DUKE POWER COMPANY

POWER BUILDING

422 SOUTH CHURCH STREET, CHARLOTTE, N. C. 28242

WILLIAM O. PARKER, JR.
VICE PRESIDENT
STEAM PRODUCTION

TELEPHONE: AREA 704
373-4083

August 18, 1980

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. R. W. Reid, Chief
Operating Reactors Branch No. 4

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Mr. Denton:

In a letter dated December 20, 1979, the NRC provided a safety evaluation approving the preliminary design of the proposed safety-grade anticipatory reactor trip. Included with this approval was a request for additional information. The attached information is provided in response to the Staff request.

For the information of the Staff, the initial unit which will have this system installed is expected to be Oconee 3, which is anticipated to be shut down for refueling in November, 1980.

Very truly yours,

William O. Parker

William O. Parker, Jr.

RLG:vr
Attachment

A001
S, 1/1

8008260 488

Oconee Nuclear Station

Anticipatory Reactor Trip
Information Needed for Final Design Approval

SER 3/4. The final design submittal should include the final logic diagrams, electrical schematic diagrams, piping and instrumentation diagrams and location layout drawings.

Response

The final design drawings will not be completed until immediately before unit shutdown for implementation of the anticipatory reactor trip. Based on the above schedule, the detailed drawings requested will be available for inspection at the plant site.

It should be noted that in a May 21, 1979 letter from Parker to Denton logic/block type diagrams (and a system description) were provided which should be sufficient for review and understanding of this system.

SER 4. For sensors located in non-seismic areas which have not previously contained RPS inputs, perform and submit an analysis which shows that the installation (including circuit routing) is designed such that the effects of credible faults (i.e., grounding, shorting, application of high voltage, or electromagnetic interference) or failures in these areas could not be propagated back to the RPS and degrade the RPS performance or operability.

Response

The sensors for the anticipatory reactor trip are separated both electrically and physically for redundant and independent operation. These sensors are provided with individual termination enclosures to protect against grounding, shorting, and environmental conditions. Interlocked armour cables transmitting the signal to the control room are placed in conduit or safety grade cable trays the entire route to guard against any application of high voltage or other credible faults. The design is such that a single failure will not prevent the sensors from performing their function. The sensor inputs are provided with a 500 volt isolation buffer. Since the sensors are anticipatory in relation to other trip parameters, the reactor protection system will not be degraded by the failure or fault of the anticipatory trip.

SER 4. Submit "Seismic and Environmental Qualification Summary Reports" for the equipment which has not been previously submitted. In addition, we require that you demonstrate that the environmental test conditions bound the actual worst case accident conditions expected at the installed locations.

Response

The seismic and environmental qualification test reports for the pressure switches used in the anticipatory reactor trip system are provided in Attachment 1 to this letter. These switches are qualified for the worst case environmental conditions expected at their installed location.

SER 4. Assure that the ARTs testability includes provisions to perform channel functional tests at power. Testing of this circuitry is to be included in the RPS monthly surveillance tests.

Response

Testability of the ARTs will be provided at power by isolating each sensor and simulating a main turbine or feedwater pump trip. This is done by releasing pressure from the sensors and verifying that a trip signal is indicated at the RPS and that proper indications have been actuated in the control room. Each pressure switch and channel will be tested and evaluated in the same manner. ARTs circuit testing will be done monthly along with the existing RPS.

SER 5. Include in the final design submittal the RPS check-out procedure which will demonstrate both the operability of the new trip circuitry and the continued operability of the previous RPS.

Response

The existing RPS is field calibrated annually and circuit tested monthly. The field calibration consists of complete channel and equipment verification of setpoints and trip signals. Monthly circuit testing is done at the cabinet by actuating test modules. The ARTs will be tested on the same schedule as the present RPS. Monthly testing of the ART will be the same procedure as existing RPS. The annual and initial calibration will consist of the above described activity. The new trip test circuitry will be added to the existing test trip string.

Detailed check out procedures for the system are retained at Oconee and will be available for site inspection.

ATTACHMENT 1

Custom Control Sensors, inc.

