

## **BOOK77R**

*Notes:*

"Aberdeen Pulse Reactor (APR) 1967 Book No. 2" on spine

Blank pages: page opposite page 1, 1-3, 20, 36, 52-152, inside back cover sheets

- page 4 has 1 paper taped to it
- pages 4/5 has sheet between pages
- page 20 has 1 (8.5x11) sheet taped
- page 25 has 1 photo taped
- page 27 has 2 photos taped
- page 28 has 2 photos taped
- pages 30/31 has 1 (8.5x11) sheet between pages
- page 32 has 1 photo taped
- pages 52/53 has 1 (8.5x11) sheet between pages

*Scanned by:*

*Sheila Finch*

*RSICC /Oak Ridge National Lab.*

*August 26, 1999*

A 31622-80



# Account Book

No. S 149

NO UNITS

Journal . . . . .

Ledger, Single Entry . .

Ledger, Double Entry .

Record Ruled (27 Lines)

Made in 150, and 300 Pages

MADE IN U. S. A.

TO REORDER, SPECIFY NUMBER,  
RULING AND THICKNESS INDICATED  
ON BACKBONE OF THIS BOOK.

Pulse Red

3-21-69

Dates from waybills

7881- -0053 Received 7-18-66

#1 (93.2%)

1,551 gms

To 7-12

10-24-66 =

7882-01-0001 Received 12-18-66

#3 (97.8%)

1,652 gms

To 7-12

1-24-67

#4

1337 gms

Received

2-2-67

Pulse #1 made 2-20-67

7881- -0053

#2

1219 gms

Received

3-22-67 -

#2 and #4 Stored (7-12) 6-13-67

(23

09

0

BR

#3 - Rec'd 12-8-66 Long  
1,652 gms Returned 1-24-67 " ✓

#4 Rec'd 2-~~9~~<sup>2</sup>-67 Short #3  
1337 gms stored 6-13-67

1551 gms #1 - Rec'd 7-~~20~~<sup>18</sup>-66  
84 → 79 To Y-12 10-24-66

#2 Rec'd 3-22-67 Short #1  
1219 gms stored - 6-13-67

53

STROKE = 10.125" as per M. Lundin

26 MAY 67

TORQUING: for 30 ft # : #13 = 6° ; 44 = 1°  
58 = 1° ; 23 = 1° , all others needed none.

Bolt measurements:

#44	+60.9
#15	+47.0
#14	+40.3
#13	5.820

DATE 26 May 67		SAFETY CHECK					
TIME	8:30	AM	BY Lynn Taylor, Dickerson				
CHANNEL	A	B	C	D	E	F	
RANGE	1000	0px		1000	900	750	
SOURCE DIST.	✓	-	0	✓	-	-	
% F. S. TRIP	✓	-	+	✓	✓	-	
BLDG. ALARM	-	-	-	-	-	-	
AUX GTRS.	✓	✓	✓	-	-	-	
SOURCES USED	X-226 + Y			MAGNETS		✓	
TABLES	✓	LIGHTS	✓	AREA CLEARED		✓	

Rhotte  
OK

0900 core = 1 R @ 1 ft.

(234) Sulfur #1 = 264 #2 = 265 #3 = 266

Center plate crack (NW) some larger.

09:42 SB in (11.498) (Changes due to break circuit  
BR in ; RR out being added)

MA = 4.198 ~

09:52 withdrew BR -101.9¢

6

P-46

SB in (11.498)

MA in (8.466)

BR out

RR = 3.133  $\infty$

RR = 4.300 (+14.994)

RR = 4.24  $\longrightarrow$

Plate = +13.32  $\phi$

Log N = 14.16

BF<sub>3</sub> 1 = 14.35

2 = 14.18

3 = 14.24

FC 1 = 14.18

2 = 14.01

avg + 14.19

11:05

SB out

11:32

SB started in

11:36

Fired BR in

(P-1)

14

Temp		Wait	After	$\Delta T C$
0-1200	C	17	465	448
	Hg	25.2	128.5	
0-2000	F	71	840	427.2
	HP	(82) 38 (76)	400 (800)	402.2
	Sc 1	61	352	162
	2	48	770	401.1
	3	72	300	127

Sun

MA travel rate: ref to pg 7 Book 1

8.337" MA - 8.463 to 0.126 in 3.32 min 2.51"/min

8.846" RR - 9.080 to 0.134 in 2.26 min 3.96"/min

Bolt meas: after P46 = #13 only checked  
dial = - .382 dial

Bolts torque: 2 bolts only checked.  
#13 needed 14°  
#44 needed none.

(P-47)

14:25

BR out

SB in (11.499)

MA in (8.463)

RR = 3,398 ∞

RR = 4,300 + 11.80 φ on 3-BF<sub>3</sub>

SB withdrawn

14:48 Room Observation - no additional cracks.  
m. hardin -

15:00 SB started in

RR = 4,600

Sulfur #267, 268, 269

$P = ?$   
 $\log N = \text{---}$   
BF<sub>3</sub> 1 = 15.7 φ  
2 = 15.56 φ  
3 = 15.56  
FC 1 = 15.5  
2 = 15.56

over

8

P-47

SB in

BR out

MA in

RR = 4.564

15:31 SB out (0.034)

15:59 SB started in

16:04 Fried BR in $\log N = 14.15$ BF<sub>3</sub> 1 = +10700  $\phi$ 2 = +15,17  $\phi$ 

3 = +15,00

FC 1 = +14,81

2 = +14,99

Avg = 15.02 $\phi$ 

Temp.		Wait	After	$\Delta TC$
0-1200	C	20	555	535
A 9	C	21	88	—
0-2000	F	75	970	497.2
HP	F (x2)	40 (80°)	471 (942)	478.8
SC 1	F	77	415	188
2	F	45	350	170
3	F	73	066	—



WCT  
↓

30 May 67

Belt Measurements #44 = 92.0 (3) +61.5  
 #15 = 49.5 (2) +50.0  
 #14 = 46.2 (2) +41.5  
 #13 = 51.820 (3) -35.0

Torquing: #13 = 6°  
 #15 = 2°  
 others none.

Observations: Thermocouple "hold in" screw on NE was on floor.  
 The crack on NW appears to be slightly larger.

Subj on: @ Bldg: #270; 2:271; 3:272

DATE <u>30 MAY 67</u> SAFETY CHECK	
TIME <u>10<sup>15</sup></u>	BY <u>TAYLOR-HYUN-DICKENSON</u>
CHANNEL	A B C D E F
RANGE	<u>1000 RPR</u> <u>1000 RPR</u> <u>750V</u>
SOURCE-DIST.	<u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u>
% F. S. TRIP	<u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u>
BLDG. ALARM	<u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u>
AUX. CTRS.	<u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u> <u>✓</u>
SOURCES USED <u>M226</u> <u>FR</u>	MAGNETS <u>✓</u>
TABLES <u>✓</u>	LIGHTS <u>✓</u> AREA CLEARED <u>✓</u>

Rhodes OK

10

(235)

BR in . RR out

10:30

SB started in (11.498)

MA = 4.950 ~ 30 sec period

MA = 4.370 ∞

MA = 4.198 = - 5¢ see p. 5

11:06

Withdrew BR = 102.2¢

(P-48)

BR out

SB in

MA in (8.466)

RR = 3.766 ∞ (-1.15¢)

RR = 3.398 = ~~4.4¢~~ see p. 7

~~11:40~~

RR = ~~4.246~~ <sup>4.98</sup> P = 15.787¢

12:

RR = 4.952 P = 15.64¢

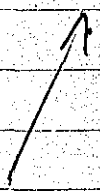
12:30

RR = 4.930 P = 18.136¢

12:45

RR = 4.940 P = 15.28¢

13:00

RR = 4.958 P = See top pg 11. 

