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EFFECTS OF REPEATING RESISTANCE TESTING ON FIRING ABILITY OF IGNITER EP360-3

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GARY O'DAY

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OCTOBER 1993

INTERIM REPORT FOR MARCH 1993 to SEPTEMBER 1993

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This report summarizes work completed under U.S. Air Force Contract F3360193P7648 Item Number 02 completed 8 September 1993. The objective of this test was to determine if repeated resistance checks of an igniter will degrade the igniters ability to fire.

An Eagle-Picher Industries, Inc. EP 360-3 igniter (part number 31-32-026-0) was used for this test. A control group was tested for firing sensitivity. A second group had 10,001 resistance checks taken at 1 milliamp. The second group was then tested for firing sensitivity. No significant difference was found between the two groups.

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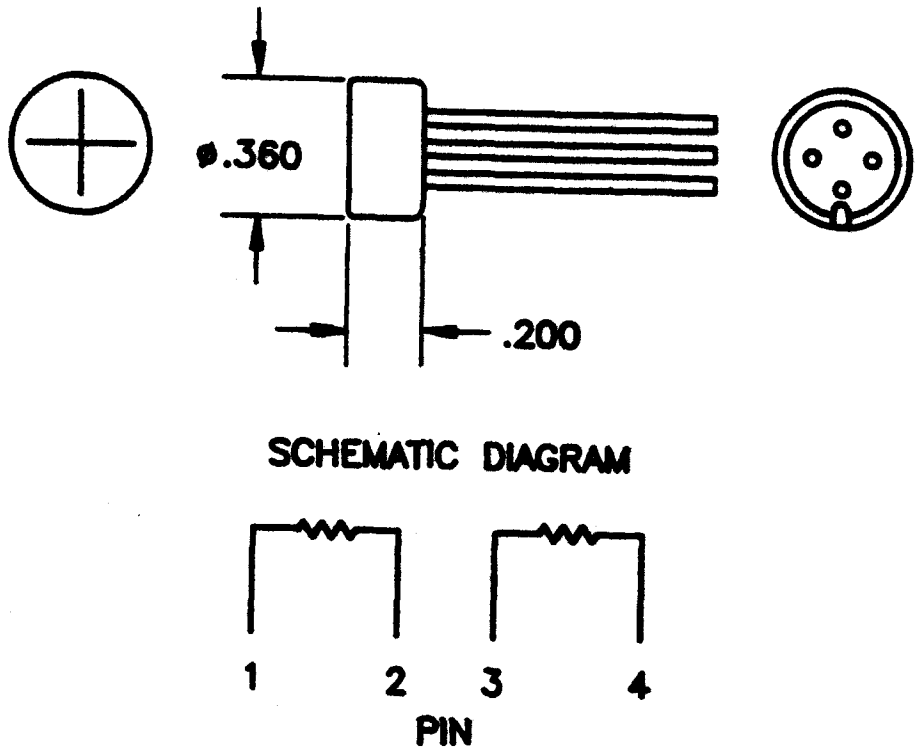
Section 1

INTRODUCTION

This report summarizes the work completed under U.S. Air Force contract F33601-93-P-7648, Data Item # 0002, issued 11 March 1993 and completed 8 September 1993.

The objective of the test was to determine if desensitization of an igniter occurs due to repeated resistance checks. An EP360-3 igniter (Eagle-Picher Industries, Inc., part number 31-32-026-0) was chosen for this test. This is a dual bridge igniter with only one bridge circuit used for testing.

The testing can be divided into three parts. First, 35 igniters were tested to determine the estimated test stimulus required to fire the igniter with a reliability of 99.99% and a confidence level of 95%. This first group was used as a control group. Second, 40 igniters taken from the same lot, had resistance readings taken every 2 minutes (1 milliampere of current for 20 milliseconds) for a total of 10,001 resistance checks. Third, the group of igniters that had been resistance checked were then tested in the exact same manner as the first group to determine the estimated test stimulus required to fire the igniters with a reliability of 99.99% and a confidence level of 95%. The two estimated test stimuli were then compared to determine if the igniters ability to fire had been impaired.



EP 360-3 IGNITER
(PART NUMBER 31-32-026-0)

Figure 1 EP360-3 Igniter With Schematic

Section 2

FIRING RELIABILITY TEST OF THE EP360-3 IGNITER

2.1 OVERVIEW

A group of 40 EP360-3 igniters (part No. 31-32-026-0) from lot SPA-072 were randomly selected to have a reliability test performed per NAVORD Report 2101, "Statistical Methods Appropriate for Evaluation of Fuze Explosive-Train Safety and Reliability," Bruceton Method, and Eagle-Picher OP-QC-035, Bruceton Test Method.