21111 Plummer Street, Chatsworth, California 91311 · (213) 341-4610 · TWX 910-494-4770

STATEMENT OF SIMILARITY

BETWEEN

MODELS GROUP A AND MODELS GROUP B

GROUP A: 646GZE1,2,3,5,7 and 11
646GZEM1,2,3,5,7 and 11

GROUP B: 604VB1-351S, 604GBR2-352S
604GR6-356S, 604GCR0-357S

The subject switches are identical in basic design. Both of the groups of models use disc springs, helical springs and flexible diaphragms to sense and transmit pressure variations to electrical switching elements.

The significant difference between the two groups of models is in the configuration of the electrical switching elements. Because of a specific customer requirements, Group B models use a DPDT electrical switching element configuration. Models in Group A utilize an explosion proof housed SPDT and DPDT electrical switching element configuration. These explosion proof electrical configurations offer equal or superior resistance to seismic vibrations.

The construction differences between these models should not affect their function or performance. All models are comparable with respect to finish, function, engineering, workmanship and overall quality.

Custom Control Sensors submits that the seismic tests performed on Group B models are also applicable to Group A models. On the basis of the indicated similarity and enclosed test data it is proposed that seismic qualification approval be granted to Group A models. Test report QTR604*-01 is submitted for evaluation.

Philip Daley

Philip Daley
Chief Engineer

CUSTOM COMPONENT SWITCHES, INC.
21111 PLUMMER ST. CHATSWORTH, CALIF. 91311

CUSTOM COMPONENT SWITCHES, INC.

ENVIRONMENTAL TEST REPORT

ON MODELS

646GZEM11, 646GZEM2-7011, 646GZE5

Prepared by Giora Dgani
Quality Assurance Engineer

Approved by [illegible]
Quality Assurance Manager

CUSTOM COMPONENT SWITCHES, INC.
21111 PLUMMER ST. CHATSWORTH, CALIF. 91311

SCOPE

This report outlines the results of environmental tests conducted at Custom Component Switches, Inc.

REFERENCES

In-house requests by the engineering department.

OBJECTIVES

The objective of this test was to demonstrate that Custom Component Switches 646GZEM11, 646GZEM2-7011 and 646GZE5 would fully comply with the general requirements of CCS.

RESULTS

During these tests all 3 units met or exceeded the specified requirements.

DESCRIPTION of TEST SWITCHES

Three pressure switches were tested. Model 646GZEM11, 646GZEM2-7011 - and 646GZE5.

The above switches were assembled from standard production parts. These switches did not receive any special treatment beyond that used in the manufacture of all Custom Component pressure switches of these models.

TEST PROCEDURE - 646GZEM2-7011 and 646GZEM11

1. The pressure setting of each unit was adjusted to the top of its range.

2. The settings were checked and recorded at room temperature, +30°F, -30°F and back at room temperature.

3. The settings were then adjusted to the bottom of the range and steps 1 and 2 were repeated.

NOTE: At each temperature the units were allowed to stablize for one hour.

TEST RESULTS

MODEL: 646GZEM2-7011
RANGE: 9 to 75 PSI
D/B: 9 PSI Maximum

	TOP RANGE			BOTTOM RANGE		
TEMP °F	D/B	INCREASE	DECREASE	INCREASE	DECREASE	D/B
Room	3.5	70.2	66.7	9.0	2.8	6.2
30°F	3.5	71.0	67.5	9.5	3.2	6.3
0°F	3.0	71.5	68.5	9.7	3.4	6.3
-30°F	3.0	72.5	69.5	10.0	3.9	6.1
Room	3.5	70.0	66.5	9.3	3.0	6.3

MODEL: 646GZEM11
RANGE: 12 to 150 PSI
D/B: 12 PSI Maximum

	TOP RANGE			BOTTOM RANGE		
TEMP°F	D/B	INCREASE	DECREASE	INCREASE	DECREASE	D/B
Room	8.0	156.5	148.5	12.0	8.2	3.8
30°F	8.0	157.5	149.5	13.2	9.3	3.9
0°F	7.5	158.5	151.0	13.6	9.6	4.0
-30°F	7.0	159.0	152.0	15.2	10.7	4.5
Room	7.2	154.2	146.0	13.1	9.0	4.1

TEST PROCEDURE - Model 646GZE5

The unit was initially tested at room temperature and factory setting points were determined. The unit was then installed inside the temperature chamber and was actuated and deactuated twice at each of the following temperatures: -30°F, at room, +160°F and back at room temperature. The set points at each temperature were recorded.