1st try

2nd try

11

Lm: —  
 Rhett = +14.40¢      +14.55¢  
 BF 1: 15.47 }  
       2: 15.52 }  
       3: 15.43 }  
 FC 1: 15.64      15.52  
       2: 15.73      15.36  
 Avg +15.558 — DIFF — +15.396  
 Avg of 2 tries = 15.472¢

$t_c$		<u>WAIT</u>	<u>AFTER</u>	$\Delta T^\circ C$
0-1200	c	17	605	588
H 9	c	25.5	off chart	
0-2000	F	71	1110	577.2
(1/2) AP	F	39 (x2)	550 (1100)	567.7
SC1	F	70	520	
2	F	43	> 800	
3	F	70	355	

14:03 SB in

14:03 Fired BR in

$\approx 2.2 \times 10^{17}$

(15.5  $\mu$  sec)

Red Checks:

15:28 RR travel = 3.350"/min.

~~2.88"/min~~

MA Travel = 2.5038"/min

BR apparently sticking but after a few insertions got out light

12

(236)

BR out

SB in

15:50

MA in (8.466)

RR = 4.674  $\infty$

Temp.

0-200 - 20°

#9 - 25.5°

0-2000 - 70°

31 May 67 all bolts which needed no torquing were loosened  $\pm 10^\circ$  and retightened.

TORQUING: #13 =  $5^\circ$ ; 44 =  $0^\circ$ ; 54 =  $0^\circ$ ; 65 =  $0^\circ$ ;  
58 =  $0^\circ$ ; 23 =  $0^\circ$ ; 63 =  $0^\circ$ ; 14 =  $0^\circ$ ; 15 =  $7^\circ$

Bolt meas: #44 dial = +64.0 on "Crane Mike"  
#15 = +50.0  
#14 = +42.0  
#13 = -30.0

Other observations: The center piece now has a large ( $\frac{1}{16}$ " ) crack across on the S.E. The already existing crack on NW is now somewhat larger than before ( $\frac{1}{16}$ " ). Most likely extends thru the piece.

Rod travel checks:

MA = 2.505"/min.

BR = OK

NR = 3.236"/min.

A, D, E, F are in SCRAM circuit

DATE	31 May 67						SAFETY CHECK	
TIME	9:10	AM	BY TAYLOR-LYNN-DICKENSON					
CHANNEL	A	B	C	D	E	F		
RANGE	1/1000	OPR	<del>1/1000</del>	1/1000	900V	750V		
SOURCE DIST.	✓	✓	✓	✓	✓	✓		
% F. S. TRIP	✓	-	0	✓	✓	✓		
BLDG. ALARM	✓	✓	✓	✓	✓	✓		
AUX. CTRS.	✓	✓	✓	✓	✓	✓		
SOURCES USED	M226 & h			MAGNETS			✓	
TABLES	-		LIGHTS	-		AREA CLEARED	-	

Rhett's OK

Put channel F & A back in cell at 9:30 AM  
 Having F "zooing" problem. Corrected and  
 trip checked @ 9:50 AM. OK. Fis bare  
 on floor under stairs.

(237) BR in So. rod shaft in  
 SB in

MA 5.698 received inhibit → +31.05 \$  
 RR out Rhett +25.30 \$

(238) MA 4.074 ~ So. shaft in  
 MA 4.370 → -10.25 \$ Rhett So. shaft in  
 MA 4.074 ~  
 Tie BR out Rhett: 102.35 \$ So. shaft in

(239) BR out  
 SB in 11.506  
 MA in 8.466 So. shaft in  
 RR 4.608 ~ I<sub>m</sub> = 0.009 or 0.4 watt

(240) BR out so. shaft out

SB in

MA in

RR ~~4.658~~ 4.658

shaft value } 0.5¢ ✓  
from curve }

RR 3.766 → 10.97¢ rhette

RR 4.658

Withdraw Fission chambers

time = (1 min 39 sec).

10:35 MA & SB out

(241) BR out

10:59 SB

11:00 RR 5.842

11:01:15 MA in

(243) reports this

$L_m = +13.87¢$

Rhette = +13.0

BF<sub>3</sub><sup>#1</sup> = +13.90

Fiss ch<sup>#1</sup> = +13.80

2 = +13.76

all Avg +13.66¢

11:11 SB <sup>start</sup> going out to 10.00

11:18 SB out

Wait 20 min

(242) BR in (102¢)

RR 5.842

MA in

(244) reports this

11:49:30 SB start in and continuously driven.

Ch 'A' trip @ SB = 11.176 dial.  $L_m = .07$   
est. # of remaining of SB at this point  
 $\# 1.16 - 0.18 = +98¢$  est. period at SCRAM.

Had no temp. changes. Rate  $\approx \#200$ /min at the SCRAM position.

(243) Repeat of run (241).

BR out

SB in

13:35 MA in

RR 5.842 ✓

RR 4.658 ✓

$$L_n = 13.69 \text{ } \phi$$

$$\text{Rhoite} = +13.29 \text{ } \phi$$

$$\text{BF}_3 \#1 = +13.80$$

$$\text{F.C.} \#1 = +13.71$$

$$2 = +13.71$$

$$\text{all avg} = +13.64 \text{ } \phi$$

13:53 SB start out

(244) Repeat of run (242)

BR in

RR 5.842

MA in

14:15 SB start in and drive continuously.

ch "A" tripped @  $L_n = .068$  SB dial 11.160can't read a diff. from curve. Is same  
as run (242). maybe +96

est 20° remaining on SB



(245) repeat (242) (244)

14:41 SB start in etc.

"A" trip @  $L_m = .056$  11.218 SB dial

"D" was @ 20% full scale.

est. 15¢ remaining on SB.

Rate of addition of reactivity = # 2.15/min

A & D Scram levels set at 160% on the maximum scales for these SB insertion checks.

(246) repeat (242) (244) (245)

15:10 SB start in etc.

"A" SCRAM @  $L_m = .025$  11.210 SB dial

"D" @ 20% full scale

est. same as (245)

(247) Remove A & D from SCRAM circuit.

(repeat again above)

15:33 SB start in etc.

E & F @ 750 V.

F tripped via 11.198 SB dial

magnet drop but did not give SCRAM

lite. F was @ 100% when SCRAM

occured. Dog<sup>20%</sup> did not trip. Did not get

$L_m = 0.09$

an indication on E.

(248) repeat again  
 15:47 SB start in etc. 11.198 SB dial  
 All else same as (247)

(249) Move F inside just around corner  
 of Rm 107. It is surrounded by  
 2" of Pb except on ends.  
 Check E & F with source - OK.

repeat again  
 16:08 SB start in etc. 11.200 SB dial

SCRAM via E  
 $L_m = 1.4$  or corrected est  $L_m = 3.0$   
 F was not being observed.  
 A & D (out of circuit) gave SCRAM LITE EARTH.  
 otherwise same as (247)  
 No temp. change.

(250) Remove E from SCRAM circuit. F is only  
 trip circuit in 107. repeat same  
 16:23 SB start in etc. 11.210 SB dial  
 SCRAM APR (#2 & #3 ch);  $L_m = 6.0$  but is  
 saturated.

No temp. change

End of Experiment as such!

1 JUNE 67

120

19

08:05 15 m/hr @ 108 dscr.

