

ELECTRO SWITCH

CORP.

Report No. 2392-10

QUALIFICATION INSPECTION
OF
SERIES 20K
INSTRUMENT AND CONTROL SWITCH
TO

8204300153





ELECTROSWITCH

Report No. 2392-10

QUALIFICATION INSPECTION
OF
SERIES 20K
INSTRUMENT AND CONTROL SWITCH
TO
ESC-STD-1000 REV. 1

APPROVALS

	PROCEDURE	DATE	REPORT	DATE
Prepared by:	<i>[Signature]</i>	10/24/80	JRQ	* 11/29/78
Approved by:	<i>H.P.T.</i>	11/6/80	JRQ	* 11/29/78
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Applications Eng.				
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*Front pages 1-7 retyped 11/3/80



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188

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PREPARED BY H.P.T.
APPROVED BY H.P.T.

NUCLEAR TEST CERTIFICATION

The information contained in this report is the result of complete and carefully conducted tests and is, to the best of my knowledge, true and correct in all respects.

H.P. Thompson
H. P. Thompson
Test Engineer

Subscribed and sworn to before me this 6 day of November, 19 80
Notary Public in and for the County of Norfolk SS, The Commonwealth of
Massachusetts.

Dorothy L. Heafner
My commission expires 3-15-85

Quality Control:

Malcolm E. Bell
Malcolm E. Bell
Quality Assurance Manager



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ENCLOSURE 1 DETAIL DATA

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ADMINISTRATIVE DATA

Purpose

The purpose of these tests is to determine the ability of the series 20K switches to conform to the qualification requirements of IEEE Std 323-1974 and IEEE Std 344-1975 while the product is manufactured in accordance with ANSI/ASME NQA-1-1979. This is accomplished by subjecting the switches to the Qualification Inspection requirements of Electro Switch Technical Publication ESC-Std-1000 Rev. 1 dated 2/15/78.

The testing consists of three parts:

1. Establishing the baseline by initial tests and measurements.
2. Aging the product to a simulated forty year life by subjecting the product to radiation, temperature, humidity, and electromechanical aging followed by seismic testing.
3. Final operational tests and inspections to verify that the product did not deteriorate from the baseline beyond accepted parameters or tolerances.

Summary of Results

The result of the tests indicate that the series 20K switches do conform to the Qualification Inspection requirements of ESC-Std-1000 Rev. 1 and thereby meets the qualification requirements of IEEE Std 323-1974 and IEEE Std 344-1975 and the quality assurance requirements of ANSI/ASME NQA-1-1979 (which includes, by reference, the NRC regulation 10CFR50 Appendix B).

A summary of the results is published on page 5. Complete test results follow.

Specifications

- IEEE Std 323-1974 IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations.
- IEEE Std 344-1975 IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.
- ANSI/ASME NQA-1-1979 Quality Assurance Program Requirements for Nuclear Power Plants.
- ESC-Std-1000 Rev. 1 General Specifications for Rotary Switches and Auxiliary Relays for Utility Applications including Class 1E Equipment Requirements for Nuclear Power Generating Stations.



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ADMINISTRATIVE DATA (Continued)

Manufacturer

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Material

Four samples of series 20K Instrument and Control Switches in accordance with ESC-Std-1000 Rev. 1 using normal production processes and tools. The samples are:

<u>QUANTITY</u>	<u>SAMPLE NUMBERS</u>	<u>SERIES</u>	<u>CATALOG NUMBERS</u>
4	1, 2, 3, 4	20K	20KB-1124A4

Test Laboratories

Electro Switch Corp.
180 King Avenue, Weymouth, Massachusetts 02188

Acton Environmental Testing Corp.
Acton, Massachusetts 01720

Arnold Greene Testing Laboratories, Inc.
Natick, Massachusetts 01760

Security Classification

The material is not security classified but all information and data contained in this report is proprietary to Electro Switch Corp. and solely for use by those persons responsible for evaluating the products tested for qualifying purposes. The material is to be kept in a secure file or returned to Electro Switch. It is not to be copied or conveyed to others without prior consent.



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Weymouth, Massachusetts 02163.

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SUMMARY OF TEST RESULTS

Test Specification
ESC-Std-1000 Rev. 1

TEST	TEST LAB	TEST PARA.	SAMPLE NOS.	NUMBER TESTED	NUMBER PASSED	NUMBER FAILED
Visual & Mechanical Examination	A	4.6.1	1,2,3,4	4	4	0
Circuit Configuration	A	4.6.2	1,2,3,4	4	4	0
Dielectric Withstanding Voltage 2200VRMS, 60Hz for 1 min.	A	4.6.3	1,2,3,4	4	4	0
Insulation Resistance 100 megohms min. at 500VDC	A	4.6.4	1,2,3,4	4	4	0
Contact Resistance 10 milliohms max. 20A	A	4.6.5	1,2,3,4	4	4	0
Radiation Aging - 10^4 Rads	A,C	4.6.6	1	1	1	0
Temperature Aging 120 hrs @80°C	A	4.6.7	1,2	2	2	0
Humidity Aging - 96 hrs @95% RH	A	4.6.8	1,2	2	2	0
Temperature Rise	A	4.6.9	1,2,3,4	4	4	0
Endurance 10,000 cycles @ 20A-600VAC 3A-125VDC	A	4.6.10	1,2,3,4	4	4	0
Seismic Vibration-ZPA=5g	A,B	4.6.11	1,2,3	3	3	0
Dielectric Withstanding Voltage 2200VRMS, 60Hz for 1 min.	A	4.6.3	1,2,3,4	4	4	0
Insulation Resistance 100 megohms min. at 500VDC	A	4.6.4	1,2,3,4	4	4	0
Contact Resistance 10 milliohms max. at 20A	A	4.6.5	1,2,3,4	4	4	0
Temperature Rise - 50°C max.	A	4.6.9	1,2,3,4	4	4	0
Circuit Configuration	A	4.6.2	1,2,3,4	4	4	0
Visual & Mechanical Examination	A	4.6.1	1,2,3,4	4	4	0

Test Laboratory References

- A - Electro Switch Corp.
- B - Acton Environmental Testing Corporation
- C - Arnold Greene Testing Laboratories, Inc.

NOTE: Data sheets are outlined in TABLE OF CONTENTS on page 2.



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Weymouth, Massachusetts 02188.