2.2 THE BRUCETON METHOD OF SENSITIVITY TESTING

The Bruceton Method of Sensitivity Testing provides results from which a statistical estimate of a high assurance of reliability can be established on the assumption that the percentage functioning is related to the test levels by means of a normal error function. In the first part of the test, five units are tested to determine an approximate 50% point of firing (denoted as letter "k"). In the second part of the test, the first unit of the second group is exposed to a pulse at this level and subsequent units are exposed to levels determined by the previous units ability to fire. An arbitrary level (denoted by letter "d") is set as the increment between test levels. If the first unit fires, the next unit is exposed to a pulse at a level of k-d. If the first unit does not fire, the next unit is exposed to a pulse at a level of k+d. Each succeeding unit will be tested at a level dependent on the firing behavior of the previous unit. (i.e., if the previous unit fired, the next unit will be tested at a level d less

than the previous level; and if the previous unit failed to fire, the next unit will be tested at a level d greater than the previous level.) Thus, the test results will be a sequence of fires (denoted by X) and failures (denoted by O) centered about the 50% firing level.

2.3 TESTING OF THE EP360-3 IGNITER BY THE BRUCETON METHOD

Using five units and knowledge gained by previous experience with these igniters the 50% firing level (k) was determined to be 1.65 Amperes. All test pulses will be of a 20 millisecond duration. The EP360-3 igniter is designed to fire at a 3.5 Ampere pulse of a 20 millisecond duration. The distance between test levels (d) was set at 0.05 Amperes.

The first test unit was exposed to a 1.65 Ampere pulse and is fired. This is shown as an "X" in the first column (see Figure 2). Therefore the next unit was tested at the k-d level (1.65-0.05=1.60 Amperes). That unit did not fire which is shown as an "O" in the second column. The testing was completed in this fashion with a total of 35 units being tested. The table at the bottom of Figure 2 was then completed and entered into a computer program which calculated the estimated test stimulus, estimated error, etc. These calculated values can be seen in Figure 3. The formulas used in these calculations can be found in OP-QC-035 which is included in this report in Appendix B.

The estimated test stimulus required to fire the igniter with a reliability of 99.99 and a confidence level of 95% was found to be 2.1301 Amperes with an estimated error of 0.0870, which gives a range of 2.0431 to 2.2171 Amperes with a 20 millisecond pulse duration.

Igniter Type EP360-3
Lot Number SPA-072
Pulse Duration 20 msec
Remarks FIRED WITH SINGLE BRIDGE CIRCUIT

Date 09/07/93
Operator Gary O'Day

Fire Current (Amps)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1.75					X		X														X		X		X		X								
1.70				O		O		X				X		X		X		X		O		O		O		O		X						X	
1.65	X		O						X		O		O		O		O		O										X				O		O
1.60		O								O																				X		O			
1.55																															O				

"X" Denotes Fire "O" Denotes Did Not Fire

Test Current	Fire	No Fire
1.75	4	0
1.70	7	2
1.65	5	5
1.60	1	5
1.55	0	1
Total	17	18

Estimated Test Stimulus = 2.13 amps

Figure 2. Bruceton Test Data for Control Group

Bruceton Test Calculations and Results

Type of test: ALL FIRE – SINGLE BRIDGE CIRCUIT
Description: EP 360-3
Pulse length: 0.02 seconds

Stimulus	I	F	NF	A	B
1.75	4	6	0	24	96
1.70	3	7	6	21	63
1.65	2	3	8	6	12
1.60	1	1	3	1	1
1.55	0	0	1	0	0
	SUM	17	18	52	172

Reliab.	[illegible]	IO	D	N	A	B
99.99	98.0	1.55	0.05	35	52	172

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Normal Dev
Im	M	S	Sm	Sz	Zr
1.6779	0.7612	0.0640	0.0160	0.0280	3.7200

[illegible]	[illegible]	[illegible]	[illegible]
Im+ZS	S(m+ZS)	t	tf
1.9161	0.0870	1.7480	2.1301

Figure 3. Control Group Calculations

Section 3

RESISTANCE CYCLE TESTING

3.1 OVERVIEW

A second group of 40 EP360-3 igniters were randomly selected from the same lot (SPA-072) and each had their resistance checked 10,001 times.

3.2 RESISTANCE CYCLE TESTING OF THE EP360-3 IGNITER

The 40 igniters were connected to a Hewlett-Packard 3497A data acquisition system and HP86B computer which sent 1 milliampere of current to each igniter every 2 minutes, continuously, until 10,001 resistance checks had been made. All testing was performed under ambient conditions. These readings were recorded every 100 checks and the resistance readings are included as Appendix A. A graph of the resistance readings for igniter number 1 can be seen in Figure 4.

3.3 RESULTS

Comparing the resistance values at the beginning and the end of the cycle test shows that all of the igniters had lower resistances at the end of the test but none were significantly lower. The maximum drop was 0.03 ohms. This data can be seen in Table I.