10 R/hr @ 8" from blocks.

08:20 Had 100 ball & km 108 mopped. Some surface contamination on 108 floor. Smears taken. Smears show generally on tables, frames, etc about 5x tolerance. More near reactor and very much more on APR frame.

Torque check 2 bolts only: #44 = 0°; #13 = 4°

Begin to remove Core from frame:

- 3 bolts holding up core were tight.
- SB was loose on its hanger. (ref Pg 1-225)
- t.couples all came out easy except 0-120°C. It was hammered out.

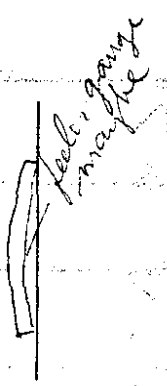
- Hang core on the hoist and measure bolts: See Pg 2-20
- checked the standard (9.2160) used for the dial readings against 3 micrometers as 9.2165" - OK.

1/16/67

Do NOT have  
BOLT MEAS:

ER/ES  
ER/ES  
↓

need not lengths of shaft  
also measure hows & bends  
also not liners off ribs  
bolt diameter and (.bends)



(ED)  
(AB)  
In

1 Jun 67

# DO NOT LOSE BOLT MEAS:

(all meas. are 9" + reading)

	PRE-(LAST SERIES) AFTER P-51	ALLEN (MIKE)	DON (MIKE)	SEYMOUR (VERNIER)	BILL (MIKE)	BILL JIG DIAL PRE-SERIES	BILL JIG DIAL POST-SERIES	JACK (VERNIER)	avg pmf							
13	.495	.5005	+5.5	.5004	+5.4	.491	-4.0	.496	+1.0	-38.0	-33.0	+5.0	495 495 499	+2.0	.495	+0.
15	.559	.5590	0	.5589	-0.1	.565	+6.0	.561	+2.0	+46.0	+49.5	+3.5	557 556 560	-3.0	.559	0
14	.555	.5742	+19.2	.5665	+11.5	.556	+1.0	.559	+4.0	+39.0	+42.5	+3.5	561 554 560 556	-1.0	.559	+4
(MA)																
63	.569	.5581	-10.9	.5700	+1.0	.568	-1.0	.570	+1.0	FLAT	X	X	.565	-4.0		
23	.556	.5723	+16.3	.5599	+3.9	.552	-4.0	.555 <sup>OK</sup>	-1.0	+50.0	+51.5	+1.5	.554	-2.0		
58	.565	.5750	+10.0	.5684	+3.4	.560	-5.0	.570	+5.0	FLAT	X	X	.558 .561 .562 .559	-4.0	.559	-5
(BE)																
65	.570	.5780	+8.0	.5789	+8.9	.570	0	.576	+6.0	+65.0	70.0	+5.0	.580	+10.0		
54	.556	.5568	+0.8	.5576	+1.6	.550	-6.0	.556 <sup>OK</sup>	0	+40.5	43.5	+3.0	.554 .556 .552 .553	-4.0	.555	+1.5
44	.554	.5545	+0.5	.5652	+11.2	.5545	+0.5	.562	+8.0	+58.5	62.5	+4.0	.561	+7.0		

23-63-65-44 broken in 1/2" deliberately on 6 Jun 67

measured after ball is out on table, 6 Jun 67

1796 888 886 892 891 895 9 1 2 3 4 5 6 7 8 9 10 11 12

2 Jun 67

21

- Starting disassembly of wiring. Ray Dickson
- Having photos made of core.
- Take core back down and into vault.
- Remove the 3 rods.
- Rinsing, washing down, wiping down items which are contaminated somewhat.
- Taking gobs of measurements.

Core ht meas: (ref pg 233)

- @ BR = 7.962"
- @ MA = 7.953"  $\downarrow \downarrow$
- @ RR = 7.965"

avg = 7.9600

Meas. between top 2 thin pieces = 5 mils.  
 between 2<sup>nd</sup> & 3<sup>rd</sup> piece = 6 mils. JTM

Core dia. meas: (ref pg 232)

Disc # →	8	9	1	6	16	5	4	22
(AB) TOP	8.930 8.924	8.902 8.913	8.902 <del>8.910</del>	8.891 8.885	8.9302	8.877	8.890 8.881	8.898 8.8963
BOTTOM			8.900	8.8892	8.9323	8.8773	8.889 8.8867	8.9015
(CD) TOP	8.931 8.946	8.901 —	8.893 8.904	8.886 8.8863	8.9405	8.894	8.891 8.8838 8.8815	8.899
BOTTOM			8.892	8.8796	8.9397	8.8960	8.8960	8.899 8.899

Ink = 2 Jun 67 assembled JDL & A Stone; Red = 12 Jun 67 not assembled JDL  
 ref pg 2-33 x

Now start preparation to remove the bolts.  
 - Set up a heater beneath a pan which contains enough oil (SHELL DONAX P<sup>31</sup> a petroleum base, graphited, penetrating oil) to cover the bottom full price.

Now move core (on crane) over, and dip once into the oil. Bring out and start to turn bolts ctr-clk-wise. Any bolt which tightens, allow it to tighten (ctr-clkwise) to only 30 ft# torque.

#63 70% of 1 turn.

13 looks loose after 2 turns

44 3 turns (minor tightness)

14 & 15 tightened some

54 free. Others loosened some.

Quite a bit of haste involved due to "hot" field. JTM observed this procedure.

Now suspend core in the oil as mentioned above. Temp. constant at 75°C. Allow to set until Monday morning.

5 Jun 67

Took core to horizontal table and bolted it down. D.C., B.T., M.L. and others continued efforts at removal of the bolts.

- #54 bolt is out and is visually crooked,  
Sort of sloppy S shape.

- Took about 8 items (Sandia gauges) to  
H2 for to be packaged and shipped to  
Sandia Corp.

15:00 Bolts <sup>back</sup> still in oil. Were worked "in  
and out a little" a few times.

16:05 "Worked" with the tight bolts some more.

16:20 Iron heater off.

Tomorrow assembly to be bolted to  
horizontal table as (ref pg. 1-235)  
for removal of all bolts.



"Twist" amount of balts which had  
to be broken off. STM

# 23 = 180°

# 63 = 150°

# 65 = 200°

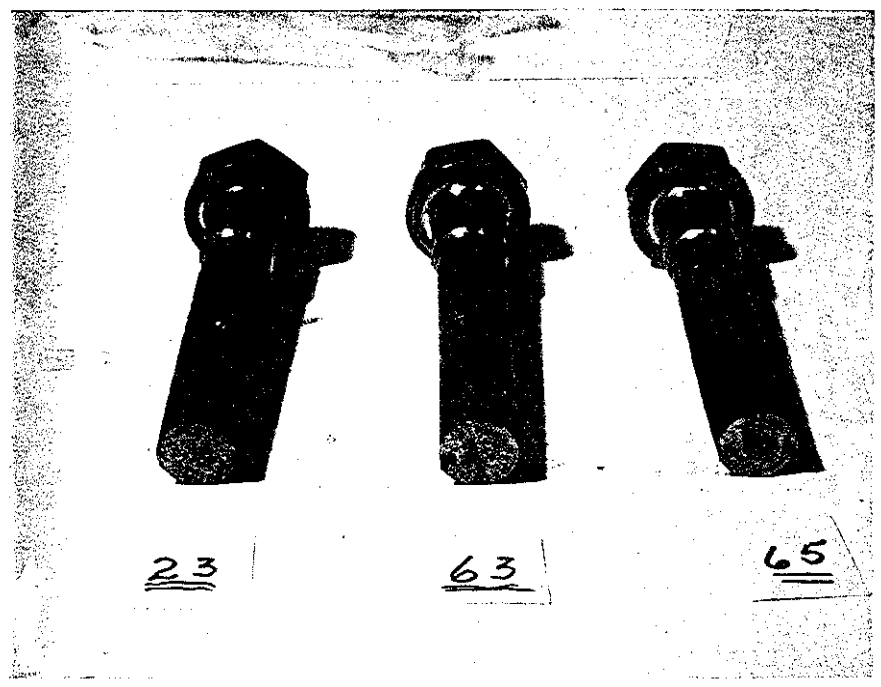
# 44 = 165° (spark at bottom).

d

6 Jun 67  
See Pg 2-24

All bolts were removed either "freely" or deliberately broken off. #23-63-65 and #44 had to be broken (near center of bolt). Others came out OK. (See photos below).

