BACKGROUND INFORMATION FROM KIRKPATRICK'S FILES

K-1 Notes from TMI Computer Surveillance Leak Rate Test Sheets.

K-2 Notes of Water Additions from CRC Log.

K-3 Change to Leak Rate Test Procedure dated 3/16/79.

K-4 TMI 1 Leak Rate Test Procedure 1303-1.1 Rev. 7 dated 05/25/76.

K-5 Calculator printer strip with program and data from leak rate calculations done in 1980.

K-6 Copy of RCS Leak Rate Hand Calculation dated 08/19/77.

K-7 Reactimiter data for Rx Trip of 03/28/79.

K-8 History of Rx power August 30 to November 30, 1979.

K-9 RCS Pressure from Narrow Range Strip Chart.

K-10 Proposed IE Bulletin on Leak Rate Testing (Was not issued).

K-11 NRC Program Used to Calculate 24 hour Leak Rates.

K-12 Notes on Discussion with J. Floyd.

K-13 Hand Calculations and Calculator Notes.

K-14 Notes on Discussion with B. Smith.

K-1

K-1 Notes from TMI Computer Surveillance Leak rate Test Sheets

Date	Time	Interval	Oper Change RCDT DS-4	Oper Change DSH	ID Leakage DS3	OTSG Tube Leak	TAVE Before / After	PZR LVL Before / After	MUT LVL Before / After	RCDT LVL "	Gross Rate GPM	ID Rate GPM	UID Rate GPM	Type of Test	Comments
1/2/79	17 [illegible]	01:03 1	0	0	-.2	0	581.109 .328	265.695 267.086	87.728 .724	76.101 .359	.0724	.5735	-.4501	C	~~0100 added 200g [illegible] to MU-T~~
1/4/79	3:2:54	1	0	0	0	0	581.250 .555	265.750 266.688	68.153 68.982	76.464 76.245	.5630	.3510	.2121	C	0300 added 200g Demin to MU-T (usually enter in log at end of add period.
1/5/79	17: 23:17	1	0	0	0	0	582.215 .086	222.789 225.673	68.424 85.369	77.649 78.091	1.1307	.4740	.6567	C	
1/6/79	2: 47:5	1	0	0	0	0	581.000 .594	225.746 229.346	75.403 .615	76.061 .547	.1054	.6083	-.5024	C	also got rate at 10:28 and 19:19 AOK
1/7/79	3: 11:12	1	0	0	0	0	581.375 .414	225.234 226.818	79.216 78.323	76.655 .995	.2034	.4242	-.2208	C	
1/8/79	3: 21:33	1	0	0	0	0	581.266 .639	225.512 .924	80.670 81.409	75.449 76.229	-.1943	.3448	-.6391	C	
1/10	1: 18:44	1	0	0	0	0	581.461 .801	225.066 226.469	85.43 82.369	77.432 77.858	1.3680	.5330	.8350	C	
1/11	21 53:28	1	0	200	.1585	0	581.670 .844	202.414 227.442	77.304 81.345	75.933 76.410	.5817	.7505	-.1688	C	200 gal Demin to MUT 22:29 - 22:30. ~~Computer printout [illegible]~~
1/13/79	9: 37:33	1	0	0	0	0	581.703 .867	225.984 208.410	67.473 65.716	77.654 78.125	.8417	.5778	.2639	C	Done by Hartman ~~[illegible]~~
1/14/79	0: 24:30	1	0	0	0	0	535.844 536.211	105.212 105.482	84.307 82.295	76.724 77.298	1.6987	.7121	.9867	C	
1/15 Mode 3	1/17 Mode 5				1/29		Mode 5								No data 1/15 — 1/30 Shut down?
1/30/79	22: 6:59	1	0	0	0	0	531.867 .727	99.328 .734	75.433 72.606	74.471 75.166	1.5111	.8107	.7003	C	

11 + 7 = 13

Feb 79 Date / Time	Tave Bef Aft	PZR LVL Bef Aft	MUT LVL " Bef Aft	RCDT LVL " Bef Aft	Gross ΔD V/O	Comments Time l hr and addition or another ~~another~~
2 14:31:59	582.461 .391	225.414 .477	67.021 66.816	76.090 .950	.1246 1.0752 -.9506	another taken at 0155
3 10:32:18	582.016 .398	224.395 5.826	74.157 73.373	80.525 81.509	.0759 1.0651 -.9894	another at 5:17 and 23:49
4 14:45:2	582.203 .594	225.914 6.564	62.258 60.545	76.082 .903	.9670 1.0274 -.0604	
5 18:37:27	581.945 580.938	225.725 224.752	68.100 63.187	79.256 80.270	1.5236 1.1607 .1629	also at 8:33 and 3:12
6 0:25:46	581.813 582.156	226.385 229.674	74.440 70.933	78.087 79.101	1.8431 1.1830 .6601	
7 1:50:35	581.805 582.000	218.949 217.857	77.420 75.665	78.247 79.326	2.1020 1.2594 .8426	also 13:52
8 1:0:44	581.711 .891	218.605 219.658	74.287 76.345	77.102 78.130	2.1981 1.2746 .9235	also 20:49 ~~also 2[illegible]~~
10 8:41:26	571.586 572.044	225.881 842	71.854 70.211	76.888 78.010	2.1705 1.4028 0.7677	
11 2:41:5	581.781 680	225.461 .586	69.382 66.661	76.109 .956	1.8189 1.0579 .7610	also 18:485 added 300g to RCS w/o ~~entering in computer~~
12 21:20:19	580.773 581.016	224.654 226.070	65.570 .058	75.802 .446	.4843 -41.40	.8984
13 18:42:28	581.164 .156	224.893 225.445	73.482 70.336	75.512 76.628	2.0404 1.3539 .6864	also 12:36
14 6:30:46	581.055 .266	226.863 225.436	75.462 79.716	77.131 78.341	1.2404 1.4842 -.2438	also 29:45 OEC 206
15 20:26	581.117 .266	226.025 .141	73.486 70.482	78.345 79.659	2.4653 1.5340 .9313	Added H_2
16 12:03	581.686 .516	226.588 227.656	76.295 79.565	76.346 77.727	1.7745 1.7263 .0482	also 2:53 OPer corrected charge 20 ± 125/125
17 4:41	581.214 .678	226.846 225.852	67.878 63.816	77.219 78.906	2.8772 2.0345	.8427
19 21:28	581.031 .125	226.486 224.770	72.636 .465	78.727 80.489	2.9283 2.0162 .9121	also 1:34 and 0:11
21 8:36	581.031 .289	221.318 .287	72.520 70.095	77.178 78.561	2.3788 2.0325 0.3463	
23 11:7	581.508 .305	224.479 228.807	70.041 66.782	75.473 .498	.3512 .0295 .3217	BY Hartman

18 + 12 = 30

Date / Time	Tave B A	PZR LVL B A	MUT LVL B A	RCDT LVL B A	Leakage Gross I.D. U.I.D.	Comment
✓2/25/89 20:02	581.367 .211	226.104 .287	79.575 78.207	75.435 77.863	2.9924 2.4058	OCC 150 .5921
✓26 18:39	581.164 .328	227.953 227.945	72.915 .095	77.064 79.143	3.2577 2.4963 0.7614	OCC 154 also 0:38 —
✓27 21:50	581.344 .469	227.104 .135	73.907 .428	76.327 78.253	3.3372 2.3864	OCC 162 .9507
✓28 19:9	581.117 .367	227.117 228.020	74.628 72.853	76.846 78.983	3.2534 2.5899 0.6635	100 to MUT 20:03–2005
✓3/1 0:41	581.516 .492	223.549 228.790	68.249 63.404	77.042 79.184	2.9831 2.5787 .4044	(added H2)
✓3/2 4:35	581.016 .523	226.727 228.756	66.641 62.853	76.457 76.627	3.2666 2.6611 0.6055	also 1:46 —
✓3 21:38	581.750	227.029 226.301	79.495 79.503	76.257 78.238	2.7738 2.4577 .3162	OCC 152 DS4
✓4 13:42	582.000 581.492	224.564 .162	84.433 .449	76.805 79.177	2.8368 2.8676 -.0308	OCC 238 DS4 ~~also~~
✓5 3:20	581.633 .789	226.025 224.730	68.187 67.246	76.271 78.521	3.6384 2.7689 .8695	OCC 128 DS4
✓6 3:21	582.195 581.852	223.740 224.227	79.229 77.807	76.235 78.435	3.4874 2.7130 .7744	OCC 180 DS4
✓8 3:6	582.063 582.031	227.242 227.814	73.466 73.508	76.250 78.789	3.5766 3.1087 0.4679	328 to MUT DS4 0400–0405
✓9 3:23	583.203 .156	228.734 .260	67.783 66.153	75.849 78.692	4.3402 3.4851 0.8557	OCC 181 DS4
✓10 3:51	582.039 .352	226.498 228.070	81.366 74.915	76.563 79.261	4.0724 3.2674 0.8050	By Hartman
✓11 21:53	581.070 .844	222.439 227.756	77.304 81.345	75.933 76.410	0.5817 0.7505 -0.1688	OCC 200 DS4 -.1585
✓12 1:32	581.773 .430	228.141 227.215	71.812 65.520	76.147 79.166	3.9384 3.6763 .2620	
✓13 2:00	582.078 .242	228.023 227.444	64.982 60.174	76.608 79.629	3.6252 3.6407 -0.0155	By Hartman
✓13 11:05	582.383 .281	228.885 229.826	71.736 72.361	76.769 79.937	4.3188 3.7994 0.5194	305 to MUT 11:55–1200
✓14 12:05	581.813 .445	227.461 228.902	72.341 79.833	76.738 78.222	-6.7468 -6.4972 -.2496	500 to RCDT DS4

18 + 2 = 20

Date / Time	TAVE B A	PZR LVL B D	HUT LVL B A	RCDT LVL B and Tab A	Leakage Gross ID UID	Comment
3/15 4:50	581.734 .906	226.777 228.188	71.782 66.386	75.578 78.652	3.8098 3.7536 .0562	
16 20:09	581.602 581.563	228.396 228.482	62.391 59.920	76.182 79.488 100	4.8614 4.0099 .8514	OCC 204 x 161.996 / 44.286 = 5.613 -.7522
17 02:48	581.789 582.094	228.336 230.623	69.241 67.500	76.192 79.389 58.4	4.4297 3.8798 0.5499	OCC 207 3:40 3:45 x 62.31 / 44.55 = 5.4264 -.9967
19 0:58	581.555 581.070	223.463 226.879	74.807 68.657	77.786 81.255 72	5.3528 3.9601 1.3926	OCC 200 (Log Smpl Hdg) x 62.3 / 44.55 = 5.5714 -.1851
21 1:24	581.492 581.281	225.391 225.168	75.786 71.462	76.005 79.448 65	6.0519 4.1839 1.8680	OCC 207 (Hg Smpl) x 62.1 / 44.57 = 5.8294 .2225
22 2:59	581.344 .422	224.125 225.047	77.229 72.295	76.235 79.881 75	6.7274 4.4006 2.3268	OCC 206 x 62.227 / 44.55 = 6.1467 .5807
24 5:40	581.852 .961	225.168 230.453	75.661 69.174	76.532 80.378 72	4.5519 4.5776 1.9744	OCC 206 x 62.2354 / 44.570 = 6.344 0.160
25 5:24	582.266 .148	226.805 231.975	76.600 71.937	74.746 78.395	6.5967 4.4230 2.1737	To HUT-1 301 (ccc 1608) 62 / 44 = 6.1645906 .4317937
28 1:28	581.641 .500	228.902 .697	77.907 69.886	74.492 78.629	6.9438 4.9926 1.9512	303 To HUT x 62.24 / 44.56 = 6.93 .01
						842

Rx critical at 2029 on 9/17 - K-2 1

Water additions from CRO LOG

Date	Time	Amount	Totals	~~Comments~~ Power	Comments
9/18/78	0205	351 (BA)			What is ~~[illegible]~~
1	0325	250			
	0410	500		Commenced Power increase	"Deborating"
	0445	~~300~~ 300			
	1005	450			
	1745				opened CA-V-4A/4B
	1835				shut CA-V-4A/4B
9/19/78	2400			15%	opened CA-V-4A/4
2	0050				shut CAV 4A/4
	0215	200			
	0255	300			
	0400	200			
	1630				opened CA-V-4A/4B
	1650	800.			
	1707				shut CA-V-4A/4B
	1740	815			
	2212	Commenced	SD from outside C Rm.		
	2217			Rx Trip	
9/20/78	0305			Rx Critical	~~[illegible]~~
3	0614			Rx 14%	
	0800				opened CA-V 4A & B
	0900				shut CA-V 4A & B.
	1606			Rx Trip.	
	1915				opened CA-V-4A/B
	2015				shut CA-V-4A/B
	2115			Rx Critical	