Table 1. Resistance Readings at Start and Finish of Cycle Testing

RESISTANCE CYCLE TESTING OF EP360-3 IGNITER			
No.	Resistance at Start	Resistance at End	Net Change
1	1.06	1.03	-0.03
2	1.05	1.02	-0.03
3	1.04	1.01	-0.03
4	1.05	1.03	-0.02
5	1.07	1.04	-0.03
6	1.09	1.06	-0.03
7	1.07	1.04	-0.03
8	1.03	1.02	-0.01
9	1.05	1.04	-0.01
10	1.05	1.03	-0.02
11	1.09	1.06	-0.03
12	1.08	1.04	-0.04
13	1.04	1.01	-0.03
14	1.07	1.04	-0.03
15	1.05	1.03	-0.02
16	1.05	1.03	-0.02
17	1.06	1.04	-0.02
18	1.06	1.04	-0.02
19	1.06	1.03	-0.03
20	1.04	1.02	-0.02
21	1.06	1.04	-0.02
22	1.05	1.03	-0.02
23	1.06	1.05	-0.01
24	1.07	1.05	-0.02
25	1.07	1.06	-0.01
26	1.08	1.07	-0.01
27	1.08	1.06	-0.02
28	1.08	1.06	-0.02
29	1.07	1.05	-0.02

RESISTANCE CYCLE TESTING OF EP360-3 IGNITER			
No.	Resistance at Start	Resistance at End	Net Change
30	1.02	1.00	-0.02
31	1.07	1.04	-0.03
32	1.09	1.06	-0.03
33	1.06	1.03	-0.03
34	1.04	1.01	-0.03
35	1.07	1.05	-0.02
36	1.01	0.98	-0.03
37	1.06	1.03	-0.03
38	1.06	1.04	-0.02
39	1.08	1.06	-0.02
40	1.03	1.01	-0.02

Table 1 continued.

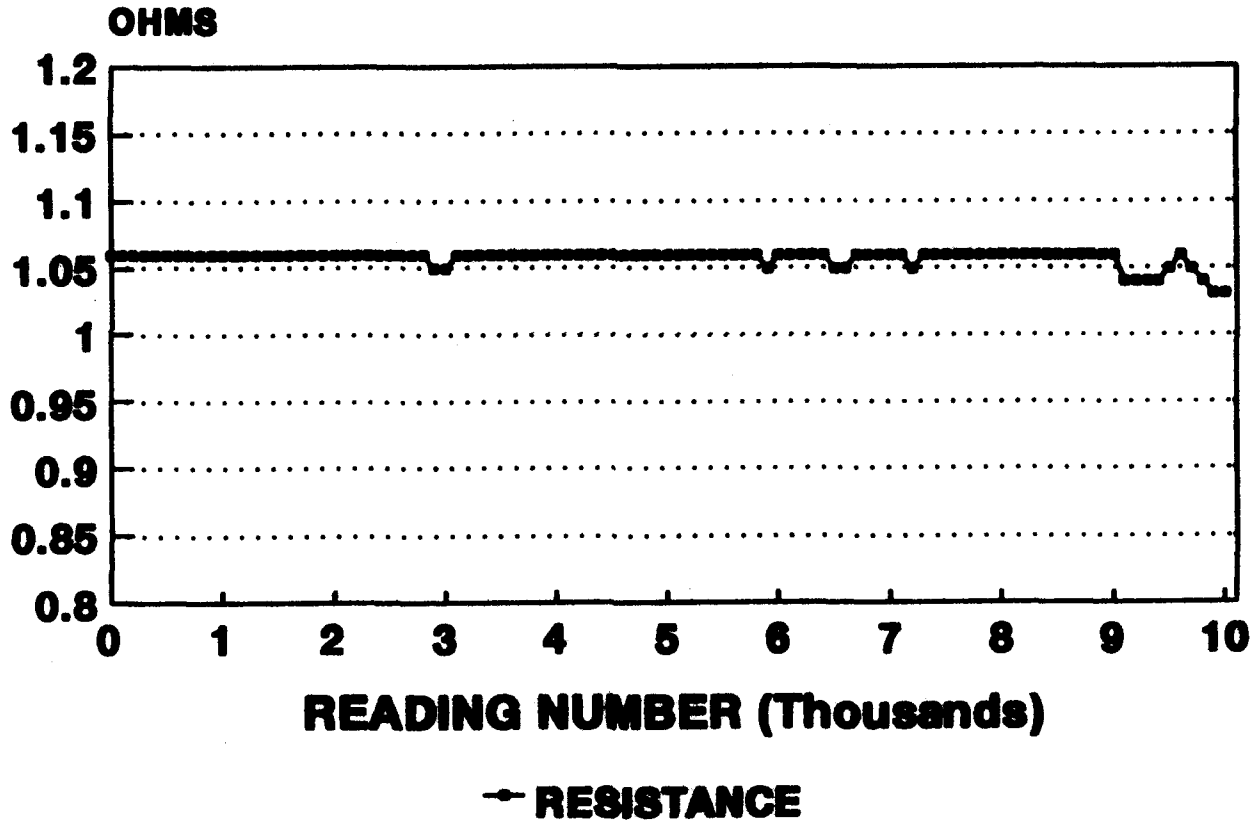


Figure 4. Resistance Readings of Igniter Number 1

Section 4

FIRING RELIABILITY TEST OF RESISTANCE CYCLED EP360-3 IGNITERS

4.1 OVERVIEW

The igniters that had been resistance cycle tested (Section 3) were then tested by the Bruceton Method of Sensitivity Testing in the exact same manner that the control group had been tested (Section 2).

4.2 TESTING OF THE EP360-3 IGNITER BY THE BRUCETON METHOD OF SENSITIVITY TESTING

Using the same procedure that was used with the control group sensitivity testing of paragraph 2.2, the resistance cycled igniters were tested. The test data are shown as Figure 5. The estimated test stimulus required to fire the igniter with a reliability of 99.99 and confidence level of 95% was found to be 1.8625 Amperes with an estimated error of 0.0324 which gives a range of 1.8301 to 1.8949 Amperes. The calculations and results can be seen in Figure 6.