Dissassembling the core, piece at a time and photographing each step (each piece). Taking photos of each piece or disc on each side also liners-bolts and Rods. Center piece came out in 2 pieces. (broken)



Other pictures of this group Pg 2-27 #2-28.

7 Jun 67

Rod liners were hard to remove due to the fuel discs (esp. center piece) having shifted to sides.

RR liner was crimped at the top. <sup>during removal</sup>

BR <sup>liner</sup> was sawed off at top and hammered out from the bottom.

MA liner was snug but came out OK.

Continuing the photo taking of components.

The Safety Block tightens at 1 turn (coming off). Using lubricant and DB in vice. Not off hanger yet.

Also <sup>pictured</sup> bottom plate (#22) showing broken studs and bolt pieces by its corresponding piece. #22 was "washed down" before picture was made.

Smears show floor <sup>Rm 108</sup> generally  $\geq x$  tolerance. At level of side lights OK of 108.

Rm 109 @ tolerance.

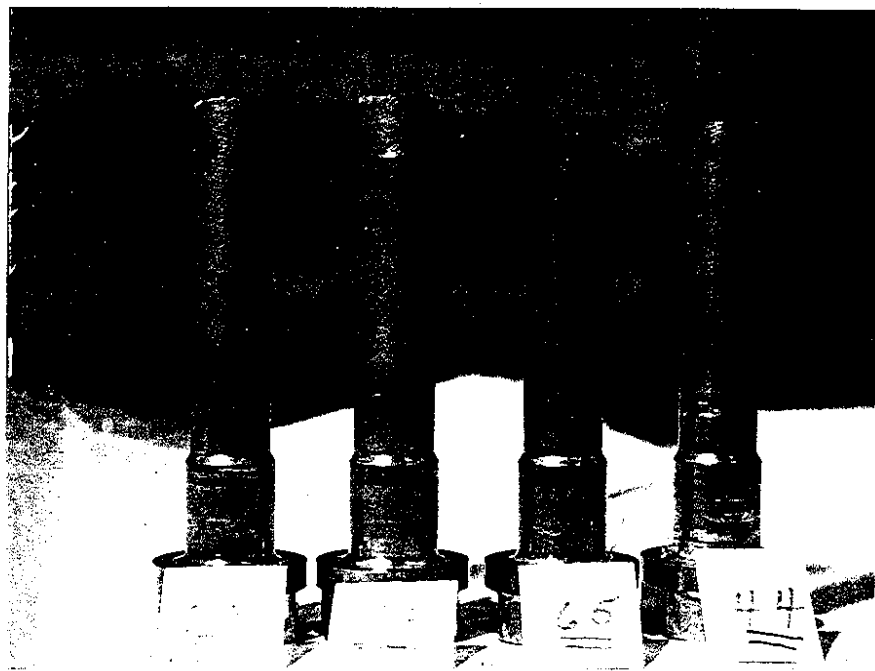
Rm 107 clean

see Pg  
2-31

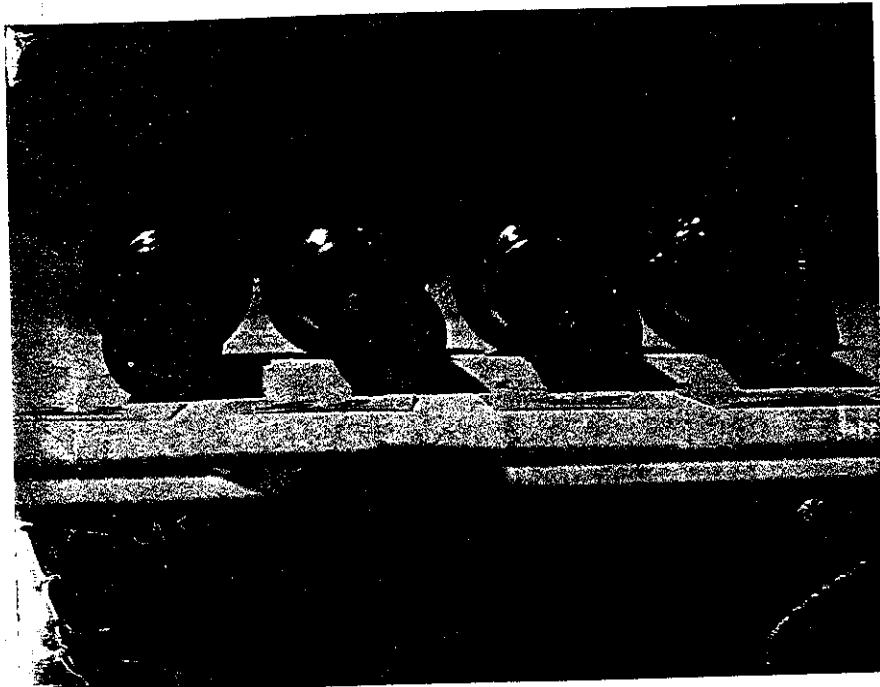
7  
Koval  
1  
red



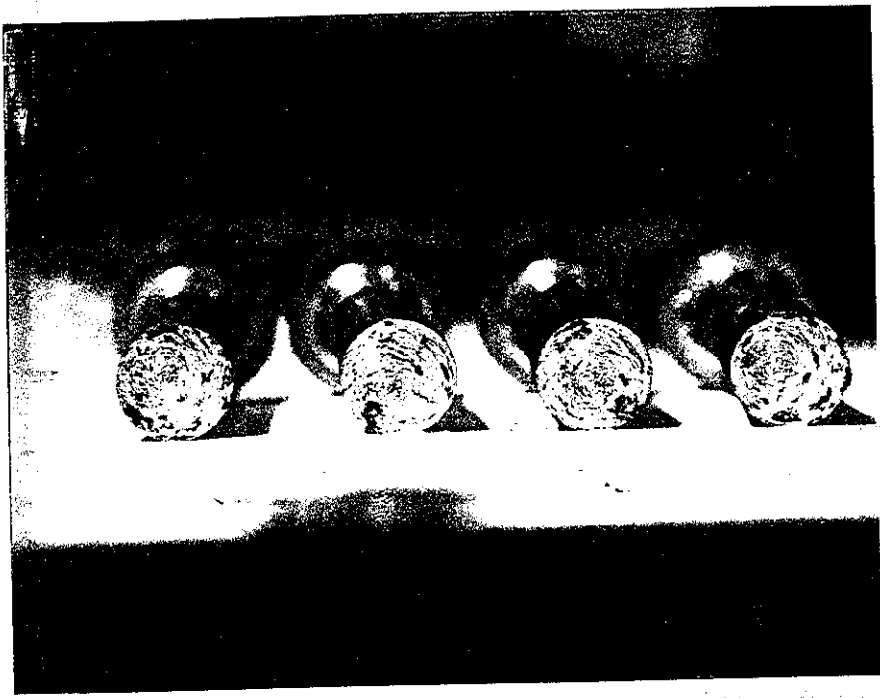
2



one other picture on Pg 2-25 of this group.