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
9/21/78	0215			10%	Opened CA-V-4A & B
4	0243			Rx Trip	Shut CA-V-4A & B
	0530			Commence Rx SU	
	1900	1000			
	2145	300			
9/22/78	0000			50%	"B Feed water valve seems to be the cause of the oscillations"
5	0245 (0145)	600			
	0550	600			
	0645	700			
	0320			Red Load 22%	
	0700			30%	
	0815				Opened CA-V-4A & B
	0855				Closed CA-V-4A & B
	0925			15%	
	1120			Rx at 10^{-8} A	
	1145	100			
9/23	0000			10^{-8} A	
6	0250	266 (BA)			~~From RCBT~~ From BAMT
	0530				RCS Press 150
	0900	4000			From "C" RCBT
	1045	400			From C RCBT
9/24	0000			CSD	
~~9/24~~	2300				2000 psi, ~~at~~ 485 °F
7	2330				Commenced deboration. Running 1/M VS demin water

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
9/25/78	0000			SD	depressuring
8	0645			Rx Critical	
	0915			Commence ramping PWR	Commenced ramping power to 5%
	1510			18%	
	2056			Rx Trip	
	2330	450			
	2350	1050			
9/26	0040			Crit at 10⁻⁸A	
9	0050	850			
	0245				Opened CA-V 4A & 4B
	0315				Shut CA-V 4A & 4B
	0700 / 1847			20%	Completed 2301-3D1 ID .232 UID .7287
	1930	1000			
	2300			150 MWE	
9/27	1640	1000			
10	2300			26%	(1st stable day) 231 MWE
9/28	0915	150			
11	0936			↑ 30%	
	1230			↑ 50%	
	1820	160			
	2010	200			
	2115				Completed SP2301-3D1 .0914 GPM UID
	2124	205			
	2300			40%	

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
9/29/78	1602	200		40%	
12	1955				Completed 2301-3D1 .6704
	2300			40%	
9/30/78	0023	211			
13	0232				Comp 2301-3D1, .3393 GPM UID
	1517	200			
	"	-200*			*Bleed 200 gpm from RCS to "B" Bleed Tk
	1700	350 BA			
		200			
	1830				Comp 230-3D1, Leak Rate Sat
	1845	200 from "C" bleed tank			
	2300			40%	
10/1	0030				Comp 2301-3D1. Sat.
.4	0440	200			
	1430				Add H_2 to MU Tk
	1540				Stopped adding H_2 to MU-T-1
	2035				Comp 2301-3D1 .1775 gpm UID
	2300			40%	
10/2	0030	312			
.5	1640	457			From "C" RCBT
	"	143			
	1914	100			
	2300			40%	
	2310				Completed 2301-3D1 Sat.

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/3/78	0830	600			
16	1740	200			From RCBT "C"
	1822	200			From RCBT "C"
	2235				Commenced feeding H_2 to makeup Tank
	2300			40%	
10/4/78	1555	285			From RCBT "C"
17	"	85			
	2255			40%	
~~10/5~~	~~1555~~ ~~140~~ ~~0140~~	~~140~~			Leak Rate .96 gpm UID
18	0150	250			
	0800				Opened CA-V-4A & B
	0900				Shut CA-V-4A & B
	1301	???			Raised MUTk Lvl to 85" from "B" RCBT
	1430			Rx Trip	Manual
	1903	???			Completed adding Required BA to RCS
	2300			on Cooldown	
10/6				SD	
10/7				SD	
10/8				SD	
10/9				SD	
10/10				SD	
10/11				SD	
10/12	0000			SD	
	2300			10%	
	2355				opened CA-V 4A/B

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/13	0035	200		10%	~~CA-V-4A/B is still open~~
19	~~0048~~ 0152	200			~~Closed CA-V-4A/B~~
	0315	200			
	0340	400			
	0435	450			
	0500	600			From "B" RCBT
	05?7	230			" " "
	0625	500			
	1333			↓ 10^-8	
	1530			↑	Began raising power
	2300			20%	
10/14	0215	682			
20	0422	400			
	0702	500			
	0720			Rx Trip.	
	1025				Opened CAV-4B 4B
	1100				"Pumped Down RC Drain Tank
					77-75" Third time since Trip
	1123				Closed CA-V-4B 4B
	1536			Rx Startup	Critical at 1555
	1615				Opened CA-V-4A & B
	1940			Rx 20%	
	2300			Rx 35%	

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/15/78	0035			40%	
21	2300			40%	
	2350				Shut CA-V-4A, 4B
10/16/78	0038	283 *			from "RCBT "B"
22	"	197 *			
	0150	200 *			
	0555	250 *			
	0830	800 *			From RCBT A and DI Water
	1115				Opened CA-V-4A/B
	1215				Closed CA-V-4A/4B
	1302	240 *			
	1528	600 *			
	1930	745 *			from RCBT B
	2300			40%	
10/17/78	0155	650 *			From RCBT "B"
23	0521				~~no effect on strip chart~~ stopped adding H_2 to MUT
	0531	630 *			From RCBT "B"
	0800			↓ 27%	at 5%/min.
	0828	400 *		*	
	0830			↑ 30%	
	0955	400 *			
	1030				manually tripped turbine
	1125	400 *			
	1155			↑ 20%	

* correlated to strip chart.

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/17/78	1228			35%	
~~[illegible]~~	1310			↑ 40%	
23	1322			40%	
	2300			at 45%	
10/18	1325				Completed 2301-3D1 −.283 gpm
24	1822	450 *			Called this "identified" lb rate
	2245				Added H_2 to MUT brought it
	~~2300~~			~~50%~~	to ≈ 22#
	2300			50%	
10/19	0505			↑510 MWe	
25	0720	100 *			
	0852				Completed 2301-3D1 UIDGO
	0920			57%	
	0927	500*			From RCBT "B"
	"	122*			
	1215	200*			
	1310	200*			
	1530	·250		~~↑60~~	
	1700			↑ 60	
	1755	350*			
	1935			↑ 63	
	2210				MUV-17 Packing Blowing out
	2221	350*			From RCBT "A" (.8) and Dwin (.2)
	2300			63%	

correlated to strip chart

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/20	0214				Vented of MU-T-1
26	0230				Added More H_2 to MUT-1
	0407	~~(± 463)~~			*Feed and bleed.
	0455			↑ 68%	
	0624	~~(± 440)~~			*Feed and bleed
	1821				~~main machine tripped?~~
	1927				Open CA-V-4A/B
	2015				Shut CA-V-4A/B
	2300			17%	
10/21	0148	426			From "A" bleed tank
27	0150				Ramped down RC drain tk to 76"
	0325	325			From "B" bleed tank
	0420				Feed and bleed 700 gal
	510	200 BA			From BAMT
	0700	50 BA			" "
	0730	50 BA			" "
	0830	50 BA			" "
	0900				Added H_2 to MU-T-1
	0930	200			fm "B" RCBT
	1125	50 BA			From BAMT
	1209	100 BA			" "
	1345				Completed 2301-3D1 0 GPM
	1501			~~[illegible]~~	Started raising power to 75% fm 55%
	1909				Turbine Trip Rx power back to 15%

*Correlated to MUT strip chart

over

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/21 cont'd	2115	3000?			To maintain Pad Hite (Feed Bleed?)
	2155			20%	Raised Power to 20%
	2230			↑28%	R
	2255				Rt Pwr to 40%
	2300			40%	
10/22	0039	90 BA			
28	0230				Began inc power to 70%.
	504			↑ 70%	
	0910				Leak Rate 2301-301 0GPM
	1105			↑ 75%	
	1355	200			strip chart
	1430	✓200			all only
	1535	✓400			↓
	1700	✓200			
	1840	✓200			
	1945	✓200			
	2057	✓200			
	2221	✓200			
	2236	✓200			
	2300			72%	
10/23	0525	✓100 *			
29	0600	✓400 *			241 gal from B RCBT & 109 [illegible]
	0710	✓100 *			

correlated w strip chart 10/23 cont'd.

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/23/78 cont	0800				Increased H_2 over pressure
29	0845	100 *			
	945	100 *			
	1200	50			
	1305	100 *			
	2300			73%	
10/24/78	0145	500 *			1098 PPM (prob bleed tank)
30	1000				added H_2
	2001	300 *			
	2300			75%	
10/25/78	~~0448~~	750 *			
31	1011	409 *			"A" RCBT
	"	91			
	1717				Added H_2 to MUTk 2# increase
	1828	458 *			RBT "A"
	"	102 *			
	2300			75%	
10/26/78	~~0440~~	470 *			Added H_2 to MUT 25#
32	1235	200			Weld strip chart
	1536	100			
	1545	200			
	1548	200			
	1605	200			↓

correlated w strip chart

10/26 contd.

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/26/78	1800	25 BA			Wilcd strip chart
32	1830	25 BA			
	1850	200			
	1945	500			
	2116	25 BA			
	2200	600 *			"B" RCBT
	2300			75%	~~45%~~
10/27/78	0817	470 *			RCBT B
33	"	130 *			
	1803				Completed 2301-3D1 .176 gpm
	2300			82.5%	
10/28	~~0125~~	300			
34	0145	300			
	0158			90%	started reducing power
	0640	400			
	0655	400			
	0700	400			
	0710	600			
	0745	600			reducing Power deborating?
	0858	600			
	0920	500			
	0930	300		8.5%	
	1229	200			

10/28 cont'd

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/28/78 cont'd	1318	300			
34	1730	100			BAMT
	1937	25			BAMT
	2008	25			BAMT
	2035	25			BAMT
	2105	25			BAMT
	2150	35			BAMT
	2220	35			BAMT
	2255	35			BAMT
	2300			89%	
10/29/78	0211	330			BAMT to move rods out to 65% 6/7
35	0345				added H_2 to MU-T-1 because of low H_2 in RCS
	0750	50			BAMT
	0850	100			BAMT
	1019	88			BAMT
	1140	88			BAMT
	1715			10^{-8} A	
	1730	2000			RCBT "B"
	"	200			
	2300			Rx SD	
10/30/78	0613	480±			RCBT "B"
36	1235				[illegible] 2301-3D1, .8874 UID
	1310	600±			B bleed tank.

10/30 cont'd

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
10/30/78 cont.	2150	350			BAMT
36	2300			SD	
10/31/78	0155	350			BAMT
37	1900	1000			"13" RCBT
	2300			SD	
				~~Rx Critical~~	~~15% at 0330~~
11/1/78	0124 ~~1020~~	420			
38	1420	470			
	1540	250			
	1615	210			
	1810	310			
	1838	600			
	2125	1200			
	2250	600			
	2300			54%	
	2345	500			
11/2/78	0130	500			
39	0431				Leakrate .8978 GPM
	"	1000			
	0559	500			
	0620	300			
	0637	500			
	0640			80%	
	650	500			

11/2/78 contd.

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
11/2/78 contd	1130			90%	
39	1250			↓ 50%	Runback on loss of FW
	1414	900		~~40%~~	
	1515	600			
	1942	600			
	2010	1000		~~40%~~	
	2055			90%	
	2120	400			
	2145	300			
	2220	20			BAMT
	2240	20			BAMT
	2300			90%	
	2305	500			
11/3/78	0025	200			
40	0200	200			
	0220	200			
	0355	300			
	0610	300			
	0805	-500			Bleed 500 gal to "C" RCBT
	0815	+500			
	1002	500			
	1325	200			
	1410	400			

11/3/78 contd.