The temperature was then increased to 200°F and the unit was operated 5000 times at a rate of 60 times per minute. Set points were checked and recorded twice at every 1000 cycle interval and again after 5000 cycles at room temperature.

NOTE: At each temperature the unit was allowed to stabilize for one hour.

CUSTOM COMPONENT SWITCHES, INC.
21111 PLUMMER ST. CHATSWORTH, CALIF. 91311

TEST RESULTS - Model 646GZE5

TEMPERATURE	INITIAL		HYSTERISIS	
	INCREASE PSI	DECREASE PSI	INCREASE PSI	DECREASE PSI
Room	569	543	566	543
$-30^{o}F$	574	543	570	546
room	570	542	566	543
$+160^{o}F$	569	539	561	539
Room	576	544	571	545
$+200^{o}F$	Cycle 5K times	K=1000		
1K	566	537	564	536
2K	567	535	561	533
3K	561	534	560	534
4K	560	534	558	532
5K	562	534	559	533
Room	572	539	567	538

CUSTOM COMPONENT SWITCHES, INC.
21111 PLUMMER STREET, CHATSWORTH, CALIFORNIA 91311

EVALUATION TEST REPORT

Subject

Custom Component Switch Model Numbers 646GE2 and 646GEM2

Objective

The objective of the tests was to evaluate CCS switch Model Numbers 646GE2 and 646GEM2 under varying vibration levels to determine the electrical chatter characteristics.

Description of Test Switches

Two units of Model 646GE2 containing a CCS 79-9 switch element and two units of Model 646GEM2 containing two CCS 79-1 switch elements.

Test Procedure

Each test unit was mounted on the vibration shaker in the vertical axis (with its electrical housing on top and the pressure port on the bottom). With the pressure set points adjusted to the middle of the range, it was subjected to vibration scans from 5 to 2000 Hz at varying acceleration g levels. Each pressure switch was tested at both actuated and deactuated conditions. The acceleration g level was observed on the oscilloscope which was continuously monitoring the normally open and closed contacts. The test was repeated with the unit adjusted at the minimum pressure set points.

Test Results

The results of the electrical contact chatter occurrence are graphically presented in Figures 1, 2, 3, and 4.

Model 646GE2 switches with CCS 79-9 elements showed electrical contact chatter at lower g and frequency levels than the 646GEM2 units with CCS 79-1 switching elements. At the low pressure range (1/4 turn of helical spring compression), the contacts began to chatter at 5 g's and 20 Hz. At 500 Hz, the electrical contact disturbance prevailed at .5 g level. The mechanical resonance frequencies were found at 550 Hz, 900 Hz and 2000 Hz.

On the other hand, 646GEM2 units containing CCS 79-9 elements did not show any evidence of electrical contact disturbance until at 40 g's input. Electrical contact chatter at lower g levels became possible only after the test units were scanned from 5 to 2000 Hz at 40 g's. Since there were several mechanical resonances occurring at 560, 1340, 1740, 1895 and 2000 Hz, a continuous 40 g vibration sweep could have had affected the units structurally and caused to chatter at the lower g levels.

