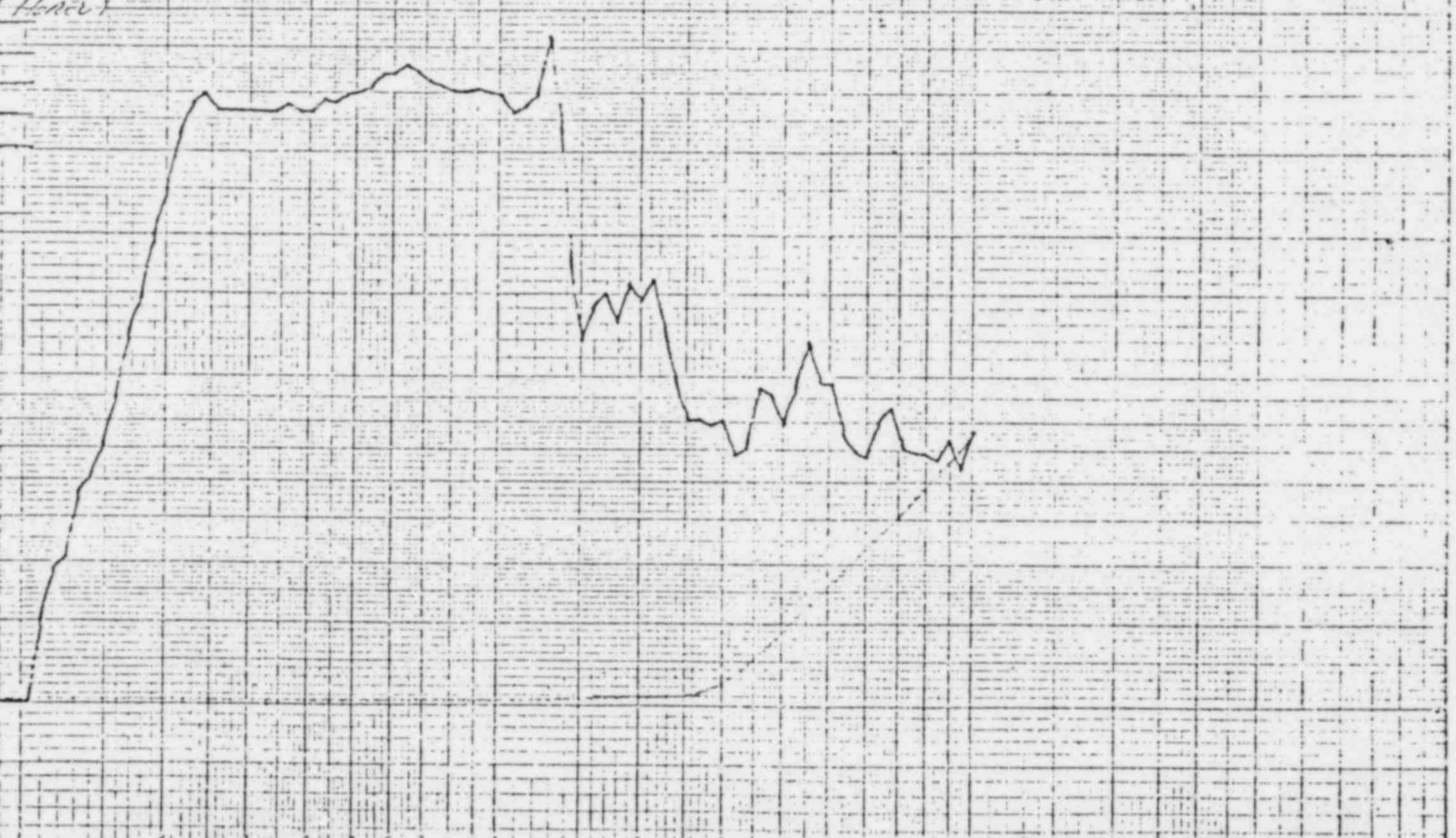
ENVIRONMENTAL TESTING CORPORATION — ACTON

Q = 20

Test No. 7 Run 5
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 OBE
Temperature Room
Period of Test 30 sec.
Control Axis S-S + Vert (3rd Harm)
Pick-up No.
Pick-up Axis Vertical
Operator C. Aloffe
Test Engr. R. Gilfoy