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
11/3/78 Cont	1809	50			
40	1845	50			
	1915	50			
	2300			89%	Turb Trip, Rx Trip, MFP's Trip Due To all Condensate polisher isolation Valves going shut
	2312	110		TRIP	
	2345				see below
11/4/78	0448	3333			"added 3333 gal" To RCS
41	1435	1120 *			From RCBHT-1B
	1645	450 *			From "B" RCBT
	1922	652 *			Boric Acid from BAMT
	2220			Rx Crit	
	2235	100			
	2300			10%	
	2305	1400			
11/5/78	0115	25 BA			BA
42	0146	25			BA
	0340	75 gal			BA
	0445	50			BAMT
	0835	65			
	1225	275			Reached 90% at 1300
BA	1348	(±300)			"Feed & Bleed"
	1520	300			
	1550	200			
	1618	200			

11/5 Cont'd -

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
11/5/78	1702	300			
42	1730	1300			
	2015	800			
	2210	500			
	2230				added H_2 to MU-T-1
	2300			90%	
11/6/78	0152	1000			Completed 2301-3D1 UID: 2[illegible]
43	0325	400			
	0445	400			
	0631	200			
	0930	600			" For Xe Control.
	1205	200			
	1615				MU Tank Level transmitters LT-1
	~~[illegible]~~				and LT-2 are both recalibrated and back in service
	1910	250			"B" RCBT
	"	200			
	2040				Completed 2301-3D1 UID ~~10 2420~~ 5275
	2100	360			
	2140	200			
	2205	100			
	2240	50			
	2250			90%	
	2322	100		~~[illegible]~~	
	2345	100			

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
0524 11/7/78	~~0524~~			Rx Trip	Rx Trip
44	1016	?			St adding BA from BAMT
	1045	?			Secured adding BA
	~~1700~~				RCS Boron went from 1076 to 1202
	1750				Completed adding 870 g BA from BAMT
	2300			SD	
11/8	2045	800			.1334 b PM Makeup
45	2300			SD	
11/9	0055				Commenced adding BA from BAMT
46	0400	763			BA (Secured adding BA)
	0415				added H_2 to MUT
	1845	6			BAMT
	"	179			"B" RCBT
	2125	18			BAMT
		881			"B" RCBT
	2300			SD	
11/10	1516				Mode 5
[illegible]	2300				RC Press 290# Mode 5
11/11	2300				RCP 240# Mode 5
11/12	2300				Mode 5
11/13	2300				Mode 5
11/14	2300				Mode 5
11/15	2300				Mode 5

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
11/16	2300				Mode 5
11/17	2300				Mode 5
11/18	2300				Mode 5
11/19	2300				Mode 5
11/20	2300				Mode 3 at 350°F
11/21	2300				Mode 3 at 532°F
11/22	2300				Mode 3 at 350°F
11/23	2300				Mode 5
11/24	2300				Mode 5
11/25	2300				Mode 5
11/26	2300				Mode 5
11/27	2300				Mode 5
11/28	2300				Mode 5
11/29	2300				Mode 5
11/30	2300				Mode 5
12/1	2010				Commenced Rx SU
12/1	2300			13%	
12/2	1330			Rx Trip	On low pressure
12/2	2300			Mode 3	
12/3	1525			Rx Crit	at 10^{-8} A
12/3	2300			47%	
~~12/4~~	~~0145~~	~~350~~			

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
12/4/78	0145	✓350			
47	0735			70%	2301-3D1 Complete "Sat"
	1013	± 100			Bleed & Feed.
	1040	± 200			Bleed & Feed
	1050	± 200			" "
	1110	± 500			" "
	1120	± 200			" "
	1225	± 140			" "
	1300	± 100			" "
	1344	± 150			" "
	1410	± 150			" "
	1435	± 275			" "
	1715	✓500			
	1758	✓1000			
	1830	✓1,000			
	2230	✓250			
	2300			87%	
12/5	0615				RCS Leak Rate .8993
48	0905	200			
	0928	200			
	1100	200			
	1215	200			
	1410	100			

12/5 contd.

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
12/5/78	1700	200			(MUT stuck Chart Wide since S/U)
	2300			91%	
12/6/78	0030	300			
49	0325	200			"A" RCBT
	0416	200			"A" RCBT
	0545	450			"A" RCBT
	0400	250			
	0925	100			
	1515	800*			
	1525	100*			
	2015				Leak Rate Sat (0.7713 gpm)
	2300			90	
12/7	0531	300*			
50	0810	20			BA
	0825	24			BA
	2005	50			
	2028	100			
	2115	100			
	2136	100			
	2210				Added 1/2 to MUT
	2300	~~4~~		90%	
~~12/8~~					

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
12/8/78	0135				LEAK Rate UID .6998 ID .1424
51	1510	200			
	1730				Completed 2301-3D1 Leak Rate
	1815	400*			"B" RCBT
	"	100*			
	1945	± 200			Feed and Bleed
	2000	± 200			" "
	2057	± 200			from "B" RCBT
	2300			90%	
12/9	0034				Completed 2301-3D1 UID .4127 ID .1872
52	1148				completed 2301-3D1 "Sat"
	1655	(Strip chart shows 1910)			Completed 2301-3D1 .2607
	1710	400 gal			"B" RCBT
	2250			90%	
12/10	0000				leak rate "Sat" .0879 UID
53	1103	± 700			Feed & Bleed
	1208	± 374			" "
	1230	± 500			" "
	1315	± 500			" "
	1340	± 300			" "
	1520				added H_2 to MU-T-1
	1605	100			
	1632	100			

12/10 center

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
12/10/78	1815	100			
53	1930				2301-3DI hot
	2300			90%	
12/11/78	0129				Completed 2301-3DI Gross = .8431
54					ID .1556 WID .6875
	0401	300 *			
	1825				Completed 2301-3DI "hot"
	2000	100			
	2255			90%	
12/12	0400	500			
55	0430	500			
	0515	50 BA			BAMT
	0725	1300			"B" bleed tank
	0930	300			"B" bleed tank
	1135				Commenced reducing PWR to 55%
	1603	100			
	1640	±200			Feed and Bleed 200
	1812	100			"B" RCBT
	1850	200			" "
	1930	300			" "
	2000	35			BAMT
	2200	30			BAMT
	2215	40			BAMT
	2235	25			BAMT
	2300			55%	

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
12/13/78	0002				2301 - 301 I.D. 0.1465 U.I.D. ~~0.1465~~ .5107
56	0015	25			BAMT
	0106	25			BAMT
	0350	25			BAMT
	0557	25			BAMT
	0936	22			BA
	1307	22			BA.
	1714	100			
	1815	100			
	2050				2301 - 301 Lot
	2100				added H_2 MUT-1
	2255			~~55~~ %	
12/14/78	0530				Sat Leak Rate 0.6995 UID
57	910	✓900*			
	1150	✓25			BAMT
	1423	✓			MUT Hydrogen Regulator Isolated
	1808	175*			
	2055				Complete 2301-301 Lot.
	2300			55%	

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
12/15/78	0308				Completed 2301-3121 SAT
58	0725	✓100*			
	1145	✓300*			"A" RCBT + DEMIN
	1550	✓300*			A Bleed Tk and Demin Water
	2215	✓600*			A " " " "
	2300			55	
12/16	0000			Commenced SD	
59	0225			Rx at 10^{-8}	
	2300			Mode 3	Tavg 533
12/17	~~0146~~ 0225	✓~~520~~ 80			~~"A" RCBT and 80 demin~~ Completed SP 2301-3121 sat, 483 GPM
~~60~~	1200	✓650			
	~~2020~~	✓100 ~~811~~			BAMT
	2300			Mode 3	Tavg 382
12/18	0915				Commenced adding BA 681 gal
61	~~1026~~ 1035				to MT-1 Completed addition
	2300 ~~1006~~ ~~2300~~			Mode 3	~~Completed 230 Mode 3 at~~ at 320°F
12/19	0145 ~~0145~~	800 800			"A" RCBT "A" RCBT
62	2300			Mode 3	at 470°F
~~12/20~~	~~2300~~			~~Mode 3~~	~~Mode 3 at 533°F~~
12/20	1110	450			"A" RCBT
63	2300			Mode 3	533°F
12/21	0425	~~2301-301~~			Leak Rate test 2301-3D
64	0955				Commenced Deborating
	1025				dc Deborating.

12/21 Contd.

84

Date	Time	Water Additions (gallons)	~~Periods of Sampling~~	Power
12/24/78	0135	300	ST 0000	930-945
65	0220*	300		97
	0245*	300		
	0540*	300	2.523	
	0840*	280		
	1210*	200		
	1225*	125		
	1437*	200		
	1450*	200		
1730	1830	200		
	1900*	200		~~946~~ 97
12/25/78	0240*	200		
25	1300*	800	1.356	
66	11 *	200		
	1600*	200		
12/26/78	0500	100	1.960	96
67	644	130		
	0855	50		
	1040	125		
	1925*	134		
	1939*	350		
	1956	200		
	2100	35		98
12/27/78	0300	300*	1.497	
68	1135	400*		
	11	100		
	1630	300*		96
	1708	100*		
	1905	100		
	1935	100		
	2000	100		
	2230	100	End 2400 (4 days)	
Start 12/28/78 of Period to 11:30	~~0322 11 1250~~	~~463 137 160~~	1.847 for Period	96
				1500 - 96

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
12/31/78	0120	300		80%	
69	309	600			
	0440	600			
	0745	200			
	0815	200			
	0845	200			
	1045	200			
	1130	350			
	1330	320 *			
	1430	225 *			(F & B Per SC)
	1800	200 *			
	1850	200 *			
2300				82%	
1/1/79	0030	300 *			
70	0100	200 *			
	0800	√300 *			
	1200	√200			Noisy SC
	1510	√200			Noisy SC
	1541	√150			
	1825	~~[illegible]~~			added H_2 to MUT
	~~[illegible]~~	~~[illegible]~~			
		~~[illegible]~~			
	2105	500 *			

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
1/2	0040	350*		83%	
71	0745	(2900)			F & B re SC
	1000	300			Large leakage
	1010	300			" "
	1025	700			" "
	2300		[illegible]	52%	
1/3	0320	286			BAMT
72	0815	600*			RCBT
	1150	150			Demin
	1250	300			
	1325	(250)			F & B
	1420	200			
	2035	400			
	2300		[illegible]	90%	
1/4	0225	300			
73	0300	(400)*			F & B re SC
	0715	500*			
	1030	50			
	1120	150			Large leakage
	1157	150			" "
	1920	500*			" "
	2200	200*			" "

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
1/5	0746	120		90%	
74	1026	200			
	1100	200			
	1115	300			
	1145	200			
	1200	(200)			F&B
	1445	20			
	1520	25			
	1600	25			
	2300			95%	
1/6	1135	100			
75	1157	(100)			F&B
	1215	(100)			F&B
	1919				2301-3D1 Sat.
	2300			92%	
	2330	100*			
1/7	0125	600*			
76	0312	100*			
	0740	100*			
	0955	467*			
	"	133*			
	1834	436*			
	"	130			
	2010	200			

WATER ADDITIONS FROM CRO LOG

ATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
/7	2300	.		90%	
/8	0255	600*			
77	0510	200*			
	0914	100 *			
	"	50			
	1050	50			
	1115	50			
	1150	50			
	1715	500*	/		
	2245	500*			
/9	2300			90%	
78	1251	600*			
	1710	450*			
	2140	200*			
	2210	200*			
	2242	200*			
/10	0350	200*		60%	
29	1445	57			BA
	1800	200			
	2033	500*			
	2300			60	
~~/11~~	~~0144~~				~~added H2 2½ bottles 154~~
	~~0240~~	~~400~~			
	0445	400			
	0945 1040 1115	1020 1000 410			

WATER ADDITIONS FROM CRO LOG

DATE	TIME	AMOUNT	TOTALS	POWER	COMMENTS
[illegible]	1430			Rx critical	
	2300			.4%	
1/11	0145			60%	Added H_2 2# bottles 15#
80	0240	400#			
	0455	400#			
	0945	1020#			Feed and Bleed
	1040	1000#			Feed and Bleed
	1115	410#			
	1500	25			
	1145	400#			
	"	200#			
	1825	(200)			F&B
	2005	485#			
	2300			90%	2301 - 3D1 Lat - .1688 gpm

Date	Time	Water in	Sampling	Power
~~12/28~~	~~1345~~	~~700~~		~~F...~~ TRIP
	~~1345~~	~~300~~		To 83% ...
~~at 1500~~	~~Commenced~~		at 1522	1/2 ...
~~Power escalation~~			FW Pump Trip	To 90% ... 4/79
~~1/4/79~~	~~0100~~			[illegible]
1/10/79	0000		START	
	0300	200		
	1445	57	1,024	
	1800	200		60%
	2033	500		
~~12/11/79~~	~~2240~~	100	END	
12/11/79	0240	400		Varies
1/11 only	0495	400		?
	0945	1020		
	1050	1000		
	1145	410		
	1500	25		

12/23, 24, 25

1/12, 13, 14

1/31 2/1, 2

2/10, 11, 12

2/22, 23, 24

3/18, 19, 20

Date	Time	Water in	[illegible]	1/11 - 1/14
1/12/79 81	0300	388*	90%	3.0985
	"	211*		
	5.45	200*		
	615	200*		
	0905	200*		
	0915	200*		
	0925	200*		
	0955	200		noisy
	1050	200*		
	1324	400*		
	1805	450*		
	"	150*		
	2035	100*		
	"	100*		
1/13/79	0130	600*		3.0194
	0610	600*		
	1000	117*		
	1200	900*		
	2145	900*	END	
~~1/14/79~~	~~0430~~	~~600~~		
				3859 for Period