Aki Okada

Aki Okada
Engrg Lab Supervisor

1-22-76

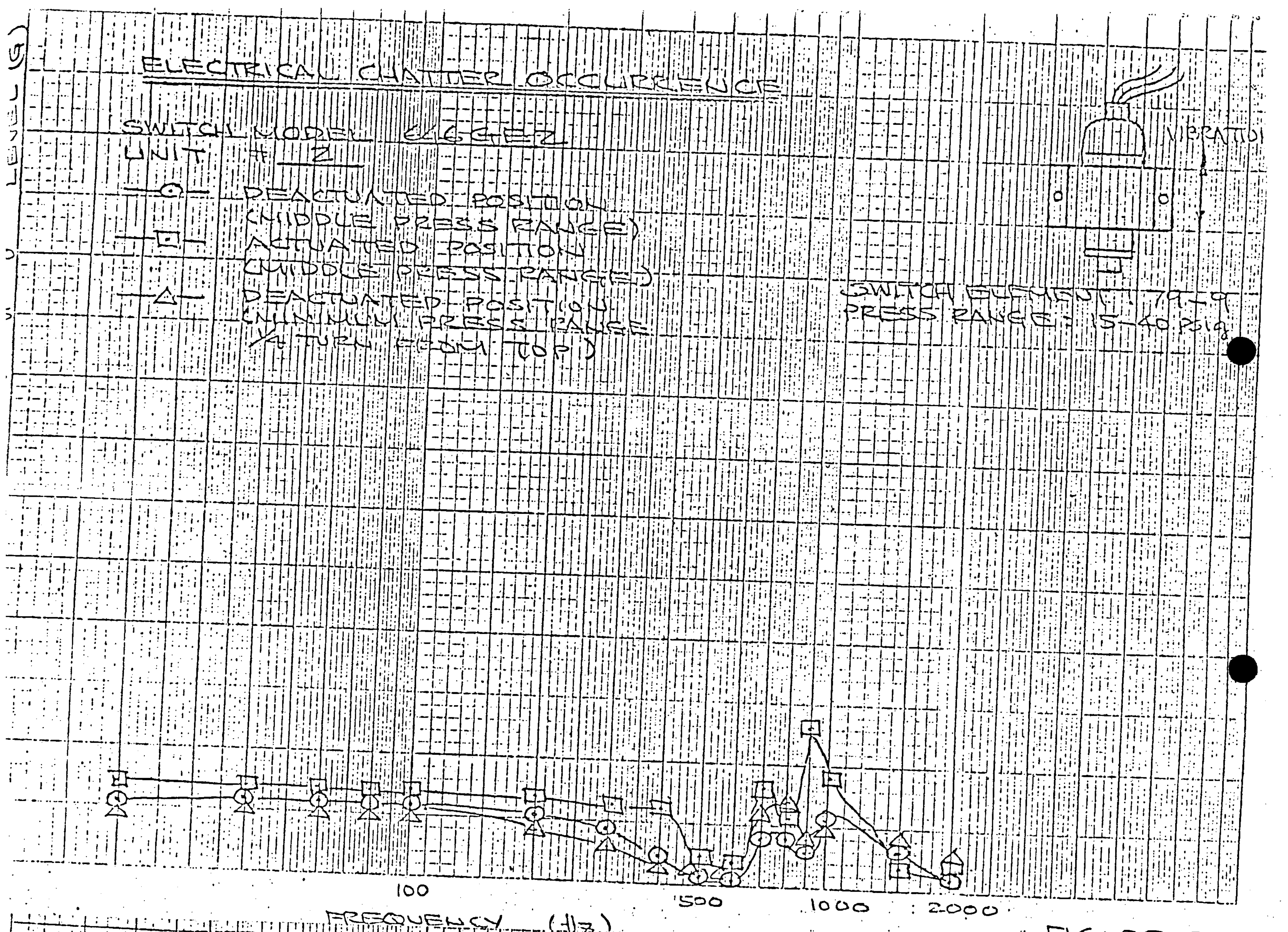
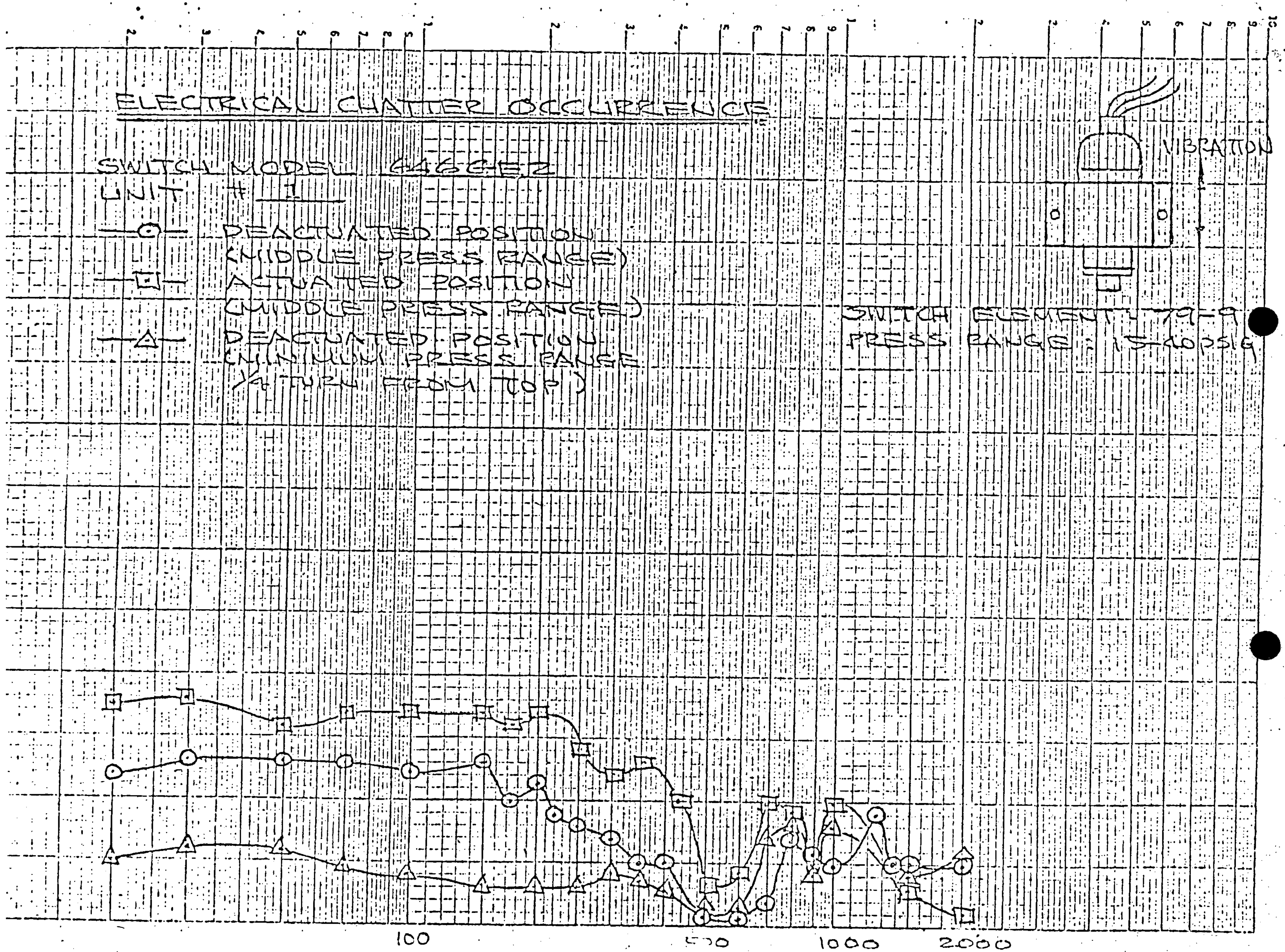