GRMS - .22



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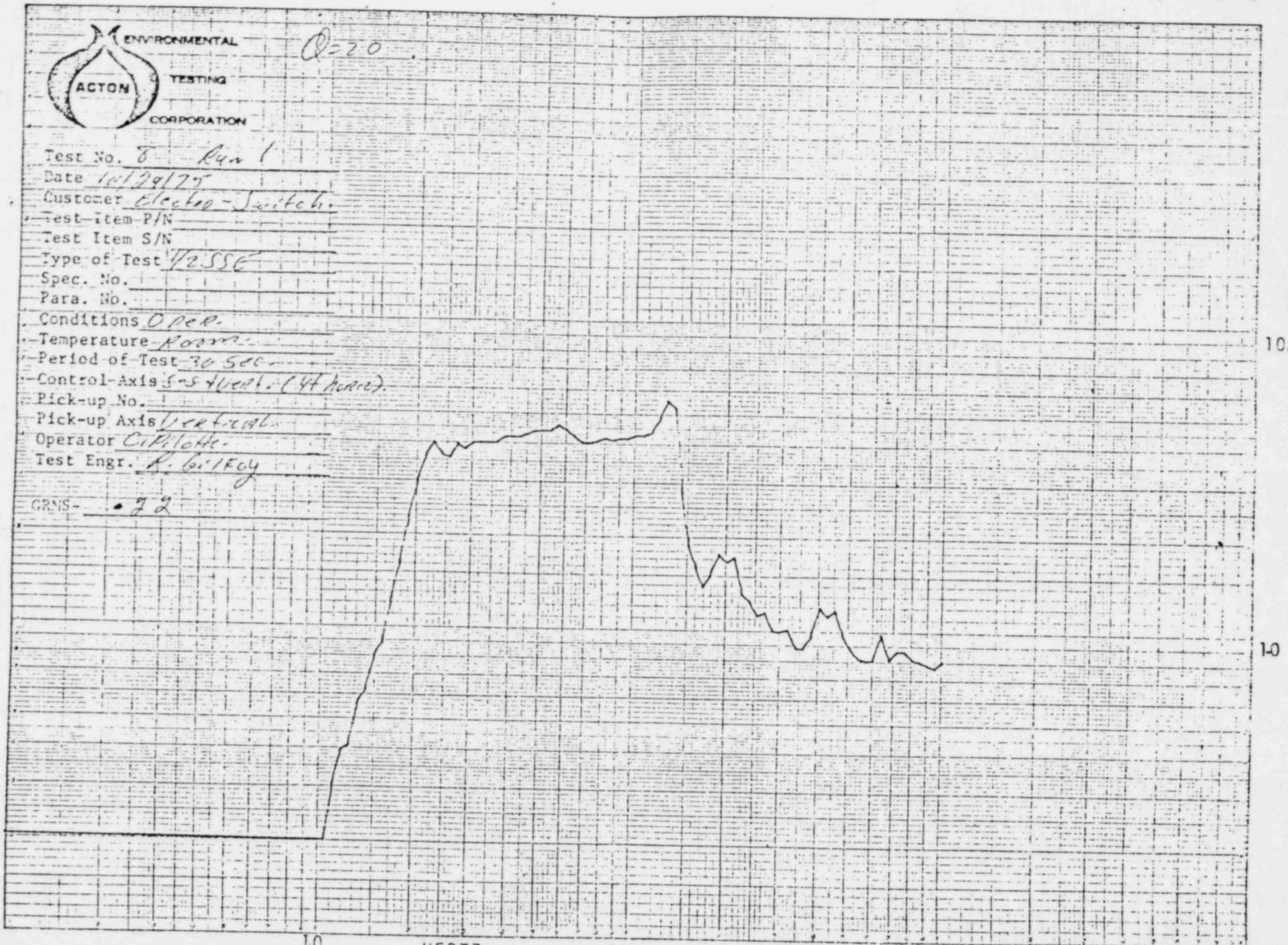
ENVIRONMENTAL TESTING CORPORATION — ACTON

Q=20

Test No. 8 Run 1
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 Oper.
Temperature Room
Period of Test 30 Sec.
Control-Axis S-S Vert. (4' horiz.)
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilroy

GRMS- .72



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ENVIRONMENTAL TESTING CORPORATION
ACTON

Q=20

Test No. T Run 2
Date 10/24/75
Customer Electro-Switch
Test Item P/N
Test Item S/N
Type of Test VJ-55E
Spec. No.
Para. No.
Conditions Oper.
Temperature Room
Period of Test 30 sec.
Control Axis S-S Vent (4th Hole)
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS- 22