Date	Time	Water add Gal	% Power	
2/3/79	0000	ST	92	~~5.38~~ 1459 [illegible] Feed & Bleed
82	0215	300		
	0245	300		
	1705	600 *		
	2112	300 *		
2/4/79	0135	450 *		
83	0432	300 *		
	1116	556 *		
	1915	600 *		
	2050	200 *		
2/5	0210	200 *		
84	0515	200 *		
	0600	150 *		
	1007	350 *		
	1353	300 *		
	1718	300 *		
	2030	100		} noisy
	2115	100		
	2130	100		
	2920	150	END	
~~85~~ 2/6	0000	END		
2/7				~~Rate of F & B~~
2/8	0000	ST	89	1695
85	0025	200 *		noisy
	0205	150 *		~~noisy~~
	1250	200 *		
	1750	200 *		
	1800	200 *		
	1825	200 *		
	1845	200 *		
	1900	200 *		
	2330	200 *		
2/9	0000	End		

Date	Time	Water	a/c Power	
2/12/79	0000	start	90% ±2%	2.156
86	0755	200 *		
	0810	(200)	} Feed & Bleed	
	0825	(200) *		
	1058	200 *		
	1428	300 *		
	1435	200 *		
	1750	626 *		
~~2/13/79~~	2345	300 * ✓		
2/13/79	0130	300 *		1.655
87	0955	200 *		
	1210	150 *		
	1435	200 *		
	1700	469 *		
	~~1900~~ "	190 *		
	2225	200 * ✓		
2/14/79	0720	70 *		1.293
88	0755	160 *		Found during rec exam
	0942	55 *		0125-500 *
	1210	400 *		0200-200 *
	1635	100 *		0545-200 *
	1645	50 *		
	1705	50 *		
	1740	50 *		
	1825	400 * ✓		
2/15/79	0125	500 *		2.945
89	0200	200 *		
	0545	200 *		
	0915	600 *		
	1345	600 *		
	1845	400 *		
	2315	300 *		
	2345	240 * ✓		
2/16/79	0405	300 *		1.889
90	0415	250 *		
	0745	200 *		
	0825	200 * cont.		

Date	Time	Water	% Power	
2/16/79 con	1033	100 #	90% ± 2%	
	1050	100 #		Found on re-exam
	1110	100 #		1250 - 204 #
	3 hrs missing	1201 to 1500		1400 - 200 #
2/16	1505	200 #		
	1850	200 #		
	2050	300 # ✓		
2/17/79	0000	350 #		2.373
91	0920	400 #		On Re Ex 0740 - 15 #
	1122	200 #		
	0150	250 #		
	1520	250 #		
	1845	500 #		
	2230	500 # ✓		
✓ 2/18/79	0245	541 #		2.349
92	"	234 #		
	0415	200 #		
	0635	200 #		
	0807	150 #		
	0854	150 #		
	1025	100 #		
	1320	150 #		
	1455	100 #		
	1550	200 #		
	2005	200 #		
	2225	200 # ✓		
2/19/79	0305	500 #		2.479
93	0750	300 #		
	1000	306 #		
	1025	201 #		
	1137	152 #		
	1545	500 #		
	2000	100 #		
	2115	500 # ✓		
2/20/79	0030	236 #		3.894
94	"	540 #		
	0355 con	200 #		

Date	Time	Water	d/a Recorder	
2/20/79 cont.	0435	150 *	90% ± 2%	
	0455	200 *		
	0530	200 *		
	0555	200 *		
	0608	200 *		
	0625	200 *		
	0700	200 *		
	1430	594 *		
	1610	400 *		
	1820	200 *		
	2203	350 *		
	"	150 *		
2/21/79 95	0210	550 *		3.196
	0415	450 *		
	0630	500 *		
	1154	555 *		
	"	245 *		
	1815	200 *		
	1850	500 *		
	2130	100 *		
	2340	200 *		
2/22/79 96	0000	300 *		3.698
	0026	300 *		
	0100	300 *		
	0240	200 *		
	0640	117 *		
	"	271 *		
	0920	300 *		
	1115	400 *		
	1217	200 *		
	1440	300 *		
	1740	420 *		
	"	180 *		
	2015	180 *		
	2123	200 *		
	2245	150 *		
2/23/79 97	0012	300 *		3.390
	0300	350 cont. *		

Date	Time	Water	o/c Power	
2/23/79 cont.	0550	500 *	90% ± 2%	
	0720	250 *		
	1135	150 *		
	1445	150 *		
	1550	450 *		
	1800	100 *		
	1836	100 *		
	1955	150 *		
	2110	200 *		
	2244	418 *		
	"	182 *		
	2335	200 *		3,353
2/24/79 98	0623	200 *		
	0722	800 *		
	08(3)32	205 *		
	0943	417 *		
	1305	400 *		
	1525	150 *		
	"	110 *		
	1740	200 *		
	"	230 *		
	1805	100		
	1900	150 *		
	2045	100 *		
	"	200 *		
	2345	200 *		4,179
2/25/79 99	0315	500 *		
	0545	500 *		
	0815	450 *		
	0940	500 *		
	1020	500		not Found on Strip chart
	1340	300 *		
	1430	200 *		
	1700	483 *		
	"	217 *		
	1830	115 *		
	1940	150 *		
	2058	150 *		
	2345	250 *	2400 END	14 days

Date	Time	water	% Power	
2/27/79	0000	start	97%	1920 - 200 gal
	0600	1000		2035 - 150
	0620	200		2245 - 103
	0900	200		59
Skip	0955	150		
	1010	200	Lowered Power	
	1150	200		
	1210	200		
100	1225	200		
	1542	200		
	"	150		
	1603	200		
	1725	200		
2/28/79	0010	Start	98%	4.133
101	0016	200 *		
	0211	200 *		
	0251	410 *		
	0458	600 *		
	0730	200 *		
	0845	200 *		
	1007	200 *		
	1230	300 *		
	1325	300 *		
	1615	400 *		
	"	200 *		
	1720	107 *		
	1850	100 *		
	"	250 *		
	2005	100 *		
	2027	150 *		
	2158	200 *		
	2330	150 *		
3/1/79	0215	150		3.309
102	0250	150		
	0400	150		
	0445	150		
	0545	500		
	0735	200 cont		

Date	Time	Water	% power	
3/1/79 cont.	0805	150	98%	
	0925	150		
	0951	150		
	missing on copy	150		
	1217	200		
	1245	200		
	1530	203		
	1630	200		
	1743	266		
	1955	150		
	2023	300 ✓		
3/2/79	0005	340		4.291
103	"	200		
	0255	300		
	0430	340		
	"	200		
	0705	150		
	0850	150		
	1000	400		
	1035	200		
	1305	200		
	1325	200		
	1600	250		
	1705	250		
	1850	250		
	2050	150		
	2140	250		
	2235	150		
	2330	450 ✓		
3/3/79	0230	250 *		3.791
104	"	240 *		
	0335	150 *		
	0522	150 *		
	0540	300 *		
	0745	150 *		
	0902	200 *		
	1040	300 *		
	1150	150 *		

cont.

Date	Time	Water	% Power
3/3/79 sat.	1225	150	98%
	1335	150	
	1420	150	
	1505	150	
	1615	150	
	1700	287	
	1840	287	
	2030	150	
	2215	150	
	2355	400	
3/4/79	0130	200	4697
1Ch	"	200	
	0240	238	
	0535	200	
	"	200	
	0650	186	
	0900	300	
	0950	200	
	1120	300	
	1438	200	
	1525	199	
	1659	395	
	1800	400	
	1840	- 462	
	1950	193	
	2055	300	
	2150	200	Only 200
	2310	200	
	2345	200	

end

Shut down on 3/6
SU on 3/7

Date	Time	Water	% Power	
3/8/79	0000	Start	98%	~~4.044~~
106	0110	200 ✗		5.500
	0152	250 ✗		
	0403	228 ✗		
	0625	200 ✗		
	0830	250 ✗		
	0845	250 ✗		
	0903	200 ✗		
	0946	200 ✗		
	0950	100 ✗		
	0952	200 ✗		
	1024	200 ✗		
	1100	250 ✗		
	1250	400 ✗		
	1350	200 ✗		
	1535	200 ✗		
	1550	150 ✗		
	1650	200 ✗		
	1710	200 ✗		
	1730	200 ✗		
	1755	400 ✗		
	1930	300 ✗		
	1950	200 ✗		
	2030	250 ✗		
	2215	200 ✗		
	2320	250 ✗		
3/9/79	0045	255 ✗		5.410
107	0223	300 ✗		
	0315	150 ✗		
	0415	180 ✗		
	0540	250 ✗		
	0615	200 ✗		
	0910	586 ✗		
	"	14 ✗		
	1155	300 ✗		
	1230	600 ✗		
	1246	300 ✗		
	1420	300 ✗ cont		

Date	Time	Water	% Power	
3/9/79 cont	1525	200 ☆	98%	
107	1540	200 ✓		
	1730	200 ✓		
	1750	200 ✓		
	~~1855~~ 1900	250 ✓		
	2020	300 ✓		
	2135	300 ✓		
	2315	500 ✓		5.422
3/10/79	0105	300 ✓		
108	0230	400 ✓		
	0316	400 ✓		
	0500	300 ✓		
	0745	600 ✓		
	0746	100 ✓		
	0814	100 ✓		
	0852	200 ✓		
	0914	200 ✓		
	0921	200 ✓		
	0950	200 ✓		
	1115	600 ✓		
	1505	100 ✓		
	1555	200 ✓		
	1730	300 ✓		
	1845	300 ✓		
	1930	100 ✓		
	2015	250 ✓		
	2120	250 ✓		
	2230	250 ✓	5598	
	2340	248 ✓	5598	
3/11/79	~~[illegible]~~ 0040	248 ✓		5.103
109	0150	250 ✓		
	0320	250 ✓		
?	0500	20		
	"	(250) additional unknown amt. entered.	Feed & Bleed	
	0615	250 ✓		
	0728	510 ✓		
actually a →	"	90 ✓		
	0840	300 ✓ cont.		

Date	^{10} Time	Water	^{to} Power	
3/11/79 109	0955	300 ✓	98%	
	1200	300 ✓		
	1400	450 ✓		
	1500	300 ✓		
	1537	300 ✓		
	1711	300 ✓		
	1825	200 ✓		
	1850	200 ✓		
	2000	200 ✓		
	2100	150 ✓		
	2115	200 ✓		
	2223	200 ✓		
3/12/79 110	0010	400 ✓		4.707
	0130	300 ✓		
	0325	300 ✓		
	0415	300 ✓		
	0620	300 ✓		
	0717	600 ✓		
	0846	200 ✓		
	0903	100 ✓		
	1005	200 ✓		
	1024	100 ✓		
	1242	100 ✓		
	1320	100 ✓		
	1520	150 ✓		
	1615	250 ✓		
	1650	250 ✓		
	1721	160 ✓		
	1900	250 ✓		
	1945	200 ✓		
	2015	200 ✓		
	2207	200 ✓		
	22[illegible]0	200 ✓		
3/13/79 111	0010	300 ✓		5.464
	0100	250 ✓		
	0315	251 ✓		
	0510	250 ✓		
	0545	250 ✓ cont.		

Date	Time		Water	% Power
3/13/79 cont.	0745	427	✓	98%
11	"	223	✓	
	0910	200	✓	
	0920	150	✓	
	1040	240	✓	
	1200	305	✓	
	1220	250	✓	
	1400	320	✓	
	"	80	✓	
	1510	200	✓	
	1610	200	✓	
	1715	200	✓	
	1810	250	✓	
	1915	200	✓	
	2007	200	✓	
	2050	200	✓	
	2150	200	✓	
	2230	200	✓	
	2320	45	✓	
	"	250	✓	
3/14/79	0025	250	✓	5.927
12	0109	230	✓	
	0200	250	✓	
	0333	250	✓	
	0434	250	✓	
	0530	250	✓	
	0625	250	✓	
	0745	300	✓	
	0815	250	✓	
	1020	200	✓	
	"	589	✓	
	1100	150	✓	
	1230	300	✓	
	1250	200	✓	
	1510	200	✓	
	1525	200	✓	
	1545	200	✓	
	1705	300	✓	

cont.