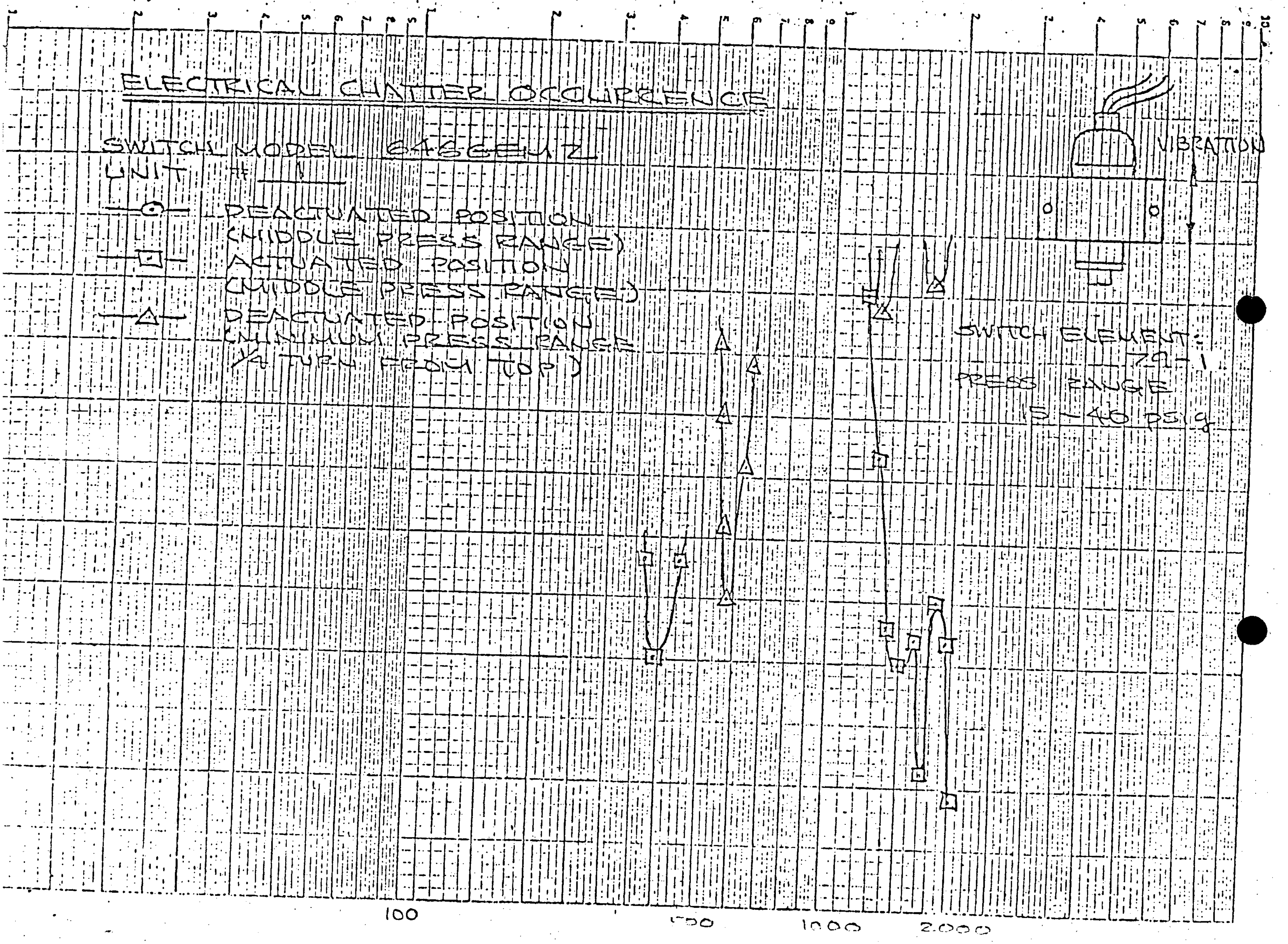
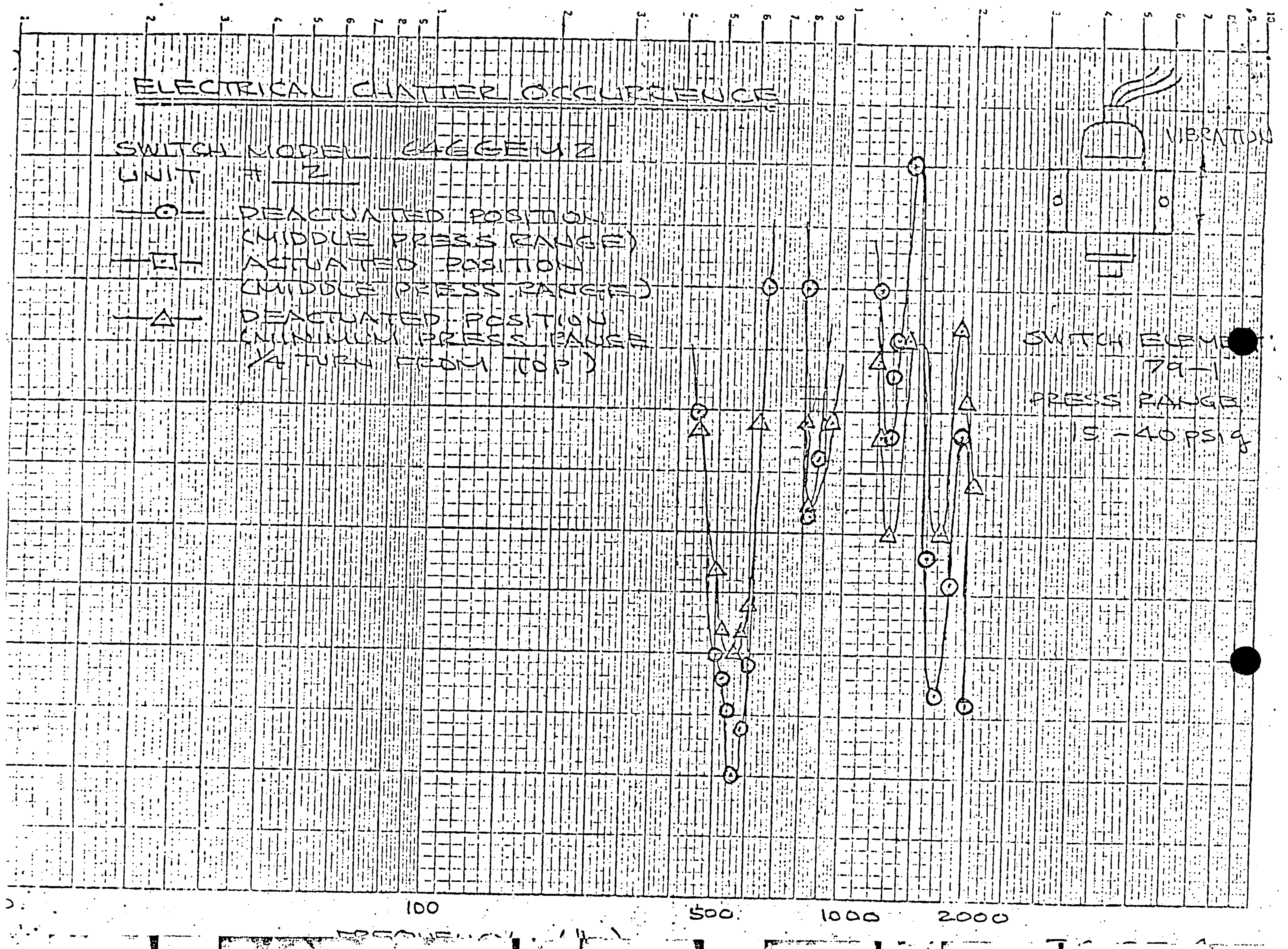