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EQUIPMENT LIST

SPEC. PARA.	EQUIPMENT	MANUFACTURER	TYPE OR MODEL	SERIAL OR INVENTORY#	DATE OF CALIBRATION
4.6.1	Vernier Caliper	Starrett	122	V-3	4/17/77
	Vernier Caliper	Tumico	75-18	18VI	4/17/77
4.6.2	Oscilloscope	Tektronix	5103N/D12	EG50	5/22/77
4.6.3	Dielectric Test Set	Westinghouse	1366351-E	55J8476	With Use
	Voltmeter	Ballantine	300	V1	7/26/77
	Multiplier, Vm.	Ballantine	1300B	V1B	1/25/78
	Shunt Resistor	Ballantine	604	A17	7/18/77
4.6.4	Megohmmeter	General Radio	1862C	EGF28	9/6/77
4.6.5	Voltmeter ¹	Ballantine	300D	V8	10/17/77
	Power Supply & Resistors	Electro Switch	--	--	N/A
	Ammeter, A.C.	Westinghouse	PA-151	A11	10/19/77
	Current Trans.	Westinghouse	PC-137	A1A	8/20/76
	Voltmeter, A.C.	Westinghouse	PA-151	V19	10/17/77
4.6.7	Test Chamber	Conrad	FD822	6513	3/21/78
	Power Supply & Resistors	Electro Switch	--	--	N/A
	Ammeter, A.C.	Westinghouse	PA-151	A11	2/17/78
	Current Trans.	Westinghouse	PC-137	A1A	8/20/76
	Voltmeter, A.C.	Westinghouse	PA-151	V19	2/17/78
4.6.8	Test Chamber	Conrad	FD822	6513	5/9/78
	Oscilloscope	Tektronix	5103N/D12	EG50	10/13/77
4.6.9	Voltmeter, D.C.	A.P.I.	4304	V27	1/31/78
	Thermocouple	Electro Switch	--	TH14	1/17/78
	Selector Box				
	Ammeter, A.C.	Westinghouse	PA-151	A11	2/17/78
	Current Trans.	Westinghouse	PC-137	A1A	8/20/76
	Thermometer	VWR Scientific	61031-020	TH12	9/15/76
	Thermometer	Cenco	19245-2	TH9	11/21/77
4.6.10	Power Supplies & Resistors	Electro Switch	--	--	N/A
	Life Tester	Electro Switch	--	3	With Use
	Ammeter, A.C.	Westinghouse	PA-151	A11	2/17/78
	Current Trans.	Westinghouse	PC-137	A1A	8/20/76
	Voltmeter, A.C.	Westinghouse	PA-151	V19	2/17/78
	Ammeter, D.C.	Weston	931	A6	12/1/77
	Voltmeter, D.C.	Weston	931	V11	1/31/78



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ENCLOSURE 1 DETAIL DATA

TEST PROCEDURES AND DATA

The test data on the following pages was generated to satisfy paragraph 4. QUALITY ASSURANCE PROVISIONS OF ESC-Std-1000 Rev. 1. The procedures of paragraph 4.6 Examination and tests were used to satisfy the requirements.

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: CIRCUIT CONFIGURATION - PAR. 4.6.2, ESC-STD-1000

DATE: APR 3 1978

TESTED BY: JRG, PBN

TEST REPORT NO. 2392-10

Series - 20K	- Instrument & Control Switch
--------------	-------------------------------

Initial

Soil	Sample 1	Sample 2	Sample 3	Sample 4
------	----------	----------	----------	----------

Requirements:

1	Carpenter	Carpenter	Carpenter	Carpenter
---	-----------	-----------	-----------	-----------

2 Coughs Coughs Coughs Coughs

3 *Cynops longirostris* *Cynops longirostris*

4 cookies Cough's Cough's Cough's

5	Conches	Conches	Conches	Conches
---	---------	---------	---------	---------

6	Campier	Campier	Campier	Campier
---	---------	---------	---------	---------

7	Cookies	Cookies	Cookies	Cookies
---	---------	---------	---------	---------

B	Candice	Candice	Candice	Candice
---	---------	---------	---------	---------

9	Camples	Camples	Camples	Camples
---	---------	---------	---------	---------

10	Combin	Combin	Combin
----	--------	--------	--------

11	Amber	Amber	1891	Amber
----	-------	-------	------	-------

12	Condit	Condit	Condit	Condit
----	--------	--------	--------	--------

(a) Circuit configuration: When the products are tested as specified they shall make and break the specified circuits in all positions of all decks. The making and breaking of circuits, in both momentary and detented positions, shall be positive. In switching break-before-make (BBM) contacts, the first contact of all decks fully breaks before any contact of any deck makes in the next position. In switching make-before-break (MBB) contacts, all contacts in the second position make before any contacts in the first position break.

ENCLOSURE: 7

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: DIELECTRIC WITHSTANDING VOLTAGE, pag. 4.6.3, ESC-

STD-1000

DATE: FLB 21 1978

TESTED BY: JPR

TEST REPORT NO. 2392-10

Series		- Instrument & Control Switch							
Sample 1		Sample 2		Sample 3		Sample 4			
Initial		Initial		Initial		Initial			
Sect.	Test A	Test B	Test A	Test B	Test A	Test B	Test A	Test B	
1	3.9	10.5	2.4	9.2	3.6	10.0	3.5	11.5	
2	4.0	10.0	3.4	9.2	3.4	11.0	3.6	12.0	
3	3.1	11.0	3.4	9.2	3.2	10.5	3.8	13.0	
4	3.8	11.0	3.4	9.8	3.4	11.0	3.8	13.0	
5	3.7	11.0	3.4	10.0	3.4	11.0	3.8	12.0	
6	3.1	11.0	3.4	9.2	3.4	11.2	4.2	12.5	
7	3.6	11.0	3.4	10.0	3.2	9.2	4.2	13.0	
8	3.8	11.0	3.2	10.0	3.4	9.4	4.2	13.0	
9	3.8	11.0	3.2	11.6	3.4	10.0	4.2	13.0	
10	3.6	11.0	2.0	11.0	3.4	11.0	3.8	13.0	
11	3.8	11.0	3.6	10.0	3.4	11.0	4.0	13.0	
12	3.6	12.0	3.7	10.0	3.2	10.5	3.6	12.0	

Notes: (a) Test voltage: 2,200 V.r.m.s., 60 Hz., (A.C.)

(b) Test voltage applied between:

Test A - Between open circuit contacts

Test B - Between closed contacts and non-current carrying parts

(c) Values are maximum found in microamps.

(d) Requirements:

- No arcing, breakdown of insulation, or damage
- Max. allowed leakage current: 100 microamps.

ENCLOSURE: 1

TEST: INSULATION RESISTANCE, per 4.6.4, ESC-STD-1000

TESTED BY: JRG, LFG

Series 20K		- Instrument of Control Switch						
Sample 1		Sample 2		Sample 3		Sample 4		
Initial		Initial		Initial		Initial		
Sec't.	Test A	Test B	Test A	Test B	Test A	Test B	Test A	Test B
1	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
2	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
3	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
4	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
5	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
6	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
7	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
8	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
9	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
10	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
11	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
12	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+	2000K+
Notes: (a) Test potential: 500 Volts d.c.								
(b) Test voltage applied between:								
Test A - Between open circuit contacts								
Test B - Between closed contacts and non-current carrying parts								
(c) Values are minimum found in megohms K=1,000								
(d) Requirement - Shall be greater than 100 megohms.								
Room Conditions								
	Temp.	Rel. Hum.						
Sample	(°F)	(%)						
1	74.0	23.0						
2	71.0	23.0						
3	80.0	12.0						
4	75.0	18.0						

ENCLOSURE: 7

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: CONTACT RESISTANCE, max. 4.6.5, ESC-STD-1000

DATE: SEP 1 1978

TESTED BY: W.D. RSM KRG

TEST REPORT NO. 2392-10

Series -		20K	- Instrument & Central Switch			
Section / Contact		Initial Sample				
Deck	Circuit	1	2	3	4	
1	1/2	1.26	0.84	0.86	0.88	
	3/4	1.39	1.09	0.72	0.86	
2	5/6	0.86	0.85	0.94	0.92	
	7/8	1.03	1.06	0.81	0.90	
3	9/10	1.02	0.86	1.03	0.88	
	11/12	0.97	0.85	0.90	0.84	
4	13/14	0.83	1.12	0.84	0.87	
	15/16	0.84	1.03	1.13	0.90	
5	17/18	1.02	0.91	0.99	0.99	
	19/20	1.06	0.91	0.95	0.90	
6	21/22	0.78	0.86	0.96	0.89	
	23/24	0.86	0.87	0.86	0.93	
7	25/26	1.00	0.88	1.01	0.90	
	27/28	0.88	0.99	0.88	1.02	
8	29/30	0.78	0.99	0.98	0.93	
	31/32	0.87	1.04	0.92	0.91	
9	33/34	1.01	0.92	0.90	0.94	
	35/36	1.02	0.86	0.90	0.98	
10	37/38	0.87	0.78	1.02	1.18	
	39/40	0.99	0.88	0.98	0.84	
11	41/42	0.86	0.83	0.90	0.82	
	43/44	0.81	0.94	0.92	0.95	
12	45/46	0.84	0.83	0.96	0.97	
	47/48	0.98	0.94	1.19	0.94	
Notes: (a) Requirement: 10 milliohms max. allowed.						
(b) Values are the average of five measurements in milliohms						
(c) Measurements taken at 20 Amps, 600 Volts a.c.						