Igniter Type EP360-3 Date 09/07/93
Lot Number SPA-072 Operator Gary O'Day
Pulse Duration 20 msec
Remarks FIRED WITH SINGLE BRIDGE CIRCUIT AFTER 10,001 RESISTANCE CHECKS

"X" Denotes Fire "O" Denotes Did Not Fire

Fire Current (Amps)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1.75												X												X											
1.70	X		X		X						O		X				X		X		X		O		X		X		X				X		X
1.65		O		O		X		X		O				X		O		O		O		O				O		O		X		O		O	
1.60							O		O						O																O				
1.55																																			

Test Current	Fire	No Fire
1.75	2	0
1.70	12	2
1.65	4	11
1.60	0	4
1.55	0	0
Total	18	17

Estimated Test Stimulus = 1.86 amps

Figure 5. Bruceton Test Data for Test Group

Bruceton Test Calculations and Results

After 10,001 Resistance Check of 1 mAmp

Type of test: ALL FIRE – SINGLE BRIDGE CIRCUIT
Description: EP 360-3
Pulse length: 0.02 seconds

Stimulus	I	F	NF	A	B
1.75	4	2	0	6	18
1.70	3	12	2	24	48
1.65	2	4	11	4	4
1.60	1	0	4	0	0
1.55	0	0	0	0	0
	SUM	18	17	34	70

Reliab.	Conf. Lev.	ID	D	N	A	B
99.99	95.0	1.60	0.05	35	34	70

Mean	Sigma	Sm	Sa	Sb	Normal Dev
Im	M	S	Sm	Sa	Zr
1.6694	0.0210	0.0089	0.0074	0.0095	3.7260

Sm+Zs	Sa	Conf. Reqd.	Sa Zr
Im+Zs	S(Im+Zs)	t	F
1.7749	0.0094	1.7400	1.8495

Figure 6. Bruceton test Calculations and Results

Section 5

CONCLUSIONS

5.1 EFFECT OF RESISTANCE CYCLE TESTING ON IGNITER RESISTANCE

After 10,001 resistance checks at 1 milliampere every 2 minutes, the resistance of the EP360-3 igniter changed a maximum of 3% (see Table I). This change is well within the normal 10% tolerance of the igniters resistance. Therefore, resistance testing at 1 milliampere has no significant effect on the igniters resistance.

5.2 COMPARISON OF SENSITIVITY TESTS

The Bruceton test on the control group yielded an estimated test stimulus of 2.1301 amperes with a 20 millisecond pulse. The Bruceton test of the test group of resistance cycled igniters yielded and estimated test stimulus of 1.8625 amperes at a 20 millisecond pulse. This is a difference of 13% with the control group firing at a higher current level than the test group (see Table II). If the resistance testing had desensitized the igniters one would expect to see the test group firing at a higher level than the control group. In this test we have seen just the opposite. This may be due to the inaccuracies of the statistical method which forms the basis for this test. Due to the estimated test stimulus of the test group not being significantly higher than that of the control group, we have determined that continual testing of resistance at 1 milliampere of current for 10,001 checks has no significant effect on the igniters ability to fire.

Table 2 Test Data Comparison

TEST DATA SUMMARY

TEST GROUP	ESTIMATES TEST STIMULUS	% DIFF	ESTIMATED ERROR	RANGE
CONTROL	2.1301		0.0870	2.0431-2.2171
EXPERIMENTAL	1.8625		0.0324	1.8301-1.8949

Section 6

RECOMMENDATIONS FOR FURTHER TESTING

In an ideal case the estimated test stimulus, plus or minus the estimated error range, for each test should overlap if the resistance testing had absolutely no effect on the igniters ability to fire. The fact that it did not for this set of tests may be due to statistical inaccuracies. It is desirable to perform one or two more Bruceton tests on control groups to see if each estimated test stimulus found would fall into the range set by the first control group in this test.

All of these tests were performed under ambient conditions. Additional testing may include: resistance cycle testing at high and low temperature extremes, resistance cycle testing in conjunction with temperature cycle testing, Bruceton testing at high and low temperature extremes or any combination of the above.

Additional testing is recommended to determine what will cause a degradation in the igniters ability to fire. Possible tests include: a longer cycle of resistance testing or a higher level of current during resistance cycle testing.

REFERENCES

[1] NAVORD REPORT 2101, "Statistical Methods Appropriate for Evaluation of Fuze Explosive-Train Safety and Reliability," U.S.Naval Ordnance Laboratory, White Oak, Maryland, 13 October 1953.