LEVEL (G)
ELECTRICAL CHATTER OCCURRENCE
SWITCH MODEL 646GE2
UNIT # 2
DEACTUATED POSITION (MIDDLE PRESS RANGE)
ACTUATED POSITION (MIDDLE PRESS RANGE)
DEACTUATED POSITION (MINIMUM PRESS RANGE 1/4 TURN FROM TOP)
VIBRATION
SWITCH ELEMENT 79-9
PRESS RANGE: 15-40 psig
100
500
1000
2000
FREQUENCY (Hz)

FIGURE 2

KEUFFEL & ESSER CO.




ELECTRICAL CHATTER OCCURRENCE
SWITCH MODEL 6A6GEM2
UNIT # 1
DEACTUATED POSITION (MIDDLE PRESS RANGE)
ACTUATED POSITION (MIDDLE PRESS RANGE)
DEACTUATED POSITION (MINIMUM PRESS RANGE 1/4 TURN FROM TOP)
VIBRATION
SWITCH ELEMENT: 72-1
PRESS RANGE 15-40 PSIG
100
500
1000
2000


ELECTRICAL CHATTER OCCURRENCE
SWITCH MODEL 646GE4Z
UNIT # 2
DEACTUATED POSITION (MIDDLE PRESS RANGE)
ACTUATED POSITION (MIDDLE PRESS RANGE)
DEACTUATED POSITION (MINIMUM PRESS RANGE 1/4 TURN FROM TOP)
VIBRATION
SWITCH ELEMENT 79-1
PRESS RANGE 15-40 PSIG
100
500
1000
2000