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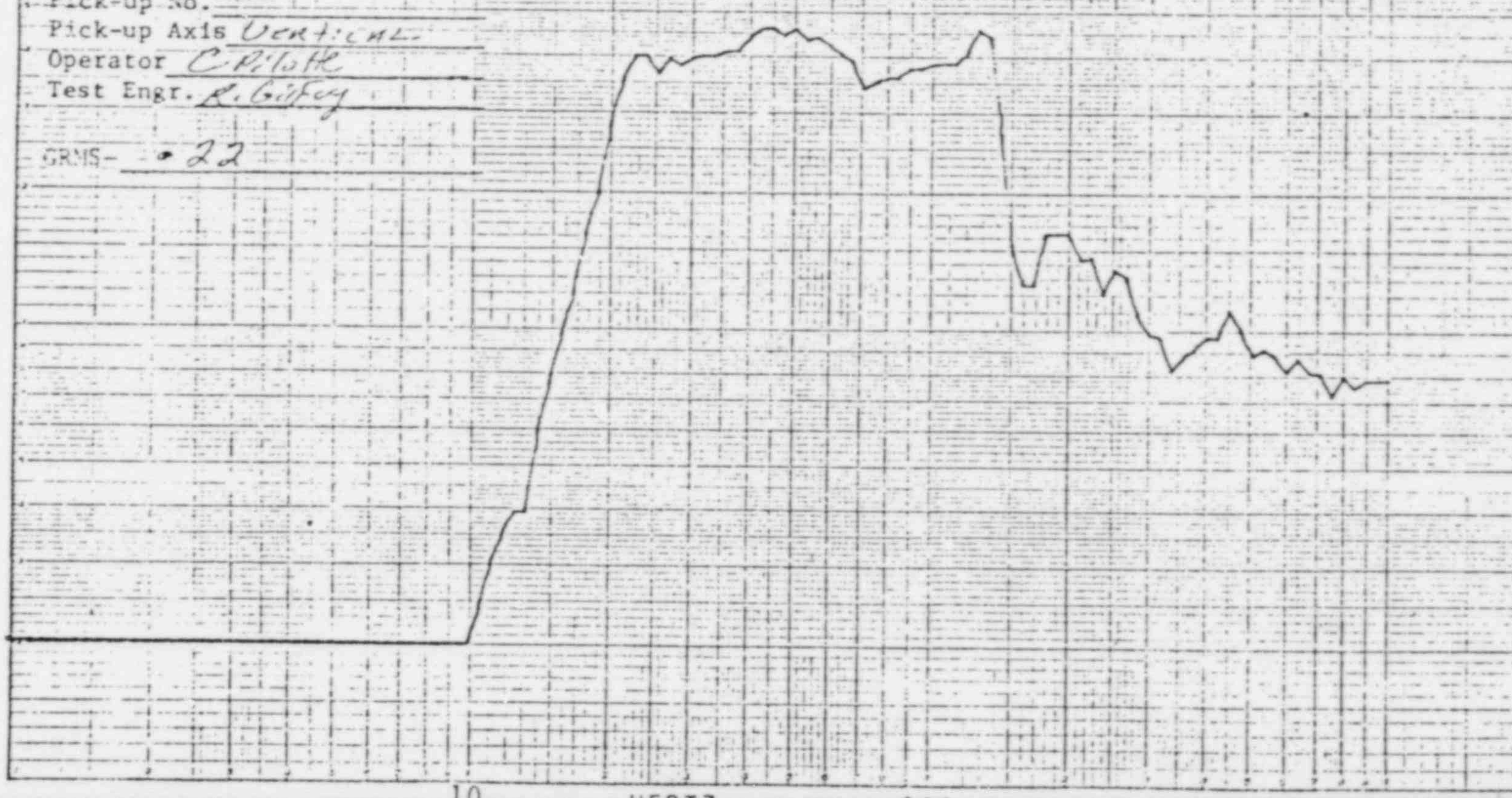
ACTON ENVIRONMENTAL TESTING CORPORATION

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 SSE
Spec. No.
Para. No.
Conditions Oper.
Temperature Room
Period of Test 30 sec.
Control Axis S-S + Vert. (4th Horiz)
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS- .22