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WYOMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: RADIATION AGING, par. 4.6.6, ESC-STD-1000

DATE: MAR 28 1960

TESTED BY: JRG, RSM

TEST REPORT NO. 2392-10

Series - 20K - Instrument & Control Switch
Sample 1

- Radiation exposure conducted by Arnold Greene Testing Laboratories, Inc., Natick, Mass. 01760.
- Electro Switch Corp. Purchase Order No. 43746
- A. G. T. L., Inc. Report No. B05584, 5/31/78 included in this report as Enclosure 2

Post Exposure Examination At Electro Switch Corp.

- | | | | | | | |
|---|--|--|--|--|--|------------|
| | | | | | | Sample 1 |
| - | Detrimental change of color (lamps, lamp lenses, targets, etc.) | | | | | : Complies |
| - | " " " physical characteristics (Weight, dimensions, deformation, etc.) | | | | | : Complies |
| - | Physical change of lubricants | | | | | : Complies |
| - | " " " thermoplastic materials (Embrittleness, crazing, etc.) | | | | | : Complies |

Requirements:

- shall be subjected to 10,000 rads cobalt 60 gamma radiation.
- There shall be no detrimental change of color, physical characteristics or physical changes of lubricant and thermoplastic materials.

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE AGING, par. 4.6.7, ESC-STD-1000

DATE: MAY 5 1978

TESTED BY: JRP, RJM

TEST REPORT NO. 2392-10

Series - ZOK - Instrument & Control Switch

- Samples 1 and 2 were subjected to $80 \pm 2^\circ\text{C}$ for a period of 120 hours. The samples were mounted in the test chamber by normal means. All terminal screws, lockwashers, shims, screws, handles and switch cover plates were assembled to the samples for this test.

Test Condition	Description
A	During the exposure period the switched poles listed were energized at the test load shown. These poles were monitored continuously during the exposure period for failure.

Switched Section / Contact				Test Load		
Sample	Position	Deck	Circuit	Amps.	Volts	P.F.
1	2	1	1/2	20	600ac	1.0
2	2	9	33/34	20	600ac	1.0

B	All switched poles not connected to a rated test load were monitored during the exposure period with failure indicating circuits for closed circuits, shorted or open circuits that close.
---	--

E	At the end of the exposure period all samples were checked manually for functional operation.
---	---

RESULTS	Test Condition	Sample 1	Sample 2
	A	Compliance	Compliance
	B	Compliance	Compliance
		Compliance	Compliance
	E	Compliance	Compliance

Requirement: The samples shall operate satisfactorily after temperature aging.

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: HUMIDITY AGING, per F.B.B., ESC-STD-1000

DATE: MAY 22 1978

TESTED BY: J. Q. B. W.

TEST REPORT NO. 2392-10

Series - 20K - Instrument & Control Switch

- Samples 1, and 2 were conditioned in a dry oven at a temperature of $40 \pm 5^\circ\text{C}$ for a period of 24 hours immediately prior to start of the humidity exposure period. The samples were mounted in the test chamber by normal means. All terminal screws, lock washers, clasp screws, handle, & escutcheon plates were assembled to the samples for this test.
- The samples were then subjected to 90 to 95% Relative Humidity at $40 \pm 2^\circ\text{C}$ for a period of 96 hours.
- At the completion of humidity exposure the samples were conditioned for a minimum of 2 hours at room ambient conditions and were then checked for functional operation.

Test Condition	Sample 1	Sample 2
- Initial conditioning at 40°C	Completed	Completed
- Humidity exposure	Completed	Completed
- Two hours at room ambient temp	Completed	Completed

- Functional Operation After Humidity Aging

	Sample 1	Sample 2
A. Circuit Configuration: Conformance to good & closed circuit operation requirements	Complies	Complies

Requirement: The samples shall operate satisfactorily after humidity aging.

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WILMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, pr. 4.6.9, ESC-SID-1000

DATE: JUL 21 1978

TESTED BY: JPR, RJA

TEST REPORT NO. 2392-10

Series - <u>20K</u> - <u>Instrument & Control Switch</u>									
Sample <u>1</u>									
Switch Temperature (°C)									
	Amb.	Section 1		Section 3		Section 5		Section 7	
Time	(°C)	1	2	11	12	17	18	27	28
11:00	27.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
12:00	27.5	35.0	33.5	35.0	35.0	36.0	35.0	37.5	35.0
1:00	25.5	37.0	36.5	38.5	38.5	38.5	38.0	38.0	38.5
2:00	27.5	37.5	36.5	39.0	39.5	39.0	38.0	39.0	37.5
3:00	27.0	38.0	38.0	40.5	40.5	40.0	39.5	40.5	40.5
3:30	27.5	38.0	38.0	40.5	41.0	40.0	39.5	40.5	40.5
4:00	27.5	38.0	38.0	40.5	41.0	40.0	39.5	40.5	40.5
4:30	27.5	38.5	38.0	40.5	41.0	40.5	39.5	40.5	41.0
Time	Temperature Rise (°C)								
11:00	0	0	0	0	0	0	0	0	0
12:00	10.5	9.0	10.5	10.5	11.5	10.5	10.0	10.5	
1:00	11.5	11.0	13.0	13.0	13.0	10.5	12.5	13.0	
2:00	11.0	10.0	12.5	13.0	12.5	11.5	12.5	13.0	
3:00	11.0	11.0	13.5	13.5	13.0	12.5	13.5	13.5	
3:30	10.5	10.5	13.0	13.5	12.5	12.0	13.0	13.0	
4:00	10.5	10.5	13.0	13.5	12.5	12.0	13.0	13.0	
4:30	11.0	10.5	13.0	13.5	13.0	12.0	13.0	13.5	
Max. Rise	11.5	11.0	13.5	13.5	13.0	12.5	13.5	13.5	
Notes: (a) Test conducted before [] endurance.									
(b) Energized with <u>20</u> Amps.									
(c) Max. rise allowed: 50°C in an ambient no greater than 55°C									
(d) Switch contacts energized are those energized with test load during the endurance test.									