↕ 23 63 65 44

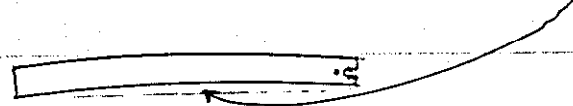


*Handwritten text on the right margin, partially cut off.*

8 June 67 Having "everyone" who is interested in to observe the fuel pieces before the pieces are carried away.

measurements of individual pieces un-assembled lying on the table. By RR.

	length	DIA. $\frac{1}{2}$ " BELOW PIN HOLE	@ DIA. $\frac{1}{2}$ "	DIA. FROM $\frac{1}{2}$ " BOTTOM	Bars
<u>RR:</u>	9.0065"	0.6310"	0.6320"	0.6315"	0.012"
	9.0059	0.6309	0.6314	0.6315	
	8.9985	0.6310	0.6315	0.6314	
	8.9986				
	9.0024"	0.6310"	0.6316"	0.6315	
<u>MA:</u>	9.0018"	1.0052"	1.0068"	1.0066"	0.009"
	8.9975	1.0058	1.0060	1.0054	
	8.9960	1.0052	1.0058	1.0052	
	9.0013				
	8.9992"	1.0054"	1.0062"	1.0057"	
	used from P-32 thru P48				
<u>BR:</u>	10.002"	0.7552"	0.7561"	0.7560"	0.046"
	10.001	0.7553	0.7555	0.7558	cont. one trans ↑
	10.002	0.7558	0.7560	0.7556	
	10.003			0.7560	
	10.002"	0.7554"	0.7559"	0.7559"	



30

LENGTH  
OF  
BOLT

DIA @  
2 1/2" BELOW  
BOLT TOP

DIA  
@  
E

DIA @ 1/2"  
FROM THREADS.

BOLT # 58

9.563"

0.7875"

0.7842"

0.7840"

Bo

9.564

0.7872

0.7836

0.7857

9.561

0.7873

0.7841

0.7840

9.564

9.5630"

0.7873"

0.7840"

0.7846"

9.5636  
9.5630  
- 0.002

BOLT # 14

9.555"

0.7884"

0.7839"

0.7861"

9.554

0.7883

0.7843

0.7853

9.554

0.7885

0.7846

0.7857

9.554

9.5543"

0.7884"

0.7843"

0.7857"

9.555  
9.554  
- 0.001

BOLT # 54

9.552"

0.7883"

0.7847"

0.7848"

9.552

0.7879

0.7823

0.7853

9.555

0.7883

0.7815

0.7854

9.556

9.553

0.7880

0.7852

0.7853

9.5538"

0.7881"

0.7834

0.7852

9.556  
9.554  
- 0.002

BOLT # 15

9.558"

0.7867"

0.7798"

0.7841"

9.558

0.7869

0.7809

0.7836

9.557

9.555

0.7868

0.7808

0.7840

9.557

9.559

0.7868

0.7807

0.7841

9.5573"

0.7868"

0.7806"

0.7840"

9.559  
9.557  
- 0.002

that <sup>result of</sup> altered the impact of the central plate

The cylindrical surface of this rod line was still parallel with the rest of the rod which was straight but it was displaced 0.036 in.

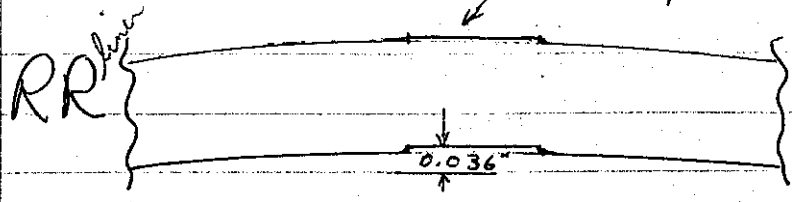
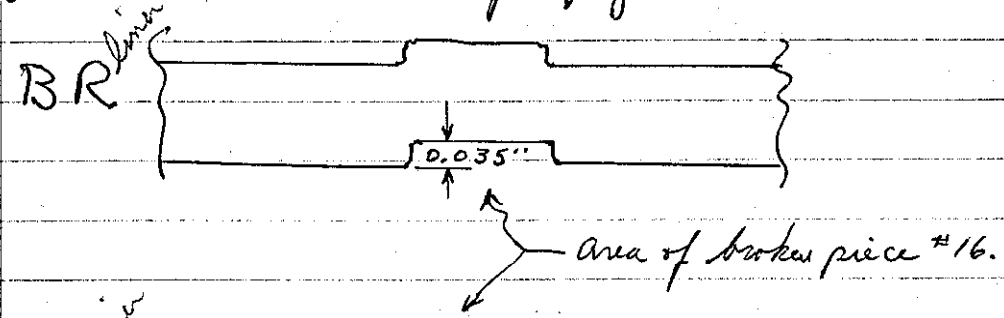
The regulating rod line was damaged similarly but to a lesser degree and was found when the inner edge rod line was straight.



	Length	Dia @ 1/2	@ 1/2	@ 1/2 from threads
<u>BOLT #13</u>	9.494"	0.7874"	0.7875"	0.7870"
	9.494			
	9.495	0.7873	0.7872	0.7870
	9.494			
0	9.494	0.7874	0.7873	0.7871
	9.495	0.7874	0.7874	0.7870
	9.4943"	0.7874"	0.7874"	0.7870"

Again check 1 1/2" calip, against BT standard. (9.2160")  
 1 = 9.2160    2 = 9.2160    3 = 9.2160

Rod Liners: also (ref pg 2-26)

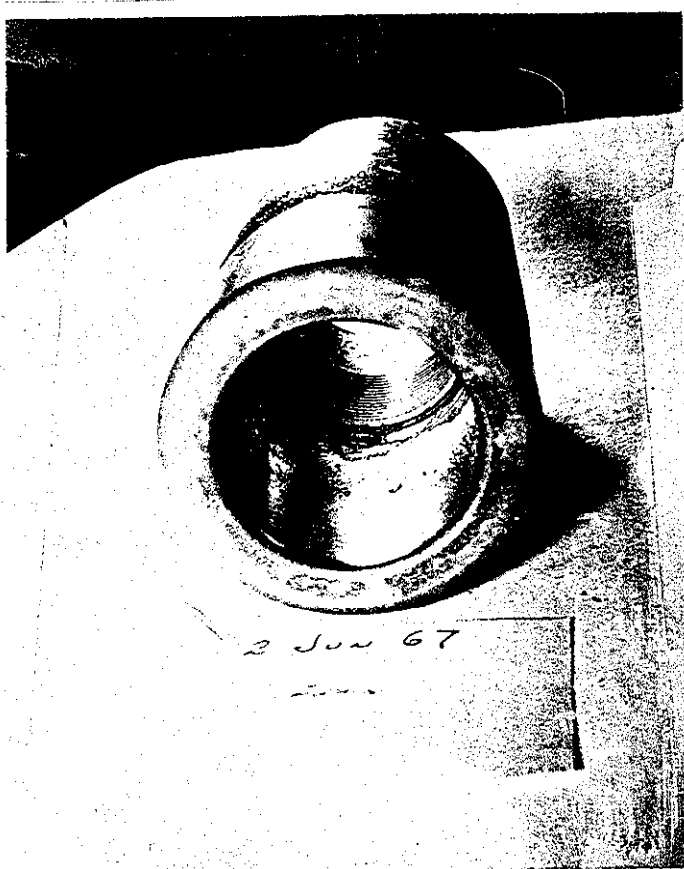


MA<sup>liner</sup> is essentially straight.