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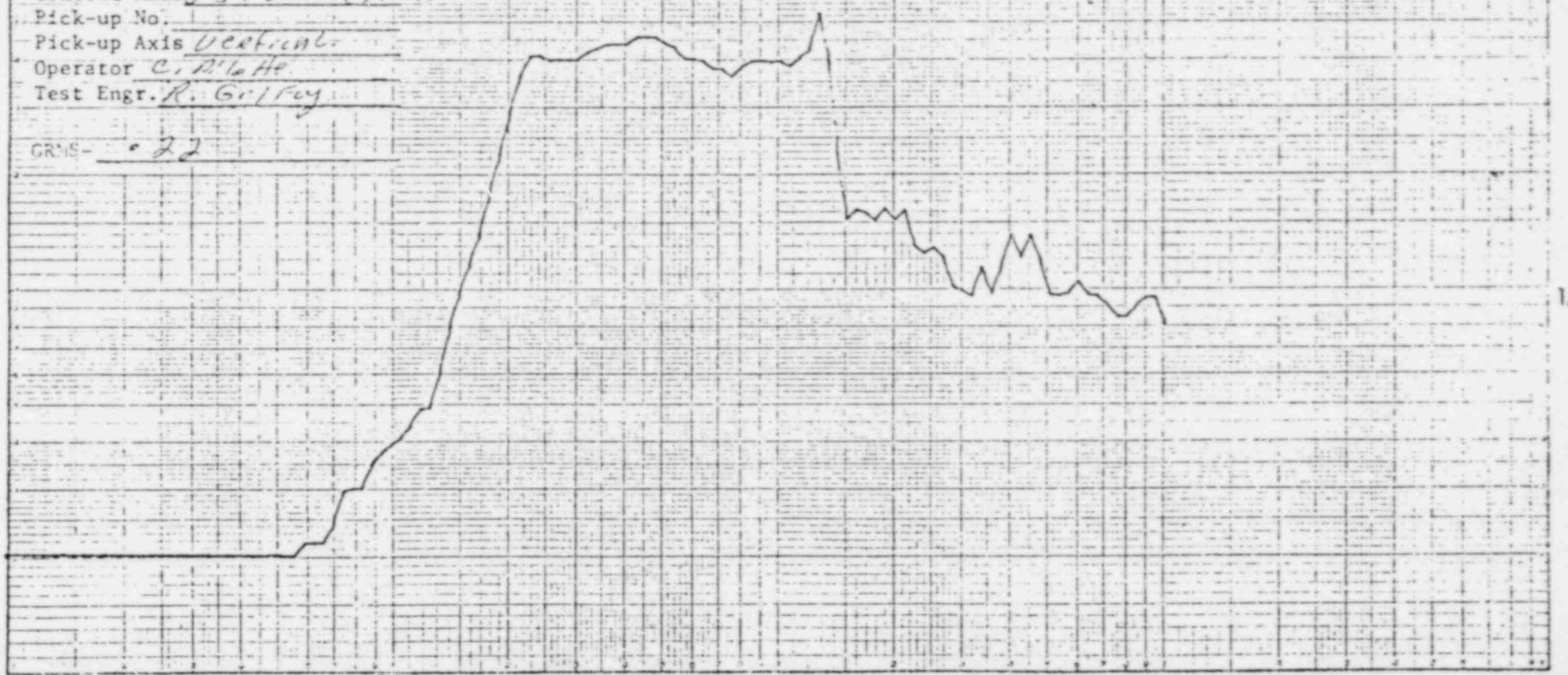
ENVIRONMENTAL TESTING CORPORATION

ACTON

Q=20

Test No. 6 Run 4
Date 10/30/75
Customer Electro-Switch
Test Item P/N
Test Item S/N
Type of Test V2556
Spec. No.
Para. No.
Conditions OPR.
Temperature Room
Period of Test 20 sec.
Control Axis Y-S+ VERT. (4th Horiz)
Pick-up No.
Pick-up Axis Vertical
Operator C. Wells
Test Engr. R. Griffey