ENCLOSURE: 1

ELECTRO SWITCH CORP. - Weymouth, Mass.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: JUL 21 1970

TESTED BY: JRG, RJM

TEST REPORT NO. 2392-10

Series -		20K - Instrument & Control Switch				Sample 1		Switch Temperature (°C)	
Amb.		Section 9		Section 11					
Time	(°C)	33	34	43	44				
11:00	23.5	23.5	23.5	23.5	23.5				
12:00	24.5	35.5	35.5	36.0	36.0				
1:00	25.5	37.5	37.5	40.0	39.0				
2:00	26.5	38.5	38.5	46.5	46.5				
3:00	27.0	46.0	46.0	41.5	42.0				
3:30	27.5	46.0	46.0	41.5	42.0				
4:00	27.5	46.0	46.0	42.0	42.0				
4:30	27.5	46.0	46.0	42.0	42.0				
Time	Temperature Rise (°C)								
11:00	0	0	0	0					
12:00	11.0	11.0	11.5	11.5					
1:00	12.0	12.0	16.5	13.5					
2:00	12.0	12.0	14.0	14.0					
3:00	13.0	13.0	14.5	15.0					
3:30	12.5	12.5	13.5	14.0					
4:00	12.5	12.5	14.0	14.0					
4:30	12.5	12.5	14.0	14.0					
Max. Rise	13.0	13.0	14.5	15.0					
Notes: (a) Test conducted before [] endurance.									
(b) Energized with 20 Amps.									
(c) Max. rise allowed: 50° in an ambient no greater than 55°C									
(d) Switch contacts energized are those energized with test load during the endurance test.									

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WETMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: JUN 1 1978

TESTED BY: JRG, SJL

TEST REPORT NO. 2392-10

	Series -	20K		- Instrument & Control Switch					
				Sample 2					
		Switch Temperature (°C)							
	Amb.	Section 1		Section 3		Section 5		Section 7	
Time	(°C)	1	2	11	12	17	18	27	28
9:00	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
10:00	25.0	40.0	36.0	35.0	34.5	37.5	35.5	36.5	37.0
11:00	25.0	41.0	37.0	36.5	36.0	38.5	37.0	38.0	38.5
12:00	25.5	41.5	37.5	37.0	36.5	39.0	37.0	38.0	39.0
1:00	25.5	41.5	37.5	37.0	36.5	39.0	37.0	38.0	38.5
1:30	25.5	41.5	37.5	37.0	36.5	39.0	37.0	38.0	38.5
2:00	26.0	42.0	38.0	37.0	36.5	39.5	37.5	38.0	38.5
2:30	26.0	42.0	37.5	37.0	37.0	39.5	38.0	38.5	39.0
	Time	Temperature Rise (°C)							
	9:00	0	0	0	0	0	0	0	0
	10:00	15.0	11.0	10.0	9.5	12.5	10.5	11.5	12.0
	11:00	16.0	12.0	11.5	11.0	13.5	12.0	13.0	13.5
	12:00	16.0	12.0	11.5	11.0	13.5	11.5	12.5	13.5
	1:00	16.0	12.0	11.5	11.0	13.5	11.5	12.5	13.0
	1:30	16.0	12.0	11.5	11.0	13.5	11.5	12.5	13.0
	2:00	16.0	12.0	11.0	10.5	13.5	11.5	12.0	12.5
	2:30	16.0	11.5	11.0	11.0	13.5	12.0	12.5	13.0
	Max. Rise	16.0	12.0	11.5	11.0	13.5	12.0	13.0	13.5
Notes:	(a) Test conducted before endurance								
	(b) Energized with 20 Amps.								
	(c) Max. rise allowed: 50°C in an ambient no greater than 55°C								
	(d) Switch contacts energized are those energized with test load during the endurance test.								

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WYOMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, per 4.6.9, ESC-STD-1000

DATE: JUN 1 1970

TESTED BY: JPR, SJC

TEST REPORT NO. 2392-10

	Series -	20K - Instrument & Control Switch							
		Sample 2							
		Switch Temperature (°C)							
	Amb.	Section 9		Section 11					
Time	(°C)	33	34	43	44				
9:00	25.0	25.0	25.0	25.0	25.0				
10:00	25.0	36.5	36.5	34.5	36.0				
11:00	25.0	38.0	38.0	35.5	37.0				
12:00	25.5	38.5	38.5	36.5	37.5				
1:00	25.5	38.5	39.0	36.5	37.5				
1:30	25.5	38.5	38.5	36.0	37.5				
2:00	26.0	38.5	39.0	36.5	38.0				
2:30	26.0	39.0	39.5	37.0	38.0				
	Time	Temperature Rise (°C)							
	9:00	0	0	0	0				
	10:00	11.5	11.5	9.5	11.0				
	11:00	13.0	13.0	10.5	12.0				
	12:00	13.0	13.0	11.0	12.0				
	1:00	13.0	13.5	11.0	12.0				
	1:30	13.0	13.0	10.5	12.0				
	2:00	12.5	13.0	10.5	12.0				
	2:30	13.0	13.5	11.0	12.0				
	Max. Rise	13.0	13.5	11.0	12.0				
Notes:	(a) Test conducted before endurance								
	(b) Energized with 20 Amps.								
	(c) Max. rise allowed: 50°C in an ambient no greater than 55°C.								
	(d) Switch contacts energized are those energized with test load during the endurance test.								

ENCLOSURE: 1

TEST DATA

TEST: TEMPERATURE RISE, sec. 4.6.9, ESC-STD-1000

DATE: MAR 28 1978

TESTED BY: JRC, RJA

TEST REPORT NO. 2592-10

Series - 20K - Instrumental Amplifier

Sample 3

Switch Temperature ($^{\circ}\text{C}$)

Amb.	Section 9	Section 11
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Time	(°C)	33	34	43	44
------	------	----	----	----	----

11.00	24.0	24.0	24.0	24.0	24.0
-------	------	------	------	------	------

12'00	24.0	37.5	32.0	37.0	32.0
-------	------	------	------	------	------

1.00	27.0	37.5	37.5	37.0	37.5
------	------	------	------	------	------

2.00	27.5	30.0	38.0	37.5	38.0
------	------	------	------	------	------

25.00	25.00	30.5	38.5	30.0	38.5
-------	-------	------	------	------	------

3.36	25.0	37.0	39.0	36.0	38.5
------	------	------	------	------	------

4.00	25.0	59.0	39.0	32.0	39.0
------	------	------	------	------	------

4:30	25.5	39.5	39.5	30.5	39.0
------	------	------	------	------	------

Time	Temperature Rise ($^{\circ}\text{C}$)
------	---

11:00	0	0	0	0
-------	---	---	---	---

12.00	13.5	13.0	13.0	13.0
-------	------	------	------	------

1'00	13.5	13.5	13.0	13.5
------	------	------	------	------

2:00	13.5	13.5	13.0	13.5
------	------	------	------	------

3.00	13.5	13.5	13.0	13.5
------	------	------	------	------

5:30	140	140	130	135
------	-----	-----	-----	-----

7'00	14.0	14.0	13.0	14.0
------	------	------	------	------

9.30	14.0	13.0	13.0	13.8
------	------	------	------	------

Max. Rice	14.0	14.0	13.0	14.0
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Notes: (a) Test conducted before [] undergone

(b) Energized with 20 amps.

(c) Max. ice allowed: 50°C . in an ambient no greater than 55°C

(d) Switch contacts energized are those energized with test load during the endurance test.