Date	Time	Water	% Power	
3/14/79 Cont.	1740	200 ✓	98%	
112	1925	300 ✓		
	1933	200 ✓		
	2040	200 ✓		
	21 45	200 ✓		
	2200	200 ✓		
	2330	200 ✓		
3/15/79	0050	400 ✓		5.291
113	0230	350 ✓		
	"	150 ✓		
	0435	350 ✓		
	0625	350 ✓		
	0848	400 ✓		
	1235	350 ✓		
	1400	300 ✓		
	1505	400 ✓		
	1630	300 ✓		
	1740	150 ✓		
	"	150 ✓		
	1900	150 ✓		
	"	450 ✓		
	2023	300 ✓		
	2115	300 ✓		
	2213	200 ✓		
	2340	207 ✓		
	2350	206 ✓		
3/16/79	0050	300 ✓		5.945
	0155	300 ✓		
114	0300	100 ✓		
	0330	300 ✓		
	0515	300 ✓		
	0540	300 ✓		
	0730	600 ✓		
	0835	200 ✓		
	0905	200 ✓		
	1025	200 ✓		
	1240	400 ✓		
	1345	200 ✓		
	1431	125 ✓ Cont.		

Date	Time	Water	% Power	
3/16/79 cont. 114	1606	400 ✓	98%	
	1700	200 ✓		
	1830	400 ✓		
	1915	100 ✓		
	1930	100 ✓		
	2050	200 ✓		
	2130	200 ✓		
	2222	200 ✓		
	2300	200 ✓		
	2345	200 ✓		7.140
3/17/79 115	0010	200 ✓		
	0010	200 ✓		
	0150	400 ✓		
	0230	200 ✓		
	0323	200 ✓		
	0405	300 ✓		
	0510	200 ✓		
	0550	200 ✓		
	0635	200 ✓		
	0826	800 ✓		
	0845	350 ✓		
	0920	250 ✓		
	1210	425 ✓		
	1245	250 ✓		
	1330	250 ✓		
	1415	250 ✓		
	1637	500 ✓		
	1743	353 ✓		
	1845	144 ✓		
	1900	500 ✓		
	2100	300 ✓		
	2130	300 ✓		
	2240	300 ✓		
	2315	300 ✓		6.667
3/18/79 116	0040	300 ✓		
	0220	300 ✓		
	0240	300 ✓		
	0315	250 ✓ cont.		

Date	Time	Water	% Power	
3/18/79 cont.	0345	450		
116	0505	207		
	0600	150		
	0625	200		
	0845	657		
	"	267		
	1000	200		
	1045	200		
	1300	196		
	"	406		
	1416	200		
	1534	200		
	1545	200		
	1626	200		
	1800	200		
	1900	600		
	2015	400		
	2145	200		
	2230	200		
	2301	200		
	2345	200		
3/19/79	0050	200		5.450
117	0100	200		
	0157	200		
	0230	200		
	0315	200		
	0355	200		
	0450	200		
	0505	200		
	0615	200		
	0637	200		
	0800	600		
	0930	300		
	1035	200		
	1200	450		
	1425	200		
	1525	300		
	1620	400 cont.		

Date	Time	Water	% Power	
3/19/79 cont.	1730	300 ✓		
117	1750	250 ✓		
		27 ✓		
	2035	150		
	2105	150 ✓		
	2247	159 ✓		
	2253	141 ✓		
3/20/79	0002	200 ✓		7.024
118	0050	200 ✓		
	0120	300 ✓		
	0225	200 ✓		
	0245	150 ✓		
	0330	200 ✓		
	0455	200 ✓		
	0555	250 ✓		
	0640	200 ✓		
	0725	250 ✓		
	0750	250 ✓		
	0828	250 ✓		
	0925	250 ✓		
	0955	400 ✓		
	1020	250 ✓		
	1105	250 ✓		
	1220	300 ✓		
	1438	400 ✓		
	1545	252 ✓		
	1622	100 ✓		
	1623	400 ✓		
	1805	400 ✓		
	1855	100 ✓		
	1900	300 ✓		
	2044	200 ✓		
	2138	200 ✓		
	2210	200 ✓		
	2252	200 ✓ cont		

Date	Time	Water	% Power	
3/20/79 cont.	2305	400 ✓		
3/21/79	0020	200 ✓		7.471
119	0100	400 ✓		
	0126	200 ✓		
	0256	100 ✓		
	0329	200 ✓		
	0405	200 ✓		
	0417	100 ✓		
	0455	200 ✓		
	0605	200 ✓		
	"	50 ✓		
	0715	250 ✓		
	0802	250 ✓		
	0850	250 ✓		
	0930	250 ✓		
	1040	350 ✓		
	"	150 ✓		
	1245	250 ✓		
	1330	250 ✓		
	1400	250 ✓		
	1515	150 ✓		
	1605	502 ✓		
	1700	804 ✓		
	1730	100 ✓		
	1745	157 ✓		
	1815	500 ✓		
	1930	300 ✓		
	2050	300 ✓		
	2100	200 ✓		
	2301	200 ✓		
	2330	400 ✓		
3/22/79	0016	200 ✓		6.876
120	0055	200 ✓		
	0145	200 ✓		
	0211	200 ✓		

cont.

Date	Time	Water	% power	
3/22/79 cont.	0256	400 ✓		
120	0353	200 ✓		
	0432	200 ✓		
	0507	200 ✓		
	0522	200 ✓		
	0607	200 ✓		
	0755	489 ✓		
		10 ✓		
	1315	600 ✓		
	1410	400 ✓		
	1530	250 ✓		
	1635	250 ✓		
	1730	350 ✓		
	1835	350 ✓		
	1900	450 ✓✓		
	1925	250		
	2017	250 ✓		
	2140	450 ✓		
	2205	250 ✓		
	2305	300 ✓		
3	2345	250 ✓		
3/23/79	0015	300 ✓		7,652
121	0110	300 ✓		
	0220	300 ✓		
	0250	300 ✓		
	0325	300 ✓		
	0350	200 ✓		
	0435	300 ✓		
	0450	200 ✓		
	0525	250 ✓		
	0630	200 ✓		
	0740	250 ✓		
	0750	300 ✓		
	0900	300 ✓		
	1100	300 ✓		

cont.

Date	Time	Water	Power	
3/[illegible]/79 cont.	1130	300 ✓		
12[illegible]	1250	300 ✓		
	1423	400 ✓		
	1430	200 ✓		
	1532	500 ✓		
	1655	500 ✓		
	1800	500 ✓		
	1920	300 ✓		
	2030	300 ✓		
	2150	500 ✓		
	2305	300 ✓		
3/24/79	0010	500 ✓		8.475
122	0137	300 ✓		
	0150	200 ✓		
	0330	200 ✓		
	0352	200 ✓		
	0445	300 ✓		
	0535	100 ✓		
	0600	100 ✓		
	0630	50 ✓		
		50 ✓		
	0735	600 ✓		
	0843	200 ✓		
	1001	200 ✓		
	1034	200 ✓		
	1225	400 ✓		
	1321	400 ✓		
	1525	750 ✓		
	1530	100 ✓		
	1650	300 ✓		
	1700	300 ✓		
	1845	600 ✓?	unclear markover	
	1915	300 ✓		
	1930	400 ✓		
	2227	250 ✓		

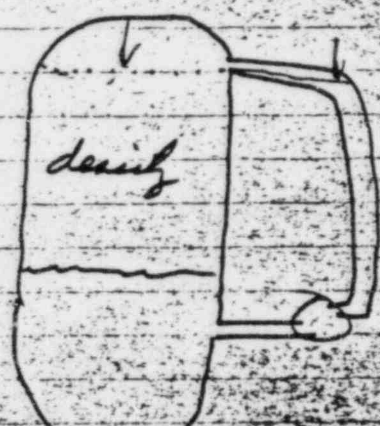
cont.

79-11
should be applied to new systems.

Date	Time	Water	% Power		
3/24/79 cont	2055	250 ✓			
[illegible]	2105	350 ✓			
	2222	450 ✓			
122	"	100 ✓			
	2315	300 ✓			
	2350	300			
3/25/79	0250	307 ✓			6.012
[illegible]	0450	300 ✓			
	0500	300 ✓			
123	0608	300 ✓			
	0636	200 ✓			
	0845	300 ✓			
	1045	300 ✓			
	1130	300 ✓			
	1215	300 ✓			
	1330	300 ✓			
	1407	300 ✓			
	1440	300 ✓			
	1505	300 ✓	Wally 600		
	1545	300 ✓			
	1800	300 ✓			
	1915	600 ✓			
	2115	600 ✓			
	2255	600 ✓			
3/26/79	0020	200 ✓			7.700
124	"	300 ✓			
	0110	300 ✓			
	0145	200 ✓			
	0220	200 ✓			
	0305	300 ✓	Feed and Bleed		
	0315	100 ✓			
	0325	350 ✓			
	"	200 ✓			
	0540	200 ✓			
	0610	200 ✓ cont			

Don't ever remember going critical
on group 5

Date	Time	Water	Power	
3/26/79 cont.	0645	200 ✓		
125'	0800	200 ✓		
	0835	200 ✓		
	0900	200 ✓		
	1000	300 ✓		
	1118	300 ✓		
	1145	300 ✓		
	1240	300 ✓		
	1530	700 ✓		
	1730	700 ✓		
	1945	700 ✓		
	2130	700 ✓		
	2300	300 ✓		
	2315	300 ✓		
3/27/79	0005	300 ✓		7.264
125	0043	300 ✓		
	0130	300 ✓		
	0415	300 ✓		
	0523	450 ✓		
	0625	300 ✓		
	0705	300 ✓		
	0757	200 ✓		
	0840	300 ✓		
	0933	300 ✓		
	1035	350 ✓		
	1135	300 ✓		
	1215	300 ✓		
	1314	300 ✓		
	1410	400 ✓		
	1545	600		
	1725	600 ✓		
	1925	600 ✓		
	2210	300 ✓		
	2240	400 ✓	added 300 gal at 2300	
	2315	300 ✓		20 drys



= 12' 12'

15# ≈ 1 gal

H_2

K - 3

GENERATION MAINTENANCE SYSTEM
MANUAL PERFORMANCE FORM

SCHED. DATE ______________

DATE ISSUED

REFERENCE MANUAL ______________

DEPT RESP - ______________

TASK NO. - ______________

PROCEDURE NO.
2301-3D1

WORK ORDER NO. - ______________

ACCOUNT NO. - ______________

GC CODE - ______________

COMPONENT NO. - ______________

COMPONENT DESC - ______________

PLANT CONDITION (MODE) SU(2) OP(1) HD(4) CD(5) RF(6) HS(3) LR(1)

FREQUENCY ______ COMPONENT STATUS ______

SPECIFIC DAY ______ INTERFERENCE ______

PRIORITY ______

COMP. LOCATION - BDG ______ LVL ______ GRID ______

PART NO	QUAN	SPEC EQUIPMENT

DEPENDENT TASKS	ASSIST DEPT

	SIGNATURE	DATE	RWP NO	TAG NO
SHIFT FOREMAN APPROVAL TO COMMENCE WORK				
QC NOTIFIED BEFORE STARTING WORK (IF APPLICABLE ONLY)				
COMPONENT RETURNED TO SERVICE (SHIFT FOREMAN)				

TXN. CD. (1-3)	ACT. (4)	COMPONENT NUMBER: SYS. (5-)	COMP. TYPE	COMP. ID.	Lp (16)	LOCATION/UNIT (17-22)	TYPE TASK (23-24)	TASK IDENTIFICATION (25-32)	SCHEDULE NUMBER (33-38)
400	A	TMI	2301	3D · 1		036002	TS	2301-3D1	79 0810 M

RESULTS (51) COMPLETE THIS SECTION (401A)

DATE PERFORMED (39): MONTH 03 DAY 21 YEAR 79

CHECK ONE ONLY
- (X) 1 PERFORMED OK
- ( ) 2 EXCEPTIONS
- ( ) 3 DEFICIENCIES
- ( ) 4 BOTH E S AND D S
- ( ) 5 NOT PERFORMED

ACTUAL MANHOURS (45) 00000.5
ACTION TAKEN CODE (52)
REASON NOT PERFORMED (54)

PERFORMED BY EMPLOYEE NUMBER (60) 064704 SIGNATURE - ______________

APPROVED BY EMPLOYEE NUMBER (65) 005455 SIGNATURE - ______________

WITNESSED BY EMPLOYEE NUMBER (70) SIGNATURE - ______________

CORRECTIVE MAINTENANCE JOB TICKET NUMBER (75)

403A (1) DUPLICATE AS ABOVE (5-38)

402 (1) DUPLICATE AS ABOVE (5-38)

RESULTS DESCRIPTION

01 (39)
(61)

ASSISTING DEPARTMENTS

CODE (39)
HOURS(44)

404A (1) DUPLICATE AS ABOVE (5-38)

01 (39)
(61)

CODE (50)
HOURS(55)

rcs1

DATE: 3/21/79
TIME: 1:14:33

REACTOR COOLANT LEAKAGE TEST
SP 2301-3D1

NOTE: IF OPERATOR ACTION DECREASES RCS VOLUME THE DATA ENTRY FOR THAT ACTION MUST BE NEG
...YOU MUST ENTER DEC. PT. WITH LEAKAGE VALUE...

DESIRED INTERVAL (1-8 HOURS)
1
ENTER OPERATOR CAUSED CHANGES TO THE RCDT FROM DS 4 (2301-3D1)
0
ENTER OPERATOR CAUSED CHANGES FROM DS 4 (2301-3D1)
207.
ENTER IDENTIFIED LEAKAGE FROM DS 3 (2301-3D1) (GPM)
0
ENTER PRIMARY TO SECONDARY OTSG TUBE LEAK (GPM)
0

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (INCHES)
1:14:56:	556.036	605.700	557.041	605.727	581.492	225.301	75.730	76.000
2:14:56:	556.041	605.555	557.430	605.516	581.201	225.100	71.462	79.440

GROSS LEAK RATE (<30 GPM): 6.0519 GPM

TOTAL IDENTIFIED RCS LEAK RATE (<10 GPM): 4.1833 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM): 1.8580 GPM

OPERATOR: Earl O. Hemmila

APPROVED: C Guthrie

CORRECTED — .22 GPM

STOP 0

"EVALUATION"

1001

1001-4

Three Mile Island Nuclear Station

SIDE 2

Nuclear Safety/Environmental Impact Evaluation

1. Procedure 2301-3D1 (No.) RCS Inventory (Title) Temporary Change Notice No

2. Nuclear Safety Evaluation

Does the attached procedure change:

* (a) increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety? . . . . . yes ☐ no ☑
* (b) create the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report? . . . . . yes ☐ no ☑
* (c) reduce the margin of safety as defined in the basis for any technical specification? . . . . . yes ☐ no ☑

Details of Evaluation (Explain why answers to above questions are "no". Attach additional pages if required.)

Change more accurately takes into account RC leakage collected and cooled in the RCDT. Change does not affect any operating conditions, and has no effect on nuclear safety

Evaluation By T E Morck Date 3/11/79

3. Environmental Impact Evaluation

Does the attached procedure change:

(a) possibly involve a significant environmental impact? . . . . . yes ☐ no ☐
(if 3(a) is "yes", answer questions (b) and (c) and fill in "Details of Evaluation" below. If "no", state why by filling in the "Details of Evaluation" below) . . . . . yes ☐ no ☐

* (b) have a significant adverse effect on the environment? . . . . . yes ☐ no ☐
* (c) involve a significant environmental matter or question not previously reviewed and evaluated by the N.R.C. . . . . . yes ☐ no ☐

Details of Evaluation (Attach additional pages if required)

N/A

Evaluation By ______ Date ______

4. Unit Superintendent requests PORC review ☐ Check if YES.

5. Approval

Evaluation Accompanying PCR

[signature] 3/11/79
Unit Superintendent Date

Evaluation Accompanying TCN

Approval ______ SRO Licensee ______ Date

Reviewed ______ Member of Plant Staff ______ Date

Approval ______ Unit Superintendent ______ Date

* 11 The Evaluation "Accompanying a PCR" evaluation and approval chain may be followed at anytime.

AP 1001

Figure 1001 - 5

NOTE Instructions and guidelines in AP 1001 must be followed when completing this form.

Three Mile Island Nuclear Station
Temporary Change Notice (TCN)

SIDE 1

TCN NO. 2 77 (From TCN List)

Unit No. 2

Date 3/16/79

1 Procedure 2301-3D1 (No) RCS Inventory (Title)

2. Change (Include page numbers, paragraph numbers, and exact wording of change.)

see attached.

3. Reason for Change:

To more ~~acc~~ accurately account for RCS leakage collected in the drain tank.

4 Recommended by JE Morck 3/16/79 (Date) 5. JE Morck (Supervisor's Signature) 3/16/79 (Date)

6 Duration of TCN - No longer than ninety days from effective date of TCN or as in (a) or (b) below whichever occurs first.

(a) TCN will be cancelled by a procedure revision issued as a result of a Procedure Change Request to be submitted by MORCK (Supervisor Submitting TCN) (Submit PCR as soon as possible) [X]

(b) TCN is not valid after ______ (fill in circumstances which will result in TCN being cancelled) [ ]

7. (a) Is the procedure on the Nuclear Safety Related Procedure List? (Sec. AP 1001 – Appendix B) If "Yes", complete Nuclear Safety Evaluation. (Side 2 of this Form) Yes [X] No [ ]

(b) Is the procedure on the Environmental Impact Procedure List? (Sec. AP 1001 – Appendix B) If "Yes", complete Environmental Evaluation. (Side 2 of this Form) Yes [ ] No [X]

(c) Does the change effect the intent of the original procedure? Yes [X] No [ ]

NOTE: If all answers are "no" the change may be approved by the Shift Supervisor. If question (c) is answered "yes", the change must be reviewed by the PORC and approval by the Station/Unit Superintendent prior to implementation. If the answer to question (c) is "no" the change may be approved by two members of the plant management staff at least one of whom holds a senior reactor operators license on the unit affected in accordance with paragraph 3.6.4.2 of AP 1001.

8. Review and Approval

Block (c) "yes"

Approved [signature] (Shift Supervisor/Foreman) 3/16/79 (Date)

Reviewed JE Morck 3/16/79

Members JR Floyd 3/16/79

Of PORC [signature] 3/16/79

RW Bensel 3/16/79

Contacted RF Wagner 3/16/79 (PORC Members) (Date)

Approved [signature] (Unit Superintendent) 3/16/79 (Date)

Block (c) "no"

Approved ______ (SRO License) ______ (Date)

______ (Member Plant Mrg. Staff) ______ (Date)

Reviewed ______ (Chairman of PORC) ______ (Date)

Approved ______ (Unit Superintendent) ______ (Date)

NOTE The block (c) "Yes" review and approval chain may be followed at anytime.

9. Approval

Manager, Generation Quality Assurance ______ Date ______

NOTE M.G.Q.A. approval required only on certain Administrative Procedures listed in Enclosure 7 of AP 1001

10. TCN is Cancelled ______ (Shift Supervisor/Shift Foreman) ______ (Date)

Attachment 1A

Note: This attachment is not valid if operator caused RCDT level changes w...

...cord RCDT temperature (from computer pt 1032) 1.5

(B) Calculate density (in $\frac{lb}{ft^3}$) of water in RCDT. Use line A, an assumed pressure of 15 psia, and ... Table 1. Interpolate

	0 psia	500 psia
50°F	.016024	.015998
100°F	.016130	.016106

(Density $[\frac{lb}{ft^3}] = \frac{1}{v} [\frac{1}{ft^3/lb}]$) Density = 62.1

(C) Calculate density of RC. Use average Tave and Figure 1.

Density = 44.57 $\frac{lb}{ft^3}$

(D) Convert identified leak rate, collected in RC drain tank, to equivalent RC gallons.

Ident Leak Rate (from print-out) 4.1839 × $\frac{\text{Density of RCDT line B} \quad 62.1}{\text{Density of RCS line C} \quad 44.57}$

RC equivalent Identified Leak Rate = 5.8294 gpm.

(E) Subtract Equivalent Identified Leak Rate from Total Leak Rate to get Unidentified.

Attachment 1A ... cont.

Total Leak Rate	6.6619		
− Equiv Ident Leak Rate	5.4344	gpm	3.992
Net Unident Leak Rate	.2275	gpm	2.813
		gpm.	1.116

Accept Criteria

Total Leak Rate must be < 30 gpm.

Total Identified Leak Rate must be < 10 gpm.

Net Unidentified Leak Rate must be < 1 gpm.

CONTROL ROOM CONTROLLED COPY

FILE COPY

1303-1.1 K-4
Revision. 7
05/25/76

THREE MILE ISLAND NUCLEAR STATION
UNIT #1 SURVEILLANCE PROCEDURE 1303-1.1
REACTOR COOLANT SYSTEM LEAK RATE

Table of Effective Pages

Page	Date	Revision	Page	Date	Revision	Page	Date	Revision
1.0	05/02/75	4						
2.0	05/02/75	4						
3.0	05/02/75	4						
4.0	10/14/75	5						
4.1	10/14/75	5						
5.0	05/02/75	4						
6.0	05/02/75	4						
7.0	05/02/75	4						
8.0	05/25/76	7						
9.0	05/02/75	4						
10.0	05/02/75	4						
11.0	10/14/75	5						
12.0	05/02/75	4						
13.0	05/02/75	4						
14.0	05/02/75	4						
15.0	05/02/75	4						
16.0	10/14/75	5						
17.0	05/02/75	4						
18.0	05/02/75	4						
19.0	05/02/75	4						
20.0	05/02/75	4						
21.0	05/02/75	4						
22.0	02/17/76	6						
23.0	02/17/76	6						
24.0	02/17/76	6						

Unit 1 Staff Recommends Approval

Approval N/A Date ______
Cognizant Dept. Head

Unit 1 PORC Recommends Approval

C.E. Hartman Date 5-24-76
VICE Chairman of PORC

PORC comments of N/A (date) included

By ______ ______ Date ______

Unit 2 Staff Recommends Approval

Approval ______ Date ______
Cognizant Dept. Head
N/A

Unit 2 PORC Recommends Approval

______ Date ______
Chairman of PORC

PORC comments of N/A (date) included

By ______ Date ______

Approval J. J. Colitz Date 5-25-76
Station Superintendent/
Unit Superintendent

TMI-55-8 11-74

Revision 4
MAY 2 - 1975

THREE MILE ISLAND NUCLEAR STATION

UNIT #1 SURVEILLANCE PROCEDURE 1303-1.1

RC SYSTEM LEAK RATE

Required Interval -

Daily, when RCS temperature > 525°oF.

1.0 PURPOSE

To evaluate reactor coolant system leakage in accordance with Technical Specification Table 4.1-2 item 7.

2.0 PLANT STATUS

2.1 Reactor coolant system temperature is greater than 525°F.

2.2 The Make-Up Tank level is between 66" and 96".

2.3 The pressurizer level is greater than 200".

2.4 Reactor power, temperature and pressure are in a steady state condition. (i.e. initial and final conditions approximately the same.)

3.0 LIMITS AND PRECAUTIONS

3.1 Avoid addition and removal of water from the reactor coolant and Make-Up systems during this test. The following operations should not be conducted during this test:

a. Make-Up or chemical addition to the make-up system.

b. Sampling of the RCS or make-up system.

c. Venting or draining of the RCS or make-up system.

d. Changing purification demineralizers or make-up filters in service.

e. Boration or deboration.

3.2 The RCS and makeup system should be maintained in a steady state condition during this test. Changes in valve line-ups, coolers-in-service, pumps-in-service, etc. should be avoided.

3.3 For the most accurate determination of the RCS leak rate, the initial and final conditions of reactor power, RCS temperature, pressure and pressurizer level should be identical.

3.4 The same sources should be used when recording initial and final RCS temperature, pressurizer level, make-up tank level and RCDT level. Differences in sources could be misinterpreted as RCS leakage when comparing successive readings.

3.5 Minimize power level variations during this test.

4.0 LOCATION OF SYSTEM/ASSEMBLY

NOTE: See enclosure two for sources of data.

4.1 The computer is the favored source of information.

4.2 If two or more inputs are not obtainable on the computer, the patch panel is to be used to obtain the required data.

5.0 EQUIPMENT

5.1 Equipment for use on patch panel.

5.1.1 Digital voltmeter capable of reading ± 10 VDC.

5.1.2 Leads for patch panel to voltmeter.

6.0 PROCEDURE

6.1 If the computer is available, initiate the "Reactor Coolant Leakage Test" as detailed in Enclosure II. Data sheets for hand calculations are provided for use as follows:

Data Sheet	For Use When
1303-1.1.1.1	Computer is operational

but not available for RCS program.

1303-1.1.1.2 Computer not operational

6.2 If a hand calculation is being performed, obtain the applicable data sheet (see step 6.1) and take the initial set of data. After a minimum of one hour, take the final set of data and determine the net RCS leak rate as per instructions on the data sheet.

6.3 If changes to the RCS inventory must be made during the performance of this test, they must be accounted for using Data Sheet 1303-1.1.3. Operations such as adding water to the Make Up Tank or sampling the RCS may be accounted for in this manner.

6.4 If the net RCS leakage is excessive as defined by the acceptance criteria in section 7, proceed as follows:

6.4.1 Perform another determination of the RCS leak rate.

6.4.2 Insure that no un-accounted for operator action has occurred that would change the RCS inventory. (See section 3.1 for a listing of possibilities). If such an action has occurred, it invalidates the measurement. Enter this in the "Remarks" section of the data sheet, clearly describing the action that invalidated the measurement.

6.4.3 Initiate action to determine the source of leakage. Check items such as:

a. Proper valve line-up.

b. Valve stem leakage.

c. Make-up pump packing glands.

d. Relief valves not seated properly.

6.4.4 If sources of leakage are found, initiate data sheet 1303-1.1.2.

a. Document completely the source of leakage. (Example: MU-V-159A stem leakage through packing gland).

b. Determine the leak rate. The most perferred method is to collect the leakage in a calibrated container. (Obtain from Chemistry Dept.) over a known period of time. Use data sheet 1303-1.1.2 to document the method used to determine the leak rate. Include: Model # & Serial # of DVM used, description of other equipment used, length of measurement and quantity of leakage collected (Example: Used 50 cc graduated cylinder to collect 40 cc of water in 10 seconds.)

c. Determine the leak rate and enter on Data Sheet 1303-1.1.2.

This quantity may be subtracted from the net RCS leakage (Line 8C of Data Sheet 1303-1.1.1 and 1.1.2).

d. The Shift Supervisor shall make the initial determination of the safety implications of the leak. If he decides that there are possible safety implications, he shall notify the proper personnel in accordance with AP 1014.

7.0 ACCEPTANCE CRITERIA

7.1 If the gross reactor coolant leakage rate (Item 7 of Data Sheet) exceeds 10 gpm, the reactor shall be placed in hot shutdown within 24 hours of detection.

7.2 If unidentified reactor coolant leakage (Item 9 of Data Sheet) exceeds 1 gpm of the reactor shall be placed in hot shutdown within 24 hours of detection.

7.3 If any reactor coolant leakage is evaluated as unsafe, the reactor shall be placed in hot shutdown within 24 hours of detection.

7.4 If any reactor coolant leakage exists through a non-isolable fault in a RCS strength boundary (such as the reactor vessel, piping, valve body, etc., except the steam generator tubes), the reactor shall be shutdown, and cooldown to the cold shutdown condition shall be initiated within 24 hours of detection.

7.5 If reactor shutdown is required by criteria 7.1, 7.2, 7.3, or 7.4, the rate of shutdown and the conditions of shutdown shall be determined by the safety evaluation for each case and justified in writing as soon thereafter as practicable.

7.6 Action to evaluate the safety implication of reactor coolant leakage shall be initiated within four hours of detection. The nature, as well as the magnitude, of the leak shall be considered in this evaluation. The safety evaluation shall assure that the exposure of offsite personnel to radiation is within the guidelines of 10 CFR 20.

7.7 If reactor shutdown is required per Specification 7.1, 7.2, 7.3, the reactor shall not be restarted until the leak is repaired or until the problem is otherwise corrected.

7.8 Loss of reactor coolant through reactor coolant pump seals and system valves to connecting systems which vent to the gas vent header and from which coolant can be returned to the reactor coolant system shall not be considered as reactor coolant leakage and shall not be subject to the consideration of the above criteria except that such losses when added to leakage shall not exceed 30 gpm. If leakage plus losses exceeds 30 gpm the reactor shall be placed in hot shutdown within 24 hours of detection.

DATA SHEET 1303-1.1.1.1

For Use When Computer is Available

Initial Conditions - To be taken at one minute intervals

		Computer Point	T_1		T_2		T_3			
Line 1	Time		______		______		______			T_2= ____
Line 2a	T_C Loop A	510	______	+	______	+	______	=	____	÷3= ____
Line 2b	T_H Loop A	508	______	+	______	+	______	=	____	÷3= ____
Line 2c	T_C Loop B	513	______	+	______	+	______	=	____	÷3= ____
Line 2d	T_H Loop B	509	______	+	______	+	______	=	____	÷3= ____
Line 2e	Unit Tave	(Sum of Lines 2a, 2b, 2c and 2d ÷ 4)							____	÷4= ____
Line 3	Przr Level	1720	______	+	______	+	______	=	____	÷3= ____
Line 4	MU T_k Level	498	______	+	______	+	______	=	____	÷3= ____
Line 5	RCDT Level	Patch Panel DVM	______	+	______	+	______	=	____	÷3= ____

Final Conditions - To be taken at one minute Intervals

		Computer Point	T_1		T_2		T_3			
Line 6	Time		______		______		______			T_2= ____
Line 7a	T_C Loop A	510	______	+	______	+	______	=	____	÷3= ____
Line 7b	T_H Loop A	508	______	+	______	+	______	=	____	÷3= ____
Line 7c	T_C Loop B	513	______	+	______	+	______	=	____	÷3= ____
Line 7d	T_H Loop B	509	______	+	______	+	______	=	____	÷3= ____
Line 7e	Unit Tave	(Sum of Lines 7a, 7b, 7c and 7d ÷ 4)							____	÷4= ____
Line 8	Przr Level	1720	______	+	______	+	______	=	____	÷3= ____
Line 9	MU Tk Level	498	______	+	______	+	______	=	____	÷3= ____
Line 10	RCDT Level	Patch Panel DVM	______	+	______	+	______	=	____	÷3= ____

NOTE: Carry Algebraic signs through all steps.

1. Mass change due to RCS Temperature change.

(use line 2e and Figure 1 to determine density)

Line 11 a. Initial Density ________ lbm/ft^3

(use line 7e and figure 1 to determine density)

Line 12 b. Final Density ________ lbm/ft^3

c. RCS Volume change (line 11 minus line 12 x 10,673)

Line 11 ______

Minus Line 12 ______

Line 13 10,673 ft^3 x ______ lbm/ft^3 = ________ lbm

2. Mass change in Pzrz. Level

(Line 3 minus Line 8 x 120.8)

Line 3 ______

Minus Line 8 ______

Line 14 120.8 $\frac{lbm}{in}$ x ______ in = ________ lbm

3. Mass change in MU Tank Level

(Line 4 minus Line 9 x 250 lbm/inch)

Line 4 ______

Minus Line 9 ______

Line 15 250 $\frac{lbm}{in}$ x ______ in = ______ lbm

4. Total RCS Mass Change

(Algebraic sum of lines 13, 14 and 15)

Line 13 ______ Tave change of mass

Line 14 ______ Pressurizer mass change

Line 15 ______ MUT mass change

Line 16 ______ lbm

5. Total RCS change in gallons

a. Mean Tave (line 2 plus line 7; ÷ 2)

Line 2e____°F

+Line 7e____°F

Line 17 ____÷ 2 = ____°F

b. Use figure 2 and Line 17 to find

Line 18 conversion factor from lbm to gallons: ____gal/lbm

c. RCS Inventory change (Line 16 times line 18)

Line 16 _____lbm

Line 19 xLine 18______gal/lbm=____gal

d. Operator caused changes to system

Line 20 (from data sheet 1303-1.1.3):____gal

e. Total RCS leakage plus losses

(Algebraic sum of lines 19 and 20)

Line 19 ____

Line 20 ____

Line 21 ____gal.

6. Total leakage plus losses

a. Duration of Test (Line 6 minus Line 1)

Line 6 _____h____m

-Line 1 _____h____m

Line 22 _____h____m = ______min

b. Leak Rate (Line 21 divided by Line 22)

Line 21 ____

Line 23 ÷Line 22 ____ = ____gpm

LIMIT: Line 23 shall not exceed 30 gpm (see acceptance criteria 7.8)

7. Gross Leak Rate

a. Mass change in RCDT

(Line 5 minus line 10 x 3540 lbm/volt)

Line 5_____

-Line 10 ___

Line 24 _____v x 3540 lbm/volt = ____lbm

b. RCDT change in gallons

(Line 24 times Line 18)

Line 24 _____

xLine 18 _____ (Conversion factor)

Line 25 = _____ gal

c. Operator caused changes to the RCDT

Line 26 (from date sheet 1303-1.1.3):____gal

d. Gross RCS Leakage

(Algebraic sum of Lines 21, 25 and 26)

Line 21 ____Total RCS Leakage + Losses

Line 25 ____RCDT increase (considered RCS losses)

Line 26 ____RCDT change by operator

Line 27 ____gal

e. Gross RCS leak rate (identified and unidentified leakage)

(Line 27 divided by line 22)

Line 27 ____

Line 28 ÷Line 22 ____=____gpm

LIMIT: Line 28 shall not exceed 10 gpm. (See Acceptance Criteria 7.1)

8. Corrections (identified leakage)

   a. Evaporative losses -.51 gpm

   b. RCPump Seal #3 Purge +.28 gpm

   c. Identified leakage - _____ gpm (sign is minus)

      (from data sheet 1303-1.1.2)

Line 29 Total (Algebraic sum) _____ gpm

9. Net unidentified RCS Leak Rate

   Algebraic sum of lines 28 and 29

   Line 28 ____

   Line 29 ____

Line 30 ____ gpm

LIMIT: Line 30 may not exceed 1 gpm (See Acceptance Criteria 7.2 and section 6.4 for action)

Remarks: ____

____

____

____

____

DVM Model # ____________________ Serial # ______________

______________________ ____________
Performed by Date

______________________ ____________
Approved by Date

DATA SHEET 1303-1.1.1.2

For Use When Computer is Not Available

Initial Conditions - To be taken at one minute intervals

		Patch Panel Point	T_1		T_2		T_3			
Line 1	Time		____		____		____			T_2=____
Line 2	Tave	40	____	+	____	+	____	=____		÷3=____
Line 3	Przr level	27	____	+	____	+	____	=____		÷3=____
Line 4	MU Tank	15	____	+	____	+	____	=____		÷3=____
Line 5	RCDT	DVM	____	+	____	+	____	=____		÷3=____

Final Conditions - To be taken at one minute intervals

		Patch Panel Point	T_1		T_2		T_3			
Line 6	Time		____		____		____			T_2=____
Line 7	Tave	40	____	+	____	+	____	=____		÷3=____
Line 8	Przr Level	27	____	+	____	+	____	=____		÷3=____
Line 9	MU Tank	15	____	+	____	+	____	=____		÷3=____
Line 10	RCDT	DVM	____	+	____	+	____	=____		÷3=____

Caution: When using patch panel voltage, be sure to record the voltage polarity (+ or -) and treat this as an algebraic sign.

NOTE: Carry Algebraic Signs Through all Steps

1. Volume change due to RCS temperature

a. Temperature conversions

1) Initial temperature (570 minus, line 2 times 5):

$570^{o}F$ - (Line 2____x5) = ____^{o}F

<u>Line 11</u>

2) Final temperature (570 minus line 7 times 5):

$570^{o}F$ - (Line 7____x5) = ____^{o}F

<u>Line 12</u>

b. Initial Density (use Line 11 and figure 1

<u>Line 13</u> to determine density) ____lbm/ft^3

c. Final Density (use line 12 and figure 1

<u>Line 14</u> to determine density) ____lbm/ft^3

d. RCS volulme change (line 13 minus line 14, times 10,673)

Line 13 ____

-Line 14-____

<u>Line 15</u> 10,673 ft^3 x ____=____lbm

2. Volume change in Pszr level

(Line 3 minus Line 8 x 120.8)

Line 3 ____

-Line 8-____

<u>Line 16</u> 120.8 lbm/in x ____in=____lbm

3. Volume change in MU Tank Level

(Line 4 minus line 9; times 250)

Line 4 ____

-Line 9-____

<u>Line 17</u> 250 lbm/in x ____in=____lbm

4. Total RCS Mass change

(Algebraic sum of lines 15, 16 and 17)

Line 15 _____ Tave change of mass

Line 16 ______ Pressurizer mass change

Line 17 ______ MUT mass change

Line 18 ______ lbm

5. Total RCS change in gallons

a. Mean Tave (Line 11 plus Line 12; ÷ 2)

Line 11 ______ °F

+Line 12 ______ °F

Line 19 ______ ÷ 2= ______ °F

b. Use figure 2 and line 19 to find

Line 20 conversion factor from lbm to gallons: ______ gal/lbm

c. RCS Inventory change (line 18 times line 20)

Line 18 ______ lbm

Line 21 xLine 20 ______ gal/lbm = ______ gal

d. Operator caused changes to system

Line 22 (from data sheet 1303-1.1.3): ______ gal

e. Total RCS leakage plus losses

(Algebraic sum of lines 21 and 22)

Line 21 ______

+line 22 ______

Line 23 ______ gal.

6. Total leakage plus losses

a. Duration of test (line 6 minus line 1)

Line 6 ____h____m

-Line 1 ____h____m

Line 24 ____h____m = ______ min

b. Leak rate (line 23 divided by line 24)

Line 23 ______

Line 25 ÷Line 24 ______ = ______ gpm

LIMIT: Line 25 shall not exceed 30 gpm (see Acceptance Criteria 7.8)

7. Gross leak rate

a. Mass change in RCDT

(Line 5 minus line 10 x 3540 lbm/volt)

Line 5 ______

-Line 10 ______

Line 26 ______ v x 3540 lbm/volt = ____ lbm

b. RCDT change in gallons

(Line 26 times line 20)

Line 26 ______

xLine 20 ______ (Conversion factor)

Line 27 = ______ gal

c. Operator caused changes to the RCDT

Line 28 (from data sheet 1303-1.1.3): ______ gal

d. Gross RCS leakage

(Algebraic sum of lines 23, 27 and 28)

Line 23 ______ Total RCS leakage + losses

Line 27 ______ RCDT increase (considered RCS losses)

Line 28 ______ RCDT change(by operator)

Line 29 ______ gal

e. Gross RCS leak rate (identified and unidentified leakage)

(line 29 divided by line 24)

Line 29 ______

Line 30 ÷Line 24 ______ = ______ gpm

LIMIT: Line 30 shall not exceed 10 gpm. (see Acceptance Criteria 7.1)

8. Corrections (identified leakage)

a. Evaporative losses -.51 gpm

b. RCPump Seal #3 Purge +.28 gpm

c. Identified Leakage - ____gpm (sign is negative) (from data sheet 1303-1.1.2)

Line 31 Total (Algebraic sum) _____gpm

9. Net unidentified RCS Leak Rate (Algebraic sum of lines 30 and 31)

Line 30 _____

Line 31 _____

Line 32 _____gpm

LIMIT: Line 32 may not exceed 1 gpm. (See Acceptance Criteria 7.2 and section 6.4 for action)

Remarks: ____

____

____

____

DVM Model #_________________ Serial #_________________

________________________ Performed by ________ Date

________________________ Approved by ________ Date

Revision 4
MAY 2 - 1975

Data Sheet 1303-1.1.2

IDENTIFIED LEAKAGE

1. Source of Leakage
(Describe in detail, attach drawings if necessary)

2. Method used to determine leak rate
(Describe briefly)

3. Leak Rate: ______________ gpm
(For use in step 8.c of Data Sheet 1303.1.1.1.1 and 1.1.1.2

______________________ Performed By ________ Date

4. Possible Safety Implications
(Shift Supervisor Check One)

________ Yes (Initiate necessary action)

________ No Explain ______________________________

____

____

____

______________________ Shift Supervisor ________ Date

Data Sheet 1303-1.1.3

OPERATOR CAUSED CHANGES TO RCS INVENTORY

1. Identify operation that caused change: ______________________________

____

____

____________ ____

____

2. Time Operation Started: ____________________

Time Operation Completed: __________________

3. Calculations

4. Total change to RCS inventory: ____________________ gal.

NOTES: 1) If change is to RCDT enter in section 7 of Data Sheet 1303-1.1.1.1 and 1303-1.1.1.2

2) If change is to any other part of the system, enter in section 5 of Data Sheet 1303-1.1.1.1 or 1.1.1.2

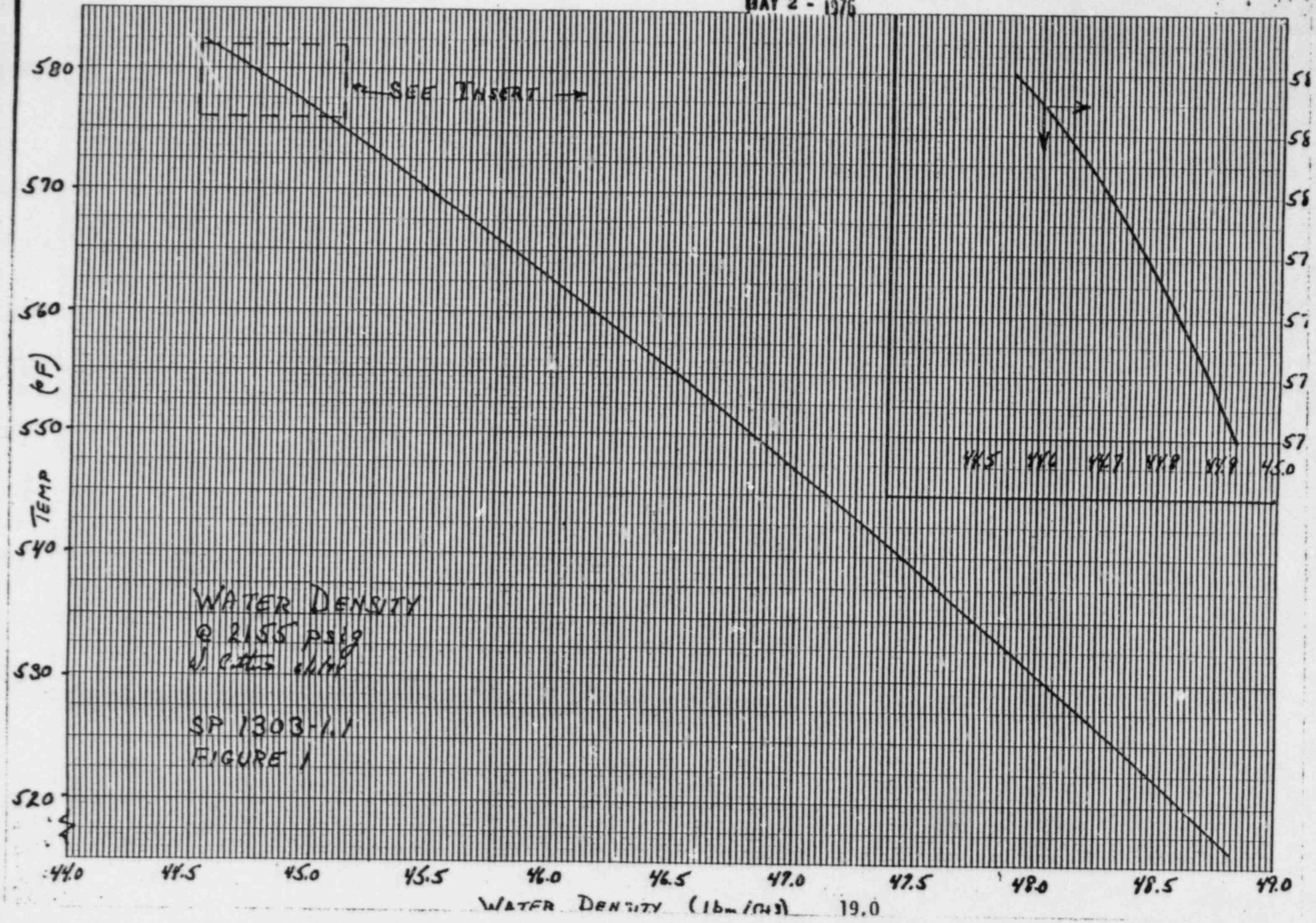
3) SIGNS: Removals from the system have a negative (-) sign. Additions to the system have a positive (+) sign.

____________________________________ Performed By   ______________ Date

____________________________________ Approved By   ______________ Date

K•E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1320

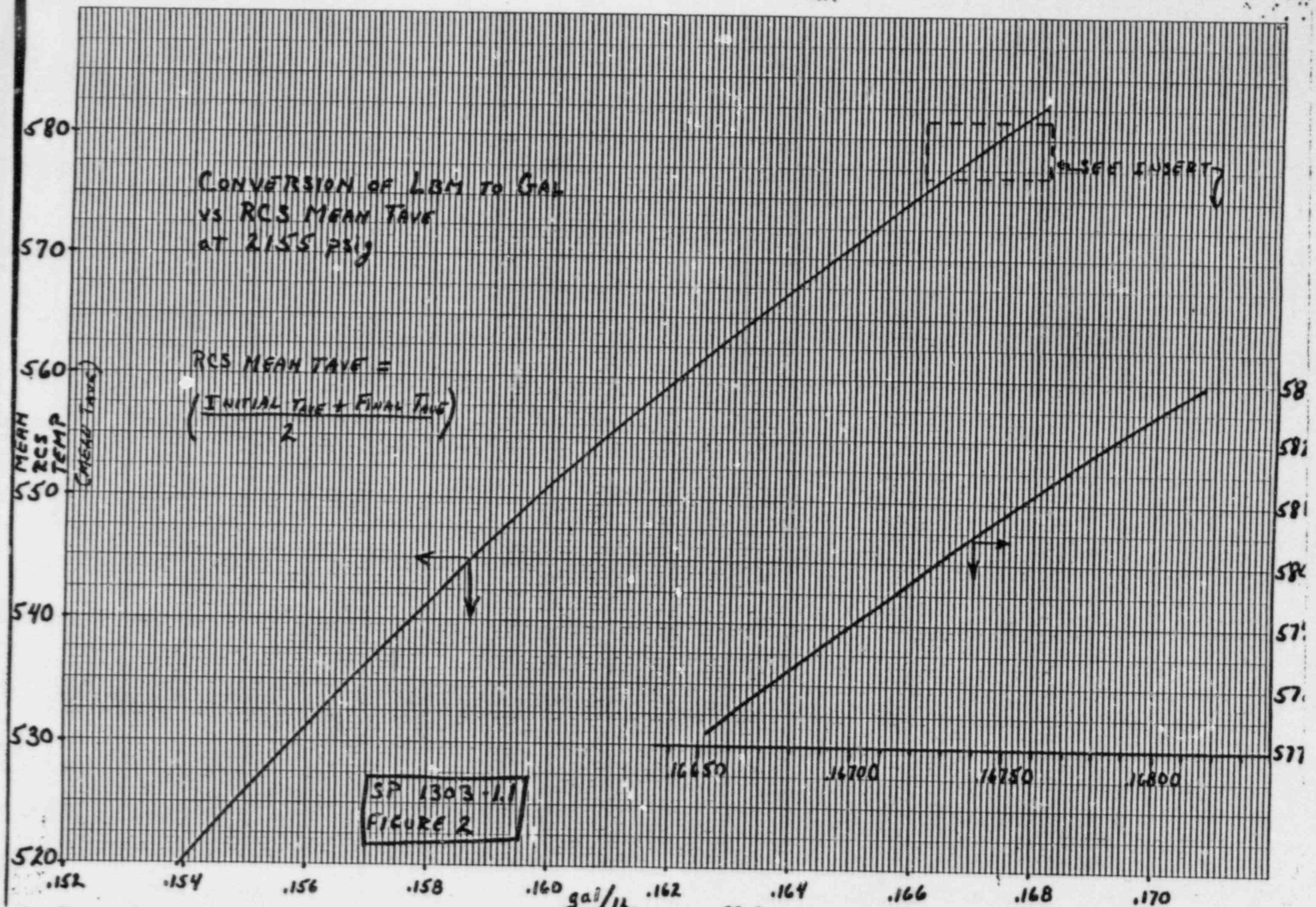
Revision 4
MAY 2 - 1976



19.0

K•E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1320

Revision 4
MAY 2 - 1975



ENCLOSURE I

SOURCES OF DATA

PARAMETER	COMPUTER POINT	CONTROL ROOM INSTRUMENTATION	PATCH PANEL POINT	RANGE	(VDC) OUTPUT	MULTIPLIER
Tave	508 Loop A T_C 510, 511, 512 Loop A T_H 509 Loop B T_C 513, 514, 515 Loop B T_H	RC 7-TAR or RC 8-DT 1	40 (unit Tav)	520-620°F	+10 to -10	T=570-(5xvolts)
Pressurizer Level	1720 1721 1722	Control Console Center Panel	27	0-400 in	+10 to -10	4000 lbm/volt
Make-up Tank Level	498	Control Console Center Panel	15	0-100 in	-10 to +10	-1250 lbm/volt
Reactor Coolant Drain Tank Level	DVM at Patch Panel	