GRMS- .22



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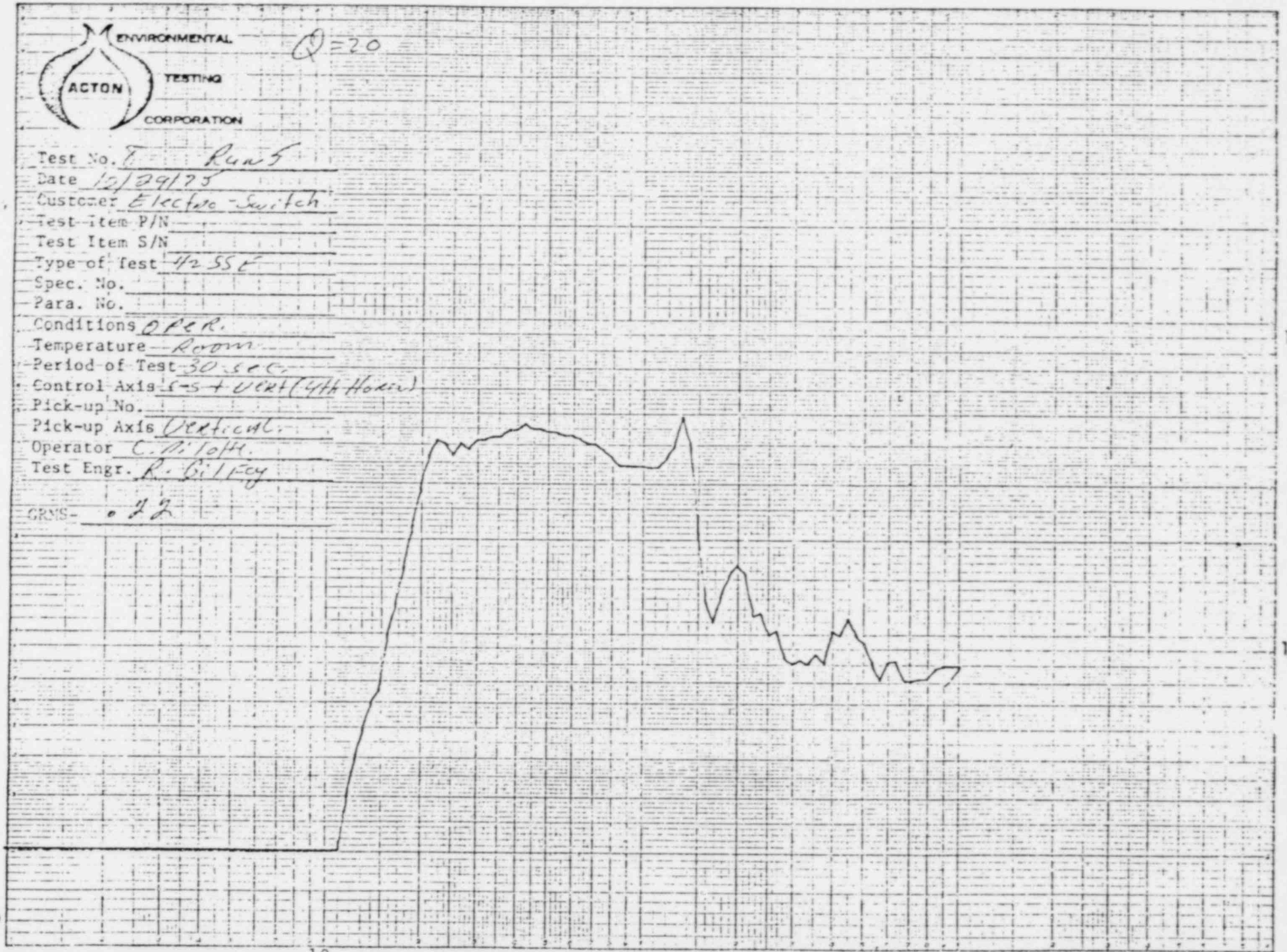
ENVIRONMENTAL TESTING CORPORATION

ACTON

Q=20

Test No. T Run 5
Date 12/29/75
Customer Electro-Switch
Test Item P/N
Test Item S/N
Type of Test 42 55 E
Spec. No.
Para. No.
Conditions OPER.
Temperature Room
Period of Test 30 sec.
Control Axis S-S + Vert (4th Horiz)
Pick-up No.
Pick-up Axis Vertical
Operator C. Milam
Test Engr. R. Gilfoy