Photo taken of the 4 broken bolts again.  
 APR console and support items being packed for shipment.

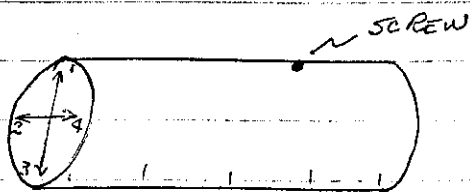
9 Jun 67 Begin "tearing down" APR support drives etc  
 SB was removed from its hanger.  
 removed penetrating oil with perclo. <sup>4-11</sup>

12 Jun 67 Contin. measuring fuel pieces.  
 Put fuel into plastic bags and into  
 "bird cages". Ready to go to Y-12.  
 Had photos made of disc # 22 with "studs".  
 also 4 broken bolts and of Safety Blocks.  
 Had a Y-12 decontamination crew working  
 on the Aberdeen rigs.



Aberdeen  
 SB Block  
 12 Jun 67

BR used from start to P-31 =  $\frac{1}{2}$  R/hr @  $\frac{1}{2}$ "  
 BR used from P-32 to P-48 = 2 R/hr @  $\frac{1}{2}$ "



SB meas:  
 (ref Q 1-227)

PARALLEL TO AXIS OF SCREW

4.002 4.012 4.035 4.009 4.003 ← OD

2.674 2.696 - 2.698 2.665 ← ID

length:

1 = 8.576"

2 = 8.575"

3 = 8.575"

PERPENDICULAR TO AXIS OF SCREW

4.002 4.006 4.032 4.012 4.002 ← OD

2.685 2.688 - 2.711 2.680 ← ID

4 = 8.574"

\*Diameters of fuel dices rechecked. In red  
 Q 2-21.

Photographer came and was sent back since all fuel has been put into "bird cages" as per wot.

Sent all fuel to Y-12 for storage in hold 85.  
 Fuel left @ 13:30 hrs for its destination.  
 Removed APR "package" from "A" frame onto its tripod base to make dries etc. accessible.

We again have 2 men from Y-12 who are continuing to decontaminate any and everything.

Note that the Burst Rod (used up thru P-31) was sent with the adapter still on it. It would not reasonably come off.

16 Jun 67 Misc. activities concerning cleaning up and preparing for APR to be taken out. Area now clean (no covers needed). APR frame has been put into its shipping barrel.  
- Took all of the S. Steel blocks, which ~~were~~ were under stairs in 108, and stored them in bottoms of cabinets in air-cond room.

19 Jun 67 Changing outlets in 108 from crow-foot to "nema". Many of them at least. (10)  
"A" frame and "I" beams sent to salvage.

20 Jun 67 Took two binoculars to Mike Lundin's office.  
Took one binocular to O.J. Smith at 2000.  
Returned the borrowed "portable shield".  
Fan used to cool fuel was returned to Y-12 pump shop.

21 Jun 67 Loading of all APR equipment, etc. into  
"Transfer Van" for shipment.

All <sup>APR</sup> parts shipped out.  
27 Jun 67 all T.V. gear returned.

Copy p. 22 book 1

(16 Sept 66 Received most all of the  
Aberdeen Reactor and associated  
"gear" Van was unloaded and left at 1:00 PM)

Page

Book 1

- 11 Reactor upside down on  $\frac{1}{4}$ " Al plate  
 17 critical  $Ht = 8.154"$   
 $\#3, 1, 6, 16, 5, 4, + 7, 3$  rods and 9 Belts  
 SB on Ram (#11).
- 19 SB Hanger = \$1.26  
 SB Hanger + Hanger Core = \$2.54  
 MA Rod = \$1.76, RR = \$0.71, BR = \$1.06 ✓  
 Top Plate = \$1.00  
 20 BR = 105.76
- 21 Rod retainers and liners 8.4¢  
 23  
 26 Air shroud = \$1.48, MA = \$1.68
- 28 Safety Tube = \$0.55  
 29 Top Plate (0.312") = \$1.02  
 30 Fuel  $Ht = 7.437"$   
 $\#10, 1, 6, 16, 5, 4 + 7$
- 33 Fuel  $Ht = 7.749"$   
 $\#8, 10, 1, 6, 16, 5, 4 + 7$
- 37 Fuel  $Ht = 7.242"$   
 MA = \$1.84, RR = \$0.74, BR = \$1.11 10-18-66
- 39 Boral Measurements
- 
- 47 Fuel Weights To APR machine  
 58 loading - \$8, 9, 1, 6, 16, 5, 4 + 7 12-27-66  
 $Ht = 7.76"$
- 64 MA = \$1.75- (Jerked out while core  
 was rotated  $120^\circ$ )

65 BR calibration

68 "

✓ 69 BR = \$1.03 12-29-66

73 Fission Chamber Poly = 2.3¢

SB = \$22.00

75 Rossi Alpha

76 Bolt #64 = 85¢

SB = \$21.50

77 BR = \$1.05 - (in =  $\frac{5}{16}$ " above core)

78 SB Transverse

✓ 79 BR = \$1.05

80 SB Transverse

81 4 Thermo Plugs = 36.56¢ (197 gms)

→ 82 Sandia m+ng Plate = 50¢

" = 48¢

83 Poly around Inst. = 15.5¢ + Inst. \$1.20

84 Safety Tube = 58.5¢

85 Air Shroud = \$1.43

✓ 86 BR = \$1.24 (Symmetric in core)

87 MA = transverse

RR = "

SB = "

91 At shell of Air Shroud = 44¢ BR 12.6

92 MA Transverse

Sandia Plate 2 1/2" from Bottom of Core = 65.9¢

93 Build up - no source

1.257  
1.2475

PAGE

96 Rossi alpha

97 Inst Ploy = 18  $\phi$

99 SB Hanger Core = 1.25<sup>#</sup>

100 Simulated Floor - No Value

101 Plutigen on radial surface  
SB = -19.7 / 1" SB = -15.72 / 4"  
= -17.4 / 2" = -15.7 / 6"

✓ 106 BR traverse

107 Core Ht = 7.95"

108 Sandia Plate = 46  $\phi$

110 SB pulled to one side = -.56<sup>d</sup>

113 Core Ht = 6.9"  
# 8, 10, 9, 6, 16, 5, 4 + 7

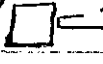
114 Core Ht = 7.24"  
# 1, 6, 16, 5, 4 + 7 BR = 118