APPENDIX A

Resistance Readings

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 1 of test

TIME 8 : 0 Total Resistance Checks Complete : 1

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.08	1.04	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

TIME 11 : 20 Total Resistance Checks Complete : 101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.05	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.09	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.09	1.08	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

TIME 14 : 40 Total Resistance Checks Complete : 201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.08	1.09	1.07	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

TIME 18 : 0 Total Resistance Checks Complete : 301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.08	1.09	1.07	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.07	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.08	1.07	1.09	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.08	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 1 of test

TIME 21 : 20 Total Resistance Checks Complete : 401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.08	1.09	1.07	1.04	1.05	1.08
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

Day 2 of test

TIME 0 : 40 Total Resistance Checks Complete : 501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.08	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

TIME 4 : 0 Total Resistance Checks Complete : 601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.08	1.08	1.08	1.03	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.05	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 7 : 20 Total Resistance Checks Complete : 701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.03	1.07	1.01	1.06	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 2 of test

TIME 10 : 40 Total Resistance Checks Complete : 801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.08	1.09	1.08	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.05	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 14 : 0 Total Resistance Checks Complete : 901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.08	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.08	1.01	1.05	1.06	1.08	1.03

TIME 17 : 20 Total Resistance Checks Complete : 1001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.07	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.09	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.08	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

TIME 20 : 40 Total Resistance Checks Complete : 1101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.08	1.09	1.07	1.04	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 3 of test

TIME 0 : 0 Total Resistance Checks Complete : 1201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

TIME 3 : 20 Total Resistance Checks Complete : 1301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 6 : 40 Total Resistance Checks Complete : 1401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.04	1.07	1.00	1.06	1.06	1.08	1.03

TIME 10 : 0 Total Resistance Checks Complete : 1501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.08	1.05	1.05	1.05	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.05	1.04	1.07	1.01	1.05	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 3 of test

TIME 13 : 20 Total Resistance Checks Complete : 1601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

TIME 16 : 40 Total Resistance Checks Complete : 1701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.08	1.04	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.07	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.09	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.08	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

TIME 20 : 0 Total Resistance Checks Complete : 1801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.05	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.07	1.06	1.07	1.07	1.07	1.09	1.08	1.08	1.08	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.08	1.09	1.06	1.04	1.08	1.01	1.06	1.06	1.08	1.03

TIME 23 : 20 Total Resistance Checks Complete : 1901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 4 of test

TIME 2 : 40 Total Resistance Checks Complete : 2001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 6 : 0 Total Resistance Checks Complete : 2101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

TIME 9 : 20 Total Resistance Checks Complete : 2201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

TIME 12 : 40 Total Resistance Checks Complete : 2301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 4 of test

TIME 16 : 0 Total Resistance Checks Complete : 2401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.08	1.07	1.08	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

TIME 19 : 20 Total Resistance Checks Complete : 2501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.04	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.08	1.07	1.08	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.08	1.01	1.05	1.06	1.08	1.03

TIME 22 : 40 Total Resistance Checks Complete : 2601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.08	1.08	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

Day 5 of test

TIME 2 : 0 Total Resistance Checks Complete : 2701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 5 of test

TIME 18 : 40 Total Resistance Checks Complete : 3201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

TIME 22 : 0 Total Resistance Checks Complete : 3301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

Day 6 of test

TIME 1 : 20 Total Resistance Checks Complete : 3401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.08	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

TIME 4 : 40 Total Resistance Checks Complete : 3501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.05	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.02

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 5 of test

TIME 5 : 20 Total Resistance Checks Complete : 2801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.08	1.04	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

TIME 8 : 40 Total Resistance Checks Complete : 2901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.06	1.03	1.05	1.07	1.08	1.07	1.03	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.07	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.02

TIME 12 : 0 Total Resistance Checks Complete : 3001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.05	1.03	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.07	1.06	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 15 : 20 Total Resistance Checks Complete : 3101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 6 of test

TIME 8 : 0 Total Resistance Checks Complete : 3601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.08	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.04	1.08	1.06	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 11 : 20 Total Resistance Checks Complete : 3701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.08	1.04	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 14 : 40 Total Resistance Checks Complete : 3801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.08	1.04	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 18 : 0 Total Resistance Checks Complete : 3901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 6 of test

TIME 21 : 20 Total Resistance Checks Complete : 4001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

Day 7 of test

TIME 0 : 40 Total Resistance Checks Complete : 4101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 4 : 0 Total Resistance Checks Complete : 4201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 7 : 20 Total Resistance Checks Complete : 4301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.08	1.03	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 7 of test

TIME 10 : 40 Total Resistance Checks Complete : 4401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.05	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.09	1.08	1.09	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 14 : 0 Total Resistance Checks Complete : 4501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 17 : 20 Total Resistance Checks Complete : 4601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.08	1.09	1.08	1.04	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 20 : 40 Total Resistance Checks Complete : 4701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.05	1.06	1.07	1.09	1.08	1.04	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 380-3 IGNITER

Day 8 of test

TIME 0 : 0 Total Resistance Checks Complete : 4801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 3 : 20 Total Resistance Checks Complete : 4901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.05	1.06	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.09	1.08	1.06	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

TIME 6 : 40 Total Resistance Checks Complete : 5001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 10 : 0 Total Resistance Checks Complete : 5101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.07	1.03	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.05	1.05	1.05	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 8 of test

TIME 13 : 20 Total Resistance Checks Complete : 5201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.08	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.08	1.07	1.09	1.09	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 16 : 40 Total Resistance Checks Complete : 5301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.05	1.06	1.07	1.09	1.08	1.03	1.05	1.06
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.06	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.05	1.06	1.08	1.03