ENCLOSURE:

ELECTRO SWITCH CORP. - WILMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: MAR 28 1978

TESTED BY: JRB, RJM

TEST REPORT NO. 2542-10

Series - 20K - Instrumental & Control Switch									
Sample 4									
Switch Temperature (°C)									
	Amb.	Section 1		Section 3		Section 5		Section 7	
Time	(°C)	1	2	11	12	17	18	27	28
11:00	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
12:00	24.0	37.5	37.5	38.0	32.0	37.0	38.0	38.0	37.5
1:00	24.0	38.0	38.0	38.0	37.5	37.5	38.5	37.5	37.5
2:00	24.5	38.0	37.5	38.0	37.0	37.5	38.0	38.0	37.5
3:00	25.0	38.5	38.5	38.5	37.5	38.0	38.5	38.5	38.0
3:30	25.0	39.0	39.0	39.0	38.0	38.5	39.0	40.0	39.0
4:00	25.0	39.0	39.0	39.5	38.5	38.5	39.5	40.0	39.0
4:30	25.5	39.0	39.0	39.5	38.5	38.5	39.5	40.0	39.5
Time	Temperature Rise (°C)								
11:00	0	0	0	0	0	0	0	0	0
12:00	13.5	13.5	14.0	13.0	13.0	14.0	14.0	13.5	13.5
1:00	14.0	14.0	14.0	13.5	13.5	14.5	13.5	13.5	13.5
2:00	13.5	13.0	13.5	12.5	13.0	13.5	13.5	13.5	13.0
3:00	13.5	13.5	13.5	12.5	13.0	13.5	13.5	13.5	13.0
3:30	14.0	14.0	14.0	13.0	13.5	14.0	15.0	14.0	14.0
4:00	14.0	14.0	14.5	13.5	13.5	14.5	15.0	14.0	14.0
4:30	13.5	13.5	14.0	13.0	13.0	14.0	14.5	14.0	14.0
Max. Rise	14.0	14.0	14.5	13.5	13.5	14.5	15.0	14.0	14.0
Notes: (a) Test conducted before [] endurance.									
(b) Energized with 20 Amps.									
(c) Max. rise allowed: 50°C in an ambient no greater than 55°C.									
(d) Switch contacts energized are those energized with test load during the endurance test.									

ENCLOSURE: 7

ELECTRO SWITCH CORP. - WETMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, per 4.6.9, ESC-STD-1000

DATE: MAR 28 1972

TESTED BY: JRD, PJH

TEST REPORT NO. 2392-10

Series - <u>20K</u>		- Instrument & Metal Switch			
		Sample <u>4</u>			
		Switch Temperature (°C)			
	Amb.	Section 9		Section 11	
Time	(°C)	33	34	43	44
11:00	24.0	24.0	24.0	24.0	24.0
12:00	24.0	32.0	37.5	36.5	37.5
1:00	24.0	37.0	37.5	36.5	36.0
2:00	24.5	37.5	37.5	37.0	36.0
3:00	25.0	36.0	36.0	37.5	36.5
3:30	25.0	38.5	38.5	38.0	39.0
4:00	25.0	38.5	39.0	38.5	39.5
4:30	25.5	36.5	39.0	38.5	39.5
Time	Temperature Rise (°C)				
11:00	0	0	0	0	
12:00	13.0	13.5	12.5	13.5	
1:00	13.0	13.5	12.5	14.0	
2:00	13.0	13.0	12.5	13.5	
3:00	13.0	13.0	12.5	13.5	
3:30	13.5	13.5	13.0	14.0	
4:00	13.5	14.0	13.5	14.5	
4:30	13.0	13.5	13.0	14.0	
Max. Rise	13.5	14.0	13.5	14.5	
Notes: (a) Test conducted before endurance					
(b) Energized with 20 Amps.					
(c) Max. rise allowed: 50°C in an ambient no greater than 55°C					
(d) Switch contacts energized are those energized with test load during the endurance test.					

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.

ENGINEERING TEST LABORATORY

TEST DATA

TEST: ENDURANCE, per 4.6.10, ESC-STD-1000DATE: APR 14 1976TESTED BY: JRG, RSMTEST REPORT NO. 2392-10

Series -		20K		Instrument & Control Switch			
Sample	Deck	Section/Contact Circuit	Electric Amps	Load (1) Volts	Cycles Completed	Remarks	
1	1	1/2	20	600 a.c.	10,000	With no evidence of failure.	
	3	11/12	3	125 d.c.	10,000	With no evidence of failure.	
	5	17/18	20	600 a.c.	10,000	With no evidence of failure.	
	7	25/26	3	125 d.c.	10,000	With no evidence of failure.	
	9	33/34	20	600 a.c.	10,000	With no evidence of failure.	
	11	43/44	3	125 d.c.	10,000	With no evidence of failure.	
2	1	1/2	20	600 a.c.	10,000	With no evidence of failure.	
	3	11/12	3	125 d.c.	10,000	With no evidence of failure.	
	5	17/18	20	600 a.c.	10,000	With no evidence of failure.	
	7	25/26	3	125 d.c.	10,000	With no evidence of failure.	
	9	33/34	20	600 a.c.	10,000	With no evidence of failure.	
	11	43/44	3	125 d.c.	10,000	With no evidence of failure.	
3	1	1/2	20	600 a.c.	10,000	With no evidence of failure.	
	3	11/12	3	125 d.c.	10,000	With no evidence of failure.	
	5	17/18	20	600 a.c.	10,000	With no evidence of failure.	
	7	25/26	3	125 d.c.	10,000	With no evidence of failure.	
	9	33/34	20	600 a.c.	10,000	With no evidence of failure.	
	11	43/44	3	125 d.c.	10,000	With no evidence of failure.	
4	1	1/2	20	600 a.c.	10,000	With no evidence of failure.	
	3	11/12	3	125 d.c.	10,000	With no evidence of failure.	
	5	17/18	20	600 a.c.	10,000	With no evidence of failure.	
	7	25/26	3	125 d.c.	10,000	With no evidence of failure.	
	9	33/34	20	600 a.c.	10,000	With no evidence of failure.	
	11	43/44	3	125 d.c.	10,000	With no evidence of failure.	

NOTES: ① P.F. = 1.0

Requirements:

- Endurance: 10,000 cycles at 30 cycles/minute. (Cycle: OFF-ON-OFF)
- Shall be electrically and mechanically capable before, during, and after the test.
- Each mating contact shall make and break at the prescribed threshold of the test. After test there shall be no evidence of broken, loose, deformed or displaced parts.

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: SEISMIC VIBRATION - par. 4, 6, 11, ESC-STD-1000

DATE: 11/14/73

TESTED BY: RML

TEST REPORT NO. 2392-10

Series 20K - Instrument & Central Switch

- Test conducted at Adcon Environmental Testing Corp., Adcon, Mass.
- A.E.T.C. Report No. 14373-4, 11/14/73 included in this report as Enclosure 3.

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: DIELECTRIC WITHSTANDING VOLTAGE, par. 4.6.3, ESC-
STD-1000

DATE: 1/1/74

TESTED BY: J. J. KRIEGER, JR.