116 BR symmetrically located. P. 117 BR to J. Raper  
124 Fuel Ht = 7.76" P. 119 pcs to be heat treated

123 #22 Bottom plate

125 Fuel Ht = 7.96"  
# 8, 9, 1, 6, 16, 5, 4 + 22. BR = 113.8 $\phi$   
SB = 19.57

127 BR air pressure optimized 73 PSI

129 Rossi-Alpha TMC 

130 Foil exposure run #76 U Foils ~~of~~ (30 min on o.i.)

134 High Power Steady State (Fiss. Prod. Sample  $\neq$  Sulfur foils)  
temp rise: 195°F.

Temp rise cost the system 39  $\phi$

st. 20  
BR  
9 $\phi$



- 136 Belts needed 10 ft lbs torque  
BR = 114.8<sup>†</sup>  
MA trav. & RR trav.
- 137 Thermal couple locations.  
Belts # 15, 42, # 54 removed - examined - OK.
- 138 MA trav.  
Maximum reactivity position of MA = 8.59 dial.  
SB = #19.97
- 139 P-1
- 140 BR = 115.7<sup>†</sup>  
Seek max. reactivity position again of MA. 8.59 dial
- 141 P-2 TMC 2.75 sec. period or + 62.33<sup>†</sup>  
P-3 1.69 sec 70.5<sup>†</sup>
- 142 P-4  
BR = 115.2<sup>†</sup>
- 143 P-5 + 0.295 sec or + 90.5<sup>†</sup>  
BR = 117.1<sup>†</sup>
- 144 P-6 TMC 977 m-sec.
- 145 BR = 116.9<sup>†</sup>
- 146 P-7 TMC 683 m-sec. no temp change.
- 147 P-8 TMC 40 m-sec.
- 148 P-9 TMC 244 m-sec.
- 149 P-10 Belts meas. & torqued.
- 151 BR = 116.9<sup>†</sup>  
P-11 had temp. rise

PAGE

- 152 P-12 ( $\approx 1.3 \times 10^{13}$  on Fico. Prod. sample)
- 153 BR = 117.1¢
- 154 retorqued  
BR = 116.6¢
- 155 P-13
- 156 BR = 114.8¢
- 157 P-14 10 min after Pulse 108 door reads 2R/hr.
- 158 Bolts measured. no additional torque needed.  
BR = 115.9¢
- 159 P-15
- 160 Bolts measured
- 161 BR = 115.5¢
- 163 P-16
- 164 BR = 112.4¢ some doubt due to gamma field for skrette.
- 165 P-17 P-167 Bolts measured - all needed slight torque.
- 166 BR = 116.0¢
- P-18
- 168 BR = 111.9¢
- P-19
- 170 P-20
- 171 Bolts meas. - loosened and retorqued - none needed torquing.
- 172 P-21 Core back to normal temp in 1 hr 34 min.
- 174 P-22 period  $\infty$  before pulse.
- 176 Bolts measured & retorqued. Temp. ch. diagramed.
- 177 BR = 119.5¢ (?)
- P-23

Page

178

P-24

180

Bolts meas. &amp; torqued, Temp. ch. diagramed

182

BR = 118.2# (&gt;)

P-25

184

Screws holding (HP cc &amp; F.P. sample) had popped off.

185

Bolts meas. &amp; torqued.

187

Plugs removed, acid cleaned, reinstalled as diagramed

188

BR = 117.4#

P-26

189

"Limit light" check made of rods.

190

Bolts meas. &amp; torqued.

Bolts are stretching.

191

Pulse shock hits screw heads (on one side) &amp; bends them sideways.

192

BR = 116.7#

P-27

193

Bolts meas. &amp; torqued.

194

P-28

196

P-29

197

P-30

198

Bolts meas. &amp; torqued.

Drilled out a broken "tc hold in" screw.

SB scorched; Dark areas near center of core.

PAGE

199

Reactivity loss due to P-30 = 3.1%

200

BR = 1170%

P-31

≈ Peak of 240000 MEGAWATTS (≈ 885°C)  
≈ 3.7 X 10<sup>17</sup> FISSIONS

201

Red glow on SB observed  
Bolts measured & torqued.

203

Cannot go critical. Inspection shows MA adapter broken off ∴ MA is lying inside the cooling fan underneath the blade. - Removed MA to table.

204

Made minor contamination clean up.  
MA pictures taken

205

APR's MA adapter used &amp; MA installed on reactor.

206

BR sticks (moving by hand) TOO TIGHT.

207

Reactivity loss due to P-31 = 6.4%  
Portable shield in operation

208

Tried to remove VNo bolt #42 - Broke the wrench.

209

Bolts measured.

BR<sup>#</sup> 7881-28-0053 installed. This one used from now thru completion of experiment.

211

BR = 102.6%

MA trav.

SB = #20.28

212

RC trav. - Total value = 69%

MA trav. - total value = 170%

213

SB partial trav.

214

SB partial trav. ; BR = 102.2%

(Rod dial reading) reproducibility checks.

- Page  
 216 SB drop reproducibility checks.  
 218 SB (2" removal & back) reproducibility checks.  
 219 MA (in & out) reproducibility checks.  
 220 Bolt space & gap meas.; length meas.  
 221 Bore Scope inspection.  
 New wrench made & bolts torqued.  
 Some rubbing of SB observed.  
 223 SB bulge inspection & Bore scope checks.  
 224 SB dia. meas.  
 225 SB & drive taken off and inspected. <sup>loose</sup> SB non hange.  
 Center plate of core is cracked.  
 Bolts torqued @ 30 ft.lbs.  
 226 Entire magnet assembly inspected - cleaned - O.K.  
 Photos of SB & Core  
 227 Complete SB dimensions  
 228 I.D. of fuel discs; magnet assembly reassembled.  
 229 Source Companion checks: M228; L387; APR POBE.  
 230 Reproducibility checks of SB & rolls  
 231 New "tc" hold in "screw" design to avoid bending.  
 232 O.D. of fuel discs  
 233 Bore scope inspection  
 Bolts measured with core on Crane.  
 Calc. actual stretch listed.  
 Core ht. measured.  
 SB lengths meas.

PAGE

234

Bolt lengths before final heat treatment.  
Some plate dia at same time.

235

Description of Bolt #42 removal from Core.

237

Meas. of U-Mo Bolt threads.

238

Description of the removal of the broken piece  
of bolt #42 from the core.

241

Core back onto normal reactor frame.  
Bolt #13 now replaces #42.  
Cracks visible on bolt #42 & disc #5 & #16.

242

New set of base numbers for meas. of bolts  
using WCT jig dial.

Bolts torqued

Sandra Van left.

244

Power runs for I & C division people.

245

Chamber poly thickness varied.

247

"Period inhibit" checked.

248

Bolt #42 sent out.

249

"Inst. read out relative to Power level" table.

250

APR source adds 9.0¢

Insert fission chambers adds  $\approx 1¢$

N<sup>6</sup>EU tests

PAGE

251 APR source checks: no source; <sup>Source</sup> on drive;  
add more shielding etc.

252 Millitron being worked on.

253 BR value from curve = 111¢

Rossi Alpha - FC in RR hole

254 Several ELDO-71 runs & check outs.

256 SB rhoette = #29.01; Millitron = #18.9

257 Many + & - periods <sup>for</sup> inst. comparisons.

258 More prompt neutron decay meas.

260 BR: rhoette = 104¢; Millitron = 95¢

261 MA trav.

262 RR calib. (accel & ELDO-71)

Servo checks for T&C

263 RR value rhoette = 69.4¢; Millitron = 68.5¢

264 Spiral Fission Chamber in MA hole worth 3.3¢

Many Burst timer and  $N_{GEN}$  checks made.

265 BR = rhoette 102.9¢; Millitron = 96.6¢

SB withdrawn 2.03" rhoette = #2.98

Millitron = #2.84

266 SB calib. points via (accel & ELDO-71)

SB withdrawn 1.62" rhoette = #2.11

Millitron = #2.04

PAGE

267

SB withdrawn 2.93" shlette = -4.92  
 Period comparison measurements of all detectors.  
 i.e. several + & - variations of period.