GRMS- .22



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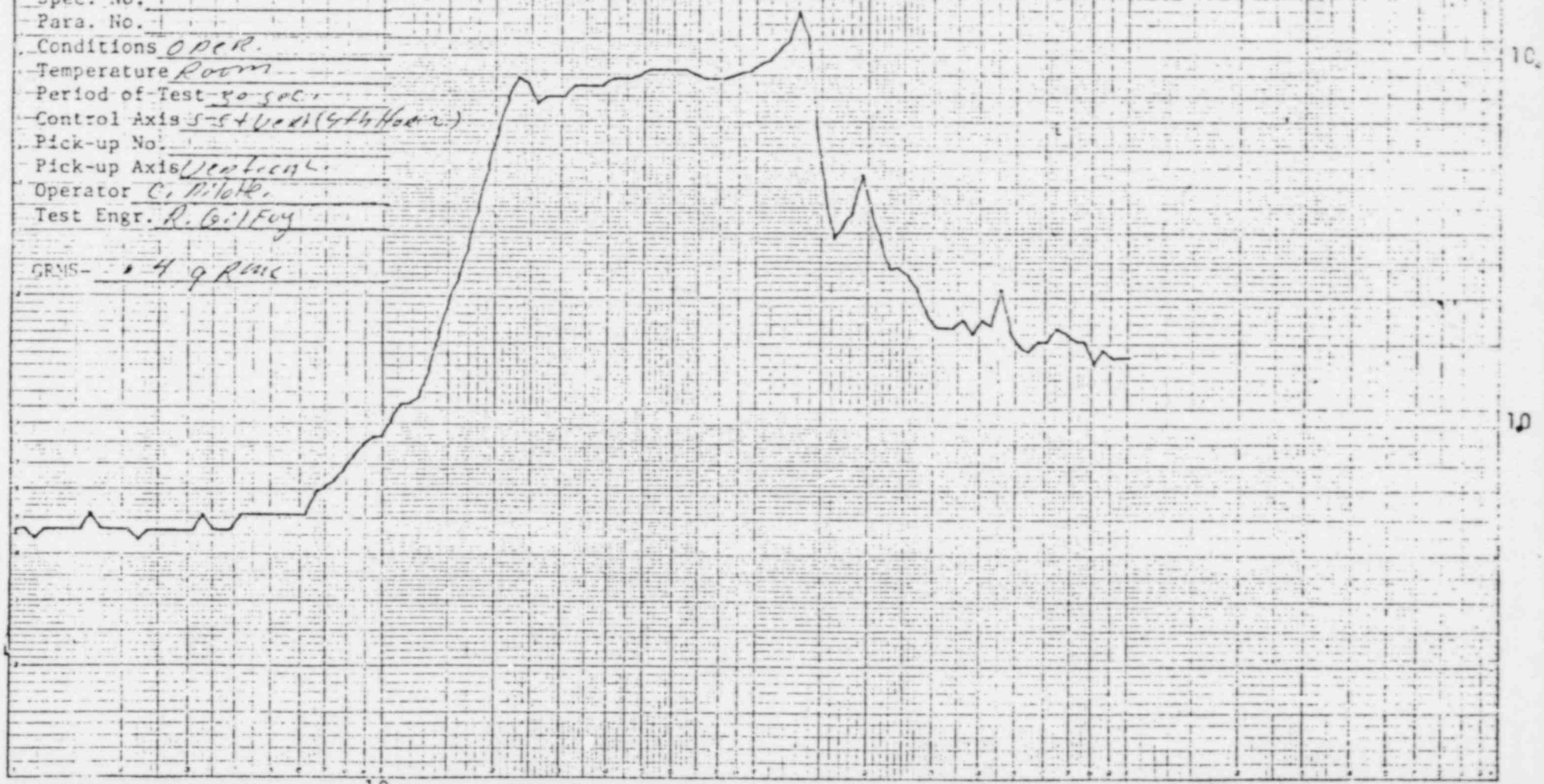
ENVIRONMENTAL TESTING CORPORATION

ACTON

Q=20

Test No. 9
Date 10/24/75
Customer Electro-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 S-S + Vert (4th Hoar.)
Pick-up No.
Pick-up Axis Vertical
Operator C. Pilotte
Test Engr. R. Coil Fay