TEST REPORT NO. 2392-10

Series		Instrument & Control Switch							
Sample 1		Sample 2		Sample 3		Sample 4			
Final		Final		Final		Final			
Seal:	Test A	Test B	Test A	Test B	Test A	Test B	Test A	Test B	
1	2.1	7.4	2.0	8.5	2.3	9.8	2.2	8.8	
2	2.1	7.2	1.9	8.4	2.5	9.5	2.3	9.3	
3	2.2	7.2	1.9	8.5	2.2	9.5	2.5	9.5	
4	2.2	7.2	2.0	8.5	2.2	9.5	2.4	9.8	
5	2.2	7.4	1.9	8.5	2.4	9.5	2.4	10.5	
6	2.3	7.2	2.0	8.5	2.3	9.5	2.4	10.0	
7	2.3	7.4	2.0	8.5	2.5	9.5	2.7	10.5	
8	2.3	7.4	2.3	8.6	2.5	9.2	2.4	10.5	
9	2.2	7.2	2.3	9.0	2.5	9.5	2.5	11.0	
10	2.4	6.8	2.2	9.2	2.4	9.5	2.6	10.5	
11	2.4	7.0	2.0	8.5	2.3	9.5	2.4	10.0	
12	2.2	7.2	2.2	8.6	2.2	9.0	2.4	9.7	

Notes: (a) Test voltage: 2,200 V.r.m.s., 60 Hz, (AC)

(b) Test voltage applied between:

Test A - Between open circuit contacts

Test B - Between closed contacts and non-current carrying parts

(c) Values are maximum found in microamps.

(d) Requirements:

- No arcing, breakdown of insulation, or damage
- Max. allowed leakage current: 100 microamps.

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: INSULATION RESISTANCE, per 4.6.4, ESC-STD-1000

DATE: 11/1/73

TESTED BY: JRG, KRL, RSW

TEST REPORT NO. 2392-10

Series 20K		Instrument Control Switch						
Sample 1		Sample 2		Sample 3		Sample 4		
Final		Final		Final		Final		
Sec't.	Test A	Test B	Test A	Test B	Test A	Test B	Test A	Test B
1	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
2	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
3	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
4	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
5	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
6	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
7	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
8	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
9	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
10	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
11	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
12	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+	2000k+
Notes: (a) Test potential: 500 Volts d.c.								
(b) Test voltage applied between:								
Test A - Between open circuit contacts								
Test B - Between closed contacts and non-current carrying parts								
(c) Values are minimum found in megohms K=1000								
(d) Resistance - Shall be greater than 100 megohms.								
Room Conditions								
Temp.		Rel. Hum.						
Sample	(°F)	(%)						
1	72.0	42.0						
2	72.0	42.0						
3	72.0	42.0						
4	74.0	23.0						

ENCLOSURE: /

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: CONTACT RESISTANCE, FIG. 4.6.5, ESC-STD-1000

DATE: NOV 1 1978

TESTED BY: JRE, KRG, RDM, C.L.L.

TEST REPORT NO. 2392-10

Series-		20K	-	Instrument & Contact Switch		
				Final		
Section/Contact		Sample				
Deck	Circuit	1	2	3	4	
1	1/2	3.04	1.27	1.62	1.51	
	3/4	0.96	0.92	0.75	0.98	
2	5/6	0.52	0.97	1.00	0.85	
	7/8	1.16	1.22	0.82	0.81	
3	9/10	0.57	0.77	0.83	0.85	
	11/12	1.02	2.17	2.77	2.79	
4	13/14	0.77	1.94	0.82	1.36	
	15/16	0.95	1.76	1.01	1.26	
5	17/18	2.86	2.56	1.50	2.05	
	19/20	0.83	1.35	1.36	0.80	
6	21/22	1.02	0.94	1.03	0.87	
	23/24	0.81	0.85	0.88	0.83	
7	25/26	4.08	1.06	0.78	0.94	
	27/28	1.87	1.16	4.38	2.37	
8	29/30	1.07	0.87	1.63	0.96	
	31/32	1.23	0.99	1.06	0.90	
9	33/34	1.80	1.91	2.64	1.21	
	35/36	1.30	0.76	1.00	0.98	
10	37/38	1.15	1.11	0.79	1.01	
	39/40	1.31	0.99	0.86	0.93	
11	41/42	1.34	0.94	1.30	0.79	
	43/44	2.14	2.33	2.72	3.25	
12	45/46	1.20	0.82	0.80	0.85	
	47/48	1.18	1.03	1.36	0.89	
Notes: (a) Dimension: 10 millichins max. allowed.						
(b) Values are the average of five measurements in millichins.						
(c) Measurements taken at 20 Amps, 600 Volts A.C.						

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, per 4.6.9, ESC-STD-1000

DATE: Oct 11 1970

TESTED BY: JFR, P.J.S.

TEST REPORT NO. 2392-10

Series -		- Instrument & Control Switch							
		Sample 1							
		Switch Temperature (°C)							
	Amb.	Section 1		Section 3		Section 5		Section 7	
Time	(°C)	1	2	11	12	17	18	27	28
9:00	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
10:00	24.0	48.0	44.5	38.0	37.0	50.0	46.5	46.5	44.0
11:00	24.5	51.0	45.5	38.5	37.5	51.0	47.0	47.0	45.0
12:00	24.5	51.5	45.5	39.0	38.0	51.5	47.5	47.0	45.5
1:00	24.5	51.0	45.0	38.5	38.0	51.0	47.0	46.0	46.0
1:30	24.5	51.0	45.0	39.0	38.0	51.0	46.5	45.5	45.5
2:00	25.0	51.5	45.5	39.5	38.5	51.5	47.0	46.0	46.0
2:30	25.0	51.5	45.5	39.5	38.5	52.0	47.5	46.0	46.5

Time	Temperature Rise (°C)								
9:00	0	0	0	0	0	0	0	0	0
10:00	24.0	20.5	14.0	13.0	26.0	22.0	22.5	20.0	
11:00	26.5	21.0	14.0	13.0	26.5	22.5	22.5	20.5	
12:00	27.0	21.0	14.5	13.5	27.0	23.0	22.5	21.0	
1:00	26.5	20.5	14.0	13.5	26.5	22.5	21.5	21.5	
1:30	26.5	20.5	14.5	13.5	26.5	22.0	21.0	21.0	
2:00	26.5	20.5	14.5	13.5	26.5	22.0	21.0	21.0	
2:30	26.5	20.5	14.5	13.5	27.0	22.5	21.0	21.5	

Max. Rise 27.0 21.0 14.5 13.5 27.0 23.0 22.5 21.5

Notes: (a) Test conducted after endurance.
(b) Energized with 20 Amps.
(c) Max. rise allowed: 50°C in an ambient no greater than 55°C.
(d) Switch contacts energized and loss energized with test load during the endurance test.

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WYTHMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: OCT 27 1978

TESTED BY: JPR, PJS

TEST REPORT NO. 2392-10

	Series -	20K	-	Instruments (Control Switch)	
				Sample 1	
				Switch Temperature (°C)	
	Amb.	Section 9	Section 11		
Time	(°C)	33	34	43	44
9:00	23.5	23.5	23.5	23.5	23.5
10:00	24.0	46.0	47.0	48.0	48.5
11:00	24.5	47.5	47.5	48.5	49.0
12:00	24.5	47.5	48.0	48.5	48.5
1:00	24.5	48.0	48.5	48.0	48.5
1:30	24.5	48.0	47.5	48.0	48.5
2:00	25.0	48.5	48.0	48.5	49.0
2:30	25.0	48.5	48.0	48.5	49.0
	Time			Temperature Rise (°C)	
	9:00	0	0	0	0
	10:00	22.0	23.0	24.0	24.5
	11:00	23.0	23.0	24.0	24.5
	12:00	23.0	23.5	24.0	24.0
	1:00	23.5	24.0	23.5	24.0
	1:30	23.5	23.0	23.5	24.0
	2:00	23.5	23.0	23.5	24.0
	2:30	23.5	23.0	23.5	24.0
	Max. Rise	23.5	24.0	24.0	24.5
Notes:	(a) Test conducted [] after endurance				
	(b) Energized with 20 Amps				
	(c) Max. rise allowed: 50°C in an ambient no greater than 55°C				
	(d) Switch completely energized as it was energized with test lead during the endurance test.				