TIME 20 : 0 Total Resistance Checks Complete : 5401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.05	1.06	1.07	1.09	1.08	1.04	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.07	1.05	1.05	1.06	1.07	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.07	1.05	1.07	1.08	1.07	1.09	1.09	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.01	1.06	1.06	1.08	1.03

TIME 23 : 20 Total Resistance Checks Complete : 5501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.02

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 9 of test

TIME 2 : 40 Total Resistance Checks Complete : 5601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.02

TIME 6 : 0 Total Resistance Checks Complete : 5701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.06	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.04	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.07	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.02

TIME 9 : 20 Total Resistance Checks Complete : 5801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.06	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.07	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.02

TIME 12 : 40 Total Resistance Checks Complete : 5901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.02

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 9 of test

TIME 16 : 0 Total Resistance Checks Complete : 6001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.00	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 19 : 20 Total Resistance Checks Complete : 6101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.07	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.02

TIME 22 : 40 Total Resistance Checks Complete : 6201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.07	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

Day 10 of test

TIME 2 : 0 Total Resistance Checks Complete : 6301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.02

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 10 of test

TIME 5 : 20 Total Resistance Checks Complete : 6401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.06	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.04	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.07	1.06	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.02

TIME 8 : 40 Total Resistance Checks Complete : 6501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.05	1.04	1.05	1.06	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.04	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 12 : 0 Total Resistance Checks Complete : 6601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.05	1.03	1.05	1.06	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.04	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.07	1.06	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.02

TIME 15 : 20 Total Resistance Checks Complete : 6701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.06	1.04	1.04	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 10 of test

TIME 18 : 40 Total Resistance Checks Complete : 6901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.07	1.04	1.05	1.06	1.06	1.06	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.06	1.08	1.03

TIME 22 : 0 Total Resistance Checks Complete : 6901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.07	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

Day 11 of test

TIME 1 : 20 Total Resistance Checks Complete : 7001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 4 : 40 Total Resistance Checks Complete : 7101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.08	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.05	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 11 of test

TIME 8 : 0 Total Resistance Checks Complete : 7201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.05	1.04	1.05	1.07	1.09	1.08	1.03	1.03	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.08	1.05	1.05	1.06	1.06	1.05	1.05
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.08	1.08	1.09	1.08	1.08	1.06	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.08	1.08	1.05	1.04	1.07	.98	1.05	1.05	1.08	1.03

TIME 11 : 20 Total Resistance Checks Complete : 7301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.05
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 14 : 40 Total Resistance Checks Complete : 7401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.06	1.04	1.06	1.08	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.06	1.05
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 18 : 0 Total Resistance Checks Complete : 7501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.04	1.08	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.05	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 11 of test

TIME 21 : 20 Total Resistance Checks Complete : 7601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.04	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

Day 12 of test

TIME 0 : 40 Total Resistance Checks Complete : 7701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.04	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.04	1.07	1.00	1.05	1.05	1.08	1.03

TIME 4 : 0 Total Resistance Checks Complete : 7801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.05	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 7 : 20 Total Resistance Checks Complete : 7901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.07	1.07	1.07	1.09	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 12 of test

TIME 10 : 40 Total Resistance Checks Complete : 8001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.08	1.04	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.06	1.07	1.07	1.08	1.08	1.08	1.08	1.03
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.05	1.08	1.03

TIME 14 : 0 Total Resistance Checks Complete : 8101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 17 : 20 Total Resistance Checks Complete : 8201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.05	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 20 : 40 Total Resistance Checks Complete : 8301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.08	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.05
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

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Day 13 of test

TIME 0 : 0 Total Resistance Checks Complete : 8401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.08	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.05
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 3 : 20 Total Resistance Checks Complete : 8501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 6 : 40 Total Resistance Checks Complete : 8601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.05	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.05	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 10 : 0 Total Resistance Checks Complete : 8701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

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Day 13 of test

TIME 13 : 20 Total Resistance Checks Complete : 8801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.05	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.06	1.07	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.09	1.06	1.04	1.07	1.00	1.05	1.06	1.08	1.03

TIME 16 : 40 Total Resistance Checks Complete : 8901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.08	1.05	1.05	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.03

TIME 20 : 0 Total Resistance Checks Complete : 9001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.05	1.07	1.09	1.06	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.04	1.06	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.06	1.08	1.06	1.03	1.07	1.00	1.05	1.05	1.08	1.02

TIME 23 : 20 Total Resistance Checks Complete : 9101

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.04	1.04	1.03	1.04	1.05	1.07	1.05	1.03	1.04	1.04
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.07	1.05	1.03	1.06	1.04	1.04	1.05	1.05	1.04	1.03
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.05	1.04	1.05	1.06	1.06	1.08	1.07	1.07	1.07	1.01
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.05	1.07	1.05	1.02	1.06	.99	1.04	1.04	1.07	1.02