GRMS- .4 g RMS



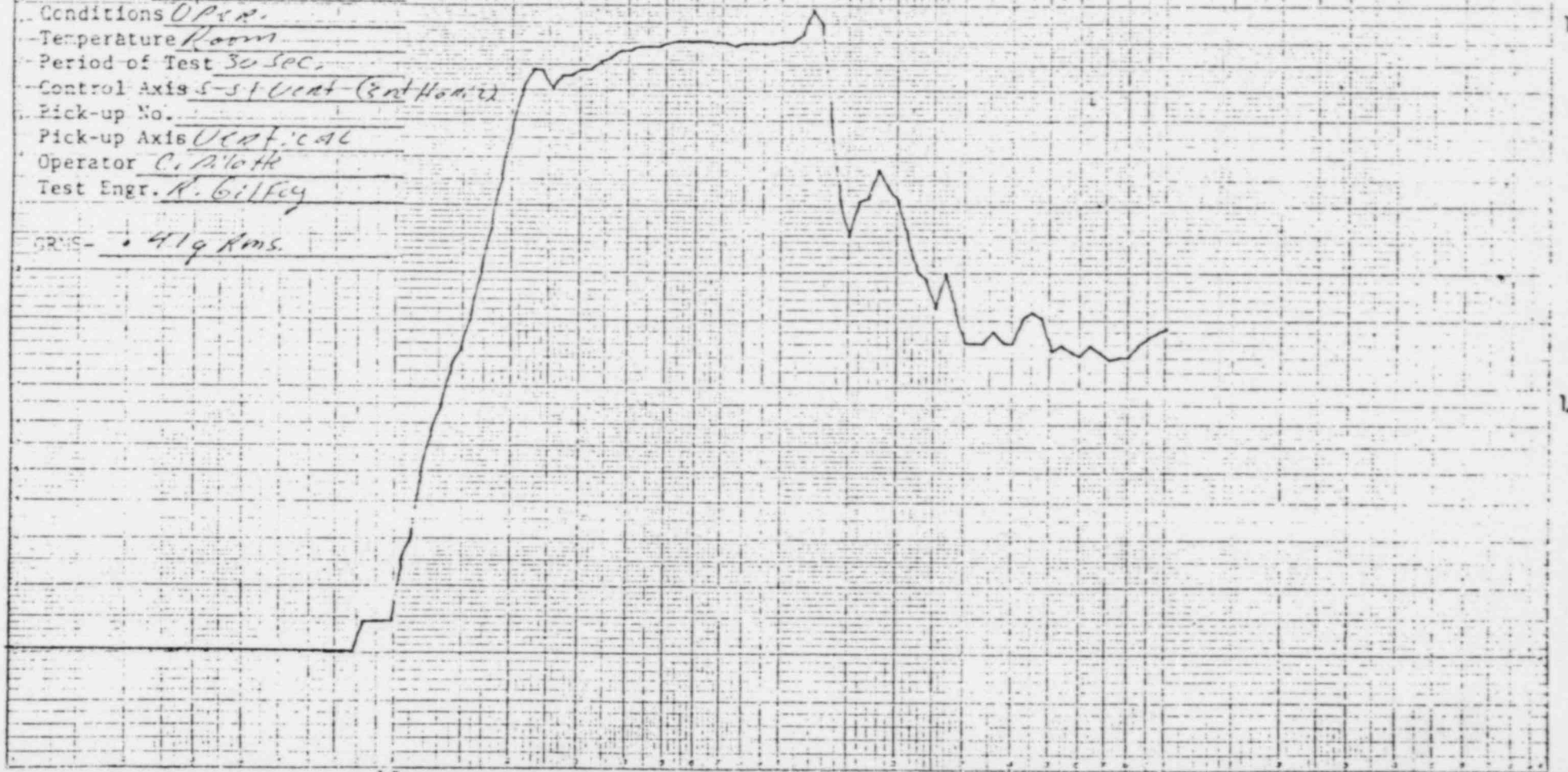
ENVIRONMENTAL TESTING CORPORATION

ACTON

Q=20

Test No. 10
Date 6/29/75
Customer Electro 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 S-S / Vert - (2nd Horiz)
Pick-up No.
Pick-up Axis Vertical
Operator C. Alotta
Test Engr. K. Gilfoy

GRMS - .41g Rms.