ENCLOSURE: 1

ELECTRO SWITCH CORP. - Weymouth, Mass.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: OCT 10 1978

TESTED BY: JRB, RLF

TEST REPORT NO. 2392-10

Series -		20K		- Insurrector's Central Switch					
				Sample 2					
				Switch Temperature (°C)					
	Amb.	Section 1		Section 3		Section 5		Section 7	
Time	(°C)	1	2	11	12	17	18	27	28
9:00	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
10:00	26.0	39.5	41.0	44.0	41.5	45.0	42.0	41.0	41.0
11:00	24.5	37.5	40.5	42.5	41.0	44.5	41.5	40.0	40.5
12:00	24.0	37.5	40.5	42.5	41.0	44.5	41.5	40.5	40.5
1:00	23.5	37.5	40.0	43.0	42.5	45.0	42.5	40.5	40.0
1:30	24.0	38.0	40.5	43.0	43.0	46.0	43.5	40.5	40.5
2:00	24.0	34.0	40.0	45.5	42.5	46.0	46.0	41.0	40.0
2:30	24.0	38.0	40.5	44.0	43.0	45.5	44.0	41.0	40.5
Time		Temperature Rise (°C)							
9:00	0	0	0	0	0	0	0	0	0
10:00	12.5	15.0	19.0	15.5	19.0	16.0	15.0	15.0	15.0
11:00	13.0	16.0	18.0	16.5	20.0	17.0	15.5	16.0	16.0
12:00	13.5	16.5	18.5	17.0	20.5	17.5	16.5	16.5	16.5
1:00	14.0	16.5	19.5	19.0	21.5	19.0	17.0	16.5	16.5
1:30	14.0	16.5	19.0	19.0	22.0	19.5	16.5	16.5	16.5
2:00	14.0	16.0	19.5	18.5	22.0	20.0	17.0	16.0	16.0
2:30	14.0	16.5	20.0	19.0	21.5	20.0	17.0	16.5	16.5
Max. Rise	14.0	16.5	20.0	19.0	22.0	20.0	17.0	16.5	16.5
Notes:	(a) Test conducted () after endurance.								
	(b) Energized with 20 Amps.								
	(c) Max. rise allowed: 50°C in an ambient no greater than 55°C.								
	(d) Switch contacts energized are those energized with test load during the endurance test.								

ENCLOSURE: /

ELECTRO SWITCH CORP. - Weymouth, Mass.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: Oct 3, 1946

TESTED BY: JRQ, P.L.L.

TEST REPORT NO. 2392-10

	Series -	20K		- Instrument & Control Switch					
				Sample 3					
		Switch Temperature (°C)							
	Amb.	Section 1		Section 3		Section 5		Section 7	
Time	(°C)	1	2	11	12	17	18	27	28
9:00	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5	23.5
10:00	23.5	43.5	42.0	46.5	45.5	40.5	39.0	46.0	46.5
11:00	23.0	43.5	42.5	46.0	45.5	40.5	39.0	47.0	46.5
12:00	23.0	43.5	42.5	46.0	47.0	41.0	39.0	47.0	47.0
1:00	23.0	44.5	43.0	47.0	48.0	41.5	40.0	48.0	48.0
1:30	23.5	45.0	43.0	47.0	48.0	42.0	40.0	48.0	48.0
2:00	24.0	45.0	43.5	47.5	48.5	42.5	40.5	48.5	48.5
2:30	24.5	45.5	43.5	48.0	49.0	42.5	41.0	49.5	49.0
	Time	Temperature Rise (°C)							
	9:00	0	0	0	0	0	0	0	0
	10:00	20.0	18.5	23.0	22.0	17.0	15.5	22.5	23.0
	11:00	20.5	19.5	23.0	22.5	17.5	16.0	24.0	23.5
	12:00	20.5	19.5	23.0	24.0	18.0	16.0	24.0	24.0
	1:00	21.5	20.0	24.0	25.0	18.5	17.0	25.0	25.0
	1:30	21.5	19.5	23.5	24.5	18.5	16.5	24.5	24.5
	2:00	21.0	19.5	23.5	24.5	18.5	16.5	24.5	24.5
	2:30	21.0	19.0	23.5	24.5	18.0	16.5	25.0	24.5
	Max. Rise	21.5	20.0	24.0	25.0	18.5	17.0	25.0	25.0
	Notes:	(a) Test conducted after endurance							
		(b) Energized with 20 Amps.							
		(c) Max. rise allowed: 50°C in an ambient no greater than 55°C							
		(d) Switch contacts energized are those energized with test load during the endurance test.							

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WYOMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: 10/1/54

TESTED BY: JPA, P.I.

TEST REPORT NO. 2392-10

	Series -	20K	- Instrument & Control Switch			
			Sample 3			
			Switch Temperature (°C)			
	Amb.	Section 9		Section 11		
Time	(°C)	33	34	43	44	
9:00	23.5	23.5	23.5	23.5	23.5	
10:00	23.5	39.5	39.5	41.5	44.5	
11:00	23.0	39.0	39.0	41.0	44.0	
12:00	23.0	39.0	39.0	40.5	44.5	
1:00	23.0	39.5	39.5	41.0	45.5	
1:30	23.5	39.5	39.5	42.0	46.0	
2:00	24.0	40.5	40.0	42.0	46.5	
2:30	24.5	40.5	41.0	42.5	46.5	
	Time	Temperature Rise (°C)				
	9:00	0	0	0	0	
	10:00	16.0	16.0	18.0	21.0	
	11:00	16.0	16.0	18.0	21.0	
	12:00	16.0	16.0	17.5	21.5	
	1:00	16.5	16.5	18.0	22.5	
	1:30	16.0	16.0	18.5	22.5	
	2:00	16.5	16.0	18.0	22.5	
	2:30	16.0	16.5	18.0	22.0	
	Max. Rise	16.5	16.5	18.5	22.5	
Notes:	(a) Test conducted after endurance					
	(b) Energized with 20 amps.					
	(c) Max. rise allowed: 50°C in an ambient no greater than 55°C					
	(d) Switch contacts energized are those energized with test load during the endurance test.					