Day 14 of test

TIME 2 : 40 Total Resistance Checks Complete : 9201

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.04	1.03	1.02	1.03	1.05	1.07	1.05	1.02	1.04	1.04
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.06	1.05	1.02	1.05	1.03	1.03	1.04	1.04	1.04	1.02
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.04	1.04	1.05	1.06	1.06	1.07	1.07	1.06	1.06	1.01
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.05	1.07	1.04	1.02	1.05	.99	1.03	1.04	1.07	1.02

TIME 6 : 0 Total Resistance Checks Complete : 9301

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.04	1.03	1.02	1.03	1.05	1.06	1.05	1.02	1.04	1.04
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.06	1.05	1.02	1.05	1.03	1.03	1.04	1.04	1.04	1.02
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.04	1.04	1.05	1.06	1.06	1.07	1.07	1.06	1.06	1.01
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.05	1.07	1.04	1.02	1.05	.99	1.03	1.04	1.07	1.02

TIME 9 : 20 Total Resistance Checks Complete : 9401

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.04	1.04	1.03	1.04	1.06	1.07	1.06	1.03	1.04	1.04
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.07	1.06	1.03	1.06	1.04	1.04	1.05	1.05	1.04	1.03
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.05	1.05	1.05	1.06	1.06	1.07	1.07	1.07	1.06	1.01
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.06	1.07	1.04	1.02	1.06	.99	1.04	1.05	1.07	1.02

TIME 12 : 40 Total Resistance Checks Complete : 9501

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.04	1.04	1.05	1.07	1.08	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.06	1.04	1.07	1.04	1.04	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.07	1.08	1.06	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.06	1.08	1.05	1.03	1.06	1.00	1.04	1.05	1.08	1.02

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 14 of test

TIME 16 : 0 Total Resistance Checks Complete : 9601

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.06	1.05	1.04	1.06	1.07	1.09	1.07	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.09	1.07	1.04	1.07	1.05	1.05	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.08	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.07	1.08	1.06	1.04	1.07	1.00	1.05	1.05	1.08	1.03

TIME 19 : 20 Total Resistance Checks Complete : 9701

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.05	1.05	1.04	1.05	1.07	1.08	1.06	1.03	1.05	1.05
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.08	1.07	1.04	1.07	1.04	1.04	1.05	1.06	1.05	1.04
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.06	1.05	1.06	1.07	1.07	1.08	1.07	1.08	1.07	1.02
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.06	1.08	1.05	1.03	1.07	1.00	1.04	1.05	1.08	1.02

TIME 22 : 40 Total Resistance Checks Complete : 9801

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.04	1.04	1.02	1.04	1.05	1.07	1.05	1.02	1.04	1.04
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.07	1.05	1.02	1.06	1.04	1.03	1.04	1.05	1.04	1.03
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.05	1.04	1.05	1.06	1.06	1.07	1.07	1.07	1.06	1.01
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.05	1.07	1.04	1.02	1.06	.99	1.04	1.04	1.07	1.02

Day 15 of test

TIME 2 : 0 Total Resistance Checks Complete : 9901

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.03	1.03	1.02	1.03	1.04	1.06	1.04	1.02	1.04	1.03
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.06	1.04	1.02	1.05	1.03	1.03	1.04	1.04	1.03	1.02
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.04	1.04	1.05	1.06	1.06	1.07	1.07	1.06	1.06	1.00
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.05	1.06	1.04	1.02	1.05	.99	1.03	1.04	1.06	1.01

RESISTANCE CYCLE TESTING OF EP 360-3 IGNITER

Day 15 of test

TIME 5 : 20 Total Resistance Checks Complete : 10001

ITEM	1	2	3	4	5	6	7	8	9	10
Resist.	1.03	1.02	1.01	1.03	1.04	1.06	1.04	1.02	1.04	1.03
ITEM	11	12	13	14	15	16	17	18	19	20
Resist.	1.06	1.04	1.01	1.04	1.03	1.03	1.04	1.04	1.03	1.02
ITEM	21	22	23	24	25	26	27	28	29	30
Resist.	1.04	1.03	1.05	1.05	1.06	1.07	1.06	1.06	1.05	1.00
ITEM	31	32	33	34	35	36	37	38	39	40
Resist.	1.04	1.06	1.03	1.01	1.05	.98	1.03	1.04	1.06	1.01

APPENDIX B

OP-QC-035

DEFINITION OF SYMBOLS

The definitions herein pertain to those symbols utilized on Eagle-Picher form OP-QC-035 "Bruceton Test Calculations and Results."

R = Reliability of parts. Normally expressed as a decimal quantity between 0 and 1.

C = Confidence level (in %) specified in analysis.

d = Test level stimulus difference between test levels.

n = Sample Size.

I_o = The lowest level of test stimulus used in the test.

F = The number of parts responding at each test level.

NF = The number of parts not responding at each test level.

A = Computational factor.

B = Computational factor.

M = Computational factor.

I_m = mean test stimulus derived from the analysis.

S = Estimate of the standard deviation of the data about I_m.

S_{Im} = Estimate of the error in the determination of I_m.

S_s = Estimate of the error in the determination of S.

Z_R = Normal deviate corresponding to R.

$S(I_m \pm Z_R S)$ = Estimate of the error in the determination of $(I_m \pm Z_R S)$.

$I_m + Z_R S$ = Estimate of ALL FIRE test stimulus assuming no sample error.