272

Several more SB calib. points via (accel & EDO-71)

275

Description of reactor and associated components.  
 i.e. te gauges, etc. in preparation for  
 the next pulsing to be done.  
 APR source shielding checks similar to Pg 251

276

Run # 212 <sup>+33.75¢</sup> begin approaching prompt critical

277

Run # 213 = +44.0¢ BR value = 103.55¢

Run # 214 = +52.2¢ BR value = 104.16¢

BR + SB value = #21.0¢ BR value = 103.8¢

278

Run # 215 = +63.49¢ BR value = 104.27¢

279

Source check similar to Pg 275

Run # 217 = +72.80¢ BR value = 102.4¢

280

Run # 218 = +81.66¢ shlette BR value = 101.23¢

Run # 219 = +92.33¢ TMC BR = 102.64¢

281

Run # 220 = +83.88¢ TMC BR = 101.47¢



P-32P-33P-34

some temp. rise.

Operator test for Ray Dickerson (steady state)  
P-35 Operator Hank Dubyoski.)Steady State & shut down (operator Don Williams)  
P-36 (operator Allen Stover).P-37

(operator J.R. Taylor for several pulses)

P-38

notation of Program timer settings.

No source present at reactor. PN 31 use priority <sup>to</sup>P-39Period  $\infty$  before pulse.P-40

NOTE: P-32 thru P-40 made with SB

out for "DIE AWAY"

P-41

Use MA for "DIE AWAY"

P-42

Pulse may have pre-initiated (JTM)

P-43

Use SB for "DIE AWAY"

Bolts meas. &amp; retorqued.

Control inhibit on MA experienced @ +21.09¢

BR = 102.0¢

PAGE

293

P-44

294

Newly noticed crack visible on other side on  
O.D. of disc #16 (center).

295

"Source Shaft only" value = 0.58¢  
Reactivity loss from P-44 = 2.82¢  
APR Servo checks made.

296

Bolts measured & torqued

297

Check out of 9213 inst. by driving SB in  
and without inhibit "in". Driving SB in  
until SCRAM occurs. (around 8.5¢ pos).

298

P-45

End of Book #1 Start Book #2

BOOK PAGE 5

Bolts meas. & torqued.  
disc #16 = crack (original on NW. is larger).  
BR value = 101.9¢

6

P-46

Rod travel rates checked.

7

#13 bolt meas.; No 13 & 44 torqued.  
P-47

9

Bolts meas. & torqued.  
Center disc (#16) on NW crack is larger.

10

BR = 102.2 $\phi$

11

P-48  $\approx 2.1 \times 10^{17}$  fissions  
Rod movement & rates checked.

13

Bolts meas. & torqued.  
Disc #16 has  $\frac{1}{16}$ " crack across on SE.  
Rod travel checks.

14

BR value = 102.35 $\phi$

15

So. Shaft value from curve = 0.5 $\phi$   
Withdraw Fiss. Chambers, time = 1 min 39 sec.

16

More checks as pg 1-297  
Regardless of period attained or power level  
reached the SB is tripped @  $\approx 11.2$  did.  
Insertion rate =  $\approx 200$ /min.

19

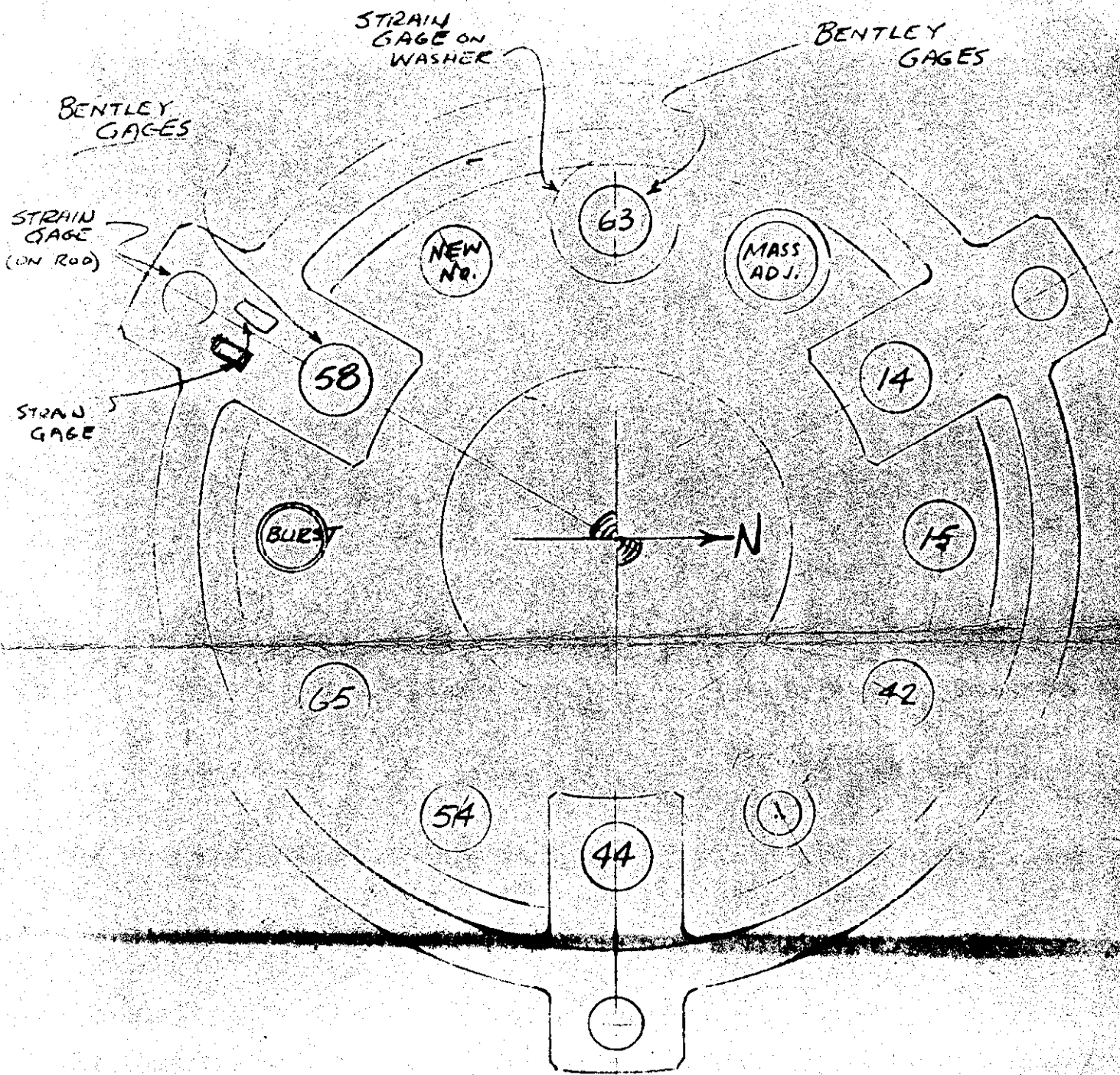
Bolt # 44 #13 torqued.

Remove core from frame onto Crane

20

Measured Bolts.

- 21 Misc. disassembling.  
Core ht measured.  
Core dia measured.  
Crack between top pieces (discs) measured.
- 22 Description of removal of all bolts ←
- 25 Core disassembled core and took picture of each "step".
- 27-28 pictures of broken bolts.
- 29 Length, dia, & Row meas. of available bolts, and rods
- 31 Rod liners condition after removal. Photos.
- 32 Support drives removed and later inspected. Photos again of broken bolts. & S Block.
- 33 Complete SB measurements.  
All fuel put in bags inside "bird cages" and sent to V-12.
- 34 "Finishing" activities - Returned all Periscopes, Portable shield, cooling fan & etc.
- 35 All APR equipment loaded and shipped. T.V. "gear" returned to Tom Cate.



BOLT LOCATIONS  
ABERDEEN CORE

2/6/67  
Tunnell