ENCLOSURE: 1

ELECTRO SWITCH CORP. - WETTING, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, PAR. 4.6.9, ESC-STD-1000

DATE: 6/27 1978

TESTED BY: JRA, KRG

TEST REPORT NO. ZE92-10

Series -		20K		- Instrument		4 Central Switch			
				Sample 4					
				Switch Temperature (°C)					
	Amb.	Section 1		Section 3		Section 5		Section 7	
Time	(°C)	1	2	11	12	17	18	27	28
0900	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
1000	23.0	44.5	44.0	46.5	49.5	39.5	42.0	46.0	49.5
1100	23.0	44.5	44.0	46.5	50.0	40.5	43.0	46.5	49.5
1200	23.5	45.0	44.0	47.0	50.0	41.0	43.5	46.5	49.5
1300	23.5	45.0	44.0	46.5	50.0	41.0	43.0	46.5	49.0
1330	24.0	45.0	44.5	47.0	50.5	41.0	43.5	47.0	49.5
1400	24.0	45.0	44.5	47.0	50.5	41.5	44.0	47.5	50.0
1430	24.5	46.0	45.5	47.5	51.0	42.0	44.0	47.5	50.5
Time		Temperature Rise (°C)							
0900	0	0	0	0	0	0	0	0	0
1000	21.5	21.0	23.5	26.5	16.5	19.0	23.0	26.5	
1100	21.5	21.0	23.5	27.0	17.5	20.0	23.5	26.5	
1200	21.5	20.5	23.5	26.5	17.5	20.0	23.5	26.0	
1300	21.5	20.5	23.0	26.5	17.5	19.5	23.0	25.5	
1330	21.0	20.5	23.0	26.5	17.0	19.5	23.0	25.5	
1400	21.0	20.5	23.0	26.5	17.5	20.0	23.5	26.0	
1430	21.5	21.0	23.5	27.0	17.5	19.5	23.0	26.0	
Max. Rise	21.5	21.0	23.5	27.0	17.5	20.0	23.5	26.5	
Notes	(a) Test conducted () after endurance.								
	(b) Energized with 20 Amps.								
	(c) Max. rise allowed: 50°C in an ambient no greater than 55°C.								
	(d) Switch contacts energized are those energized with test load during the endurance test.								

ENCLOSURE: 7

ELECTRO SWITCH CORP. - WENMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: TEMPERATURE RISE, par. 4.6.9, ESC-STD-1000

DATE: MAY 11 1978

TESTED BY: JPR, KRG

TEST REPORT NO. 2392-10

	Series -	20K	- Instrument & Control Switch			
			Sample 4			
			Switch Temperature (°C)			
	Amb.	Section 9	Section 11			
Time	(°C)	33	34	43	44	
0900	22.0	22.0	22.0	22.0	22.0	
1000	23.0	40.0	40.0	45.5	44.0	
1100	23.0	40.0	40.5	46.0	44.0	
1200	23.5	40.5	41.0	46.0	44.0	
1300	23.5	40.0	40.5	46.0	44.0	
1330	24.0	40.5	41.5	46.5	45.0	
1400	24.0	41.0	41.5	46.5	44.5	
1430	24.5	41.5	42.0	47.5	45.5	

Time	Temperature Rise (°C)				
0900	0	0	0	0	
1000	17.0	17.0	22.5	21.0	
1100	17.0	17.5	23.0	21.0	
1200	17.0	17.5	22.5	20.5	
1300	16.5	17.0	22.5	20.5	
1330	16.5	17.5	22.5	21.0	
1400	17.0	17.5	22.5	20.5	
1430	17.0	17.5	23.0	21.0	

Max. Rise 17.0 17.5 23.0 21.0

- Notes: (a) Test conducted after endurance.
(b) Energized with 20 Amps.
(c) Max. rise allowed: 50°C in ambient not greater than 55°C.
(d) Switch contacts energized as these energized with test load during the endurance test.

ENCLOSURE: 1

TEST: CIRCUIT CONFIGURATION- DAY. 4.6.7, ESC-STD-1000

TESTED BY: JRG, KRG, RJM

TEST REPORT NO. 2392-10

PAGE 30 OF 31

ENCLOSURE:

TEST REPORT NO. 2592-10

ELECTRO SWITCH CORP. - WEYMOUTH, MASS.
ENGINEERING TEST LABORATORY
TEST DATA

TEST: VISUAL & MECHANICAL EXAMINATION - Final, rec'd. b. l.
& Table III, ESC-STD-1000

DATE: MAY 7 1970

TESTED BY: JRG,

TEST REPORT NO. 2392-10

Series - 20K - Instrument & Control Switches

- All samples examined for failure at the completion of all testing.

- Examination of each sample revealed no evidence of failure, electrical, or mechanical damage, or loosening of parts as a result of the tests.

ENCLOSURE: 1



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02158.

ENGINEERING TEST REPORT

REPORT NO. 2392-10

PAGE 8 OF 9

DATE: _____

PREPARED BY _____

APPROVED BY _____

ENCLOSURE 2

RADIATION REPORT



ARNOLD GREENE TESTING LABORATORIES, INC.

Nondestructive - Chemical - Pollution - Metallurgical - Inspection - Evaluation - Analysis

EAST NATICK INDUSTRIAL PARK • 6 HURON DRIVE • NATICK, MASS. 01760

(617) 235-7330, 653-5950 • TELEX 940459 (GREENE LAB NTIK)

BRANCH LABORATORIES

NATICK, MASS. 01760
(617) 235-7330

EVERETT, MASS. 02149
(617) 367-3770

SPRINGFIELD, MASS. 01104
(413) 734-0545

AUBURN, MASS. 01501
(617) 832-5549



TEST REPORT

TO: Electro Switch Corp. DATE May 31, 1978 MATERIAL Switches
King Ave. JOB NO. P05584 HEAT NO. _____
Weymouth, MA 02188 LAB. NO. Natick SPECIFICATIONS Electro Test
ATT: J.R. Qualley ORDER NO. 83716 Report # 2392-10, Sample

Switch #20KB-112HA4 has been exposed to 10,000 RADS of gamma radiation using 29 curies of cobalt 60. Using a distance of 30" from the source, this unit was exposed for a total of 152 hours.

SUBSCRIBED TO AND SWORN TO BEFORE ME THIS

DAY OF

19

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND THIS

31st DAY OF May

19 78

ARNOLD GREENE TESTING LABORATORIES, INC.

R.G. Cassidy
R.G. Cassidy

NOTARY PUBLIC

UNLESS STIPULATED IN WRITING BY YOU, ALL SAMPLES WILL BE RETAINED FOR 30 DAYS AND THEN DISPOSED OF.

THIS REPORT IS RENDERED UPON THE CONDITION THAT IT IS NOT TO BE REPRODUCED WHOLLY OR IN PART FOR ADVERTISING AND/OR OTHER PURPOSES OVER OUR SIGNATURE OR IN CONNECTION WITH OUR NAME WITHOUT OUR SPECIAL PERMISSION IN WRITING.

NONDESTRUCTIVE TESTING: MARGRAPH • ZYGLO • MILLION VOLT & LOW VOLTAGE X RAY • ULTRASONIC FLAW DETECTION • AUDIGAGE
THICKNESS MEASUREMENT • BORESCOPE • GAMMA RAY • FILM INTERPRETATION & CONSULTATION
DESTRUCTIVE TESTING: FATIGUE TESTING • METALLURGICAL INVESTIGATIONS • WET CHEMICAL ANALYSIS • SALT SPRAY • ACID ETCH
SPECTROGRAPHIC ANALYSIS • PROCEDURE & WELDER QUALIFICATION • IMPACT • STRESS RUPTURE • ROCKWELL
SUPERFICIAL • BRINELL • MICROHARDNESS • MICROPHOTOGRAPHY



ELECTRO SWITCH CORP.
Weymouth, Massachusetts 02188.

ENGINEERING TEST REPORT

REPORT NO. 2392-10

PAGE 9 OF 9

DATE: MAY 27 1961

PREPARED BY

APPROVED BY

ENCLOSURE 3

SEISMIC REPORT

NOTE: ONLY A TYPICAL OBE AND SSE CURVE IS INCLUDED IN THIS REPORT FOR BREVITY. THE COMPLETE REPORT IS ON FILE AT THE ELECTRO SWITCH LABORATORY FOR VISUAL EXAMINATION IF REQUIRED.