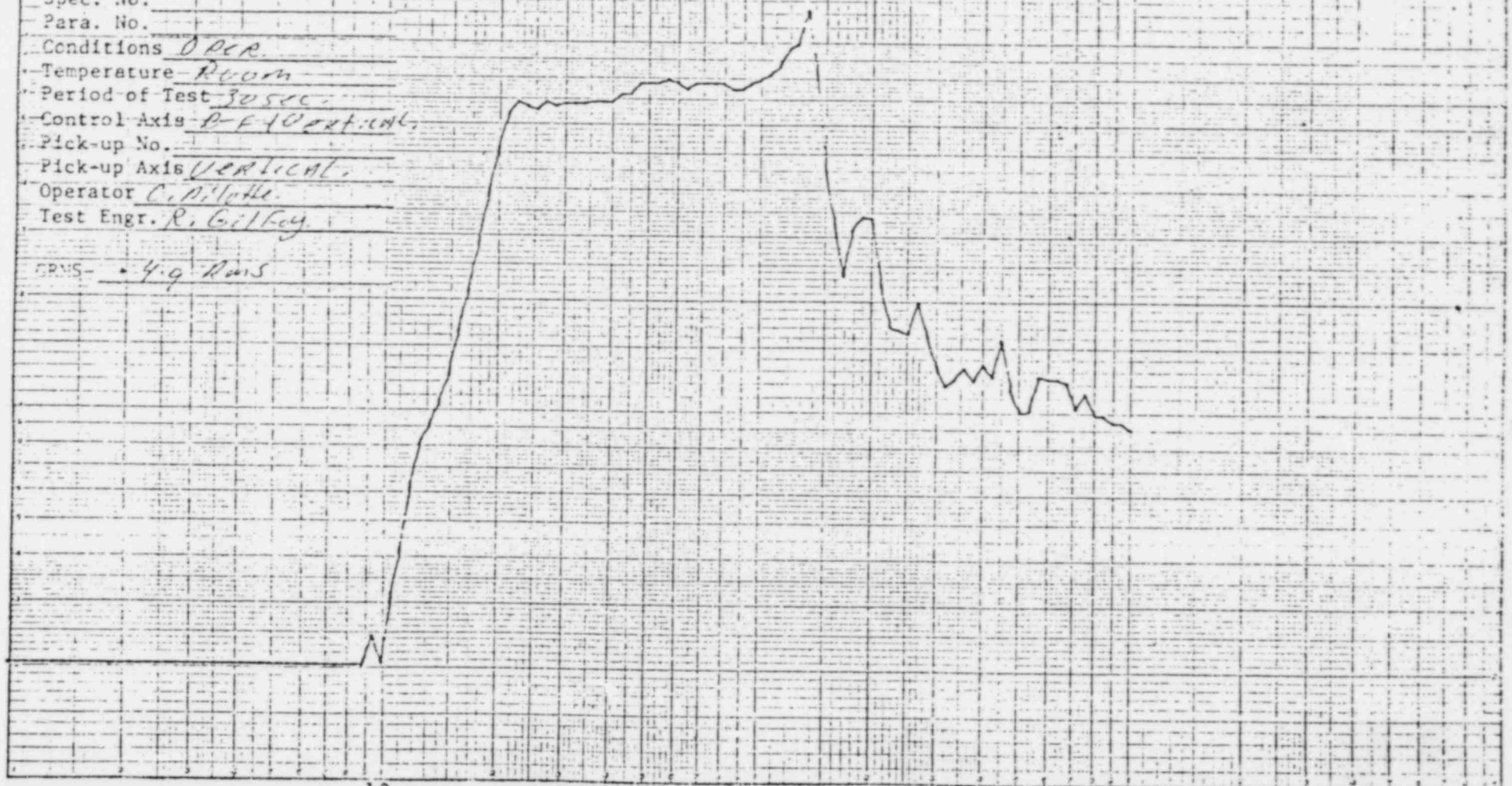
GRAPH PAPER

ENVIRONMENTAL TESTING CORPORATION
ACTON

Q-20

Test No. 11
Date 10/27/75
Customer Electro-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 B-F Vertical
Pick-up No.
Pick-up Axis VERTICAL
Operator C. Pilotte
Test Engr. R. Gilfoy

GRMS - .4.9 Rms



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ENVIRONMENTAL
ACTON TESTING
CORPORATION

Q=20

Test No. 12
Date 10/29/75
Customer Electro-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 seconds
Control Axis F-B + Vertical
Pick-up No.
Pick-up Axis Vertical
Operator C. Alotte
Test Engr. R. Gilroy

GRMS- .36 gRms