$I_m - Z_R S$ = Estimate of NO FIRE test stimulus assuming no sampling error.

I_F = The ALL FIRE test stimulus for specified confidence and reliability levels.

I_{NF} = The NO FIRE test stimulus for specified confidence and reliability levels.

THE BRUCETON TEST METHOD - References

1. The NAVORD 3369 - NOTS 948, Reprinted as "Statistical Manual," Dover, 1960, par. 4.5.

2. NAVORD 2101, "Statistical Methods Appropriate for Evaluation of Fuze Explosive Train Safety and Reliability," 13 October 1053.

3. AMP Report No. 101.1R, SRGP No. 40, "Statistical Analysis for a New Procedure in Sensitivity Experiments," July, 1944.

BRUCETON TEST CALCULATIONS & RESULTS

REPORT NUMBER		REMARKS
NUMBER	TYPE OF TEST	
DESCRIPTION	PULSE LENGTH	
NUMBER	CALCULATED BY	CHECKED BY

		F	NF	A	B
I	i	(n)	(n)	in	i^2n
	8				
	7				
	6				
	5				
	4				
	3				
	2				
	1				
	0				
	Sums				

R = _____ C = _____

d = _____ I_o = _____

n = _____ B = _____

A = _____ I_m = _____

**M = _____

S = _____

S_{DM} = _____

S_s = _____

Z_r = _____

$S(I_m \pm Z_r S)$ = _____

$I_m + Z_R S$ = _____

$I_m - Z_R S$ = _____

t = _____

I_F = _____

I_{NF} = _____

$I_m = I_o + (d)[(A/n) \pm 0.500]$ *

$M = (nB - A^2)/(n^2)$

$S = 1.62d(M + 0.0290)$

$S_{DM} = (6S + d)(7n^{1/2})$

$S_s = (S)(1.1d + 0.3S)/Dn1^{/2})$

$S(I_m + Z_R S) = (S_{DM}^2 + Z_R^2 S_s^2)^{1/2}$

$I_F = (I_m + Z_R S) + (t)(S(I_m + Z_R S))$

$I_{NF} = (I_m - Z_R S) - (t)(S(I_m - Z_R S))$

* Use + if NF used; - if F used. N in formulas is either NF or F.
Formulas taken from NAVORD 3369 and NAVORD 2101.
** If M < 0.3 use larger value of n.

REPORT NUMBER **BRUCETON TEST RECORD**

Fire Current	* Denotes Fire																																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

Table 1
Values of Confidence Parameter t

C	75%	80%	90%	95%	97.5%	99%	99.5%
2	1.000	1.376	3.08	6.31	12.71	31.82	63.66
3	0.816	1.061	1.89	2.92	4.30	6.97	9.93
4	0.765	0.978	1.64	2.35	3.18	4.54	5.84
5	0.741	0.941	1.53	2.13	2.78	3.75	4.60
6	0.727	0.920	1.48	2.02	2.57	3.37	4.03
7	0.718	0.906	1.44	1.94	2.45	3.14	3.71
8	0.711	0.896	1.42	1.90	2.37	3.00	3.50
10	0.703	0.883	1.38	1.83	2.26	2.82	3.25
12	0.697	0.876	1.36	1.80	2.20	2.72	3.11
14	0.694	0.876	1.35	1.77	2.16	2.65	3.01
16	0.691	0.865	1.34	1.75	2.13	2.60	2.95
18	0.689	0.863	1.33	1.74	2.11	2.57	2.90
20	0.688	0.861	1.33	1.73	2.09	2.54	2.86
22	0.686	0.859	1.32	1.72	2.08	2.52	2.83
24	0.685	0.858	1.32	1.71	2.07	2.50	2.81
26	0.684	0.856	1.32	1.71	2.06	2.49	2.79
28	0.684	0.855	1.31	1.70	2.05	2.47	2.77
30	0.683	0.854	1.31	1.70	2.05	2.46	2.76
40	0.681	0.851	1.30	1.68	2.02	2.42	2.70
60	0.679	0.848	1.30	1.67	2.00	2.39	2.66
120	0.677	0.845	1.29	1.66	1.98	2.36	2.62
1000	0.674	0.842	1.28	1.65	1.96	2.33	2.58

Table 2
Values of Z_R

R(%)	Z_R
80.0	0.84
85.0	1.04
90.0	1.28
95.0	1.65
97.5	1.96
99.0	2.33
99.5	2.58
99.9	3.09
99.95	3.29
99.99	3.72

Table 3
Values of 1/h

n	1/h	n	1/h
1	1.000	23	0.209
2	0.707	24	0.204
3	0.577	25	0.200
4	0.500	26	0.196
5	0.447	27	0.192
6	0.408	28	0.189
7	0.378	29	0.186
8	0.354	30	0.183
9	0.333	31	0.180
10	0.302	32	0.177
11	0.301	33	0.174
12	0.289	34	0.171
13	0.277	35	0.169
14	0.267	36	0.167
15	0.258	37	0.164
16	0.250	38	0.162
17	0.243	39	0.160
18	0.236	40	0.158
19	0.229	41	0.156
20	0.224	42	0.154
21	0.218	43	0.152
22	0.213	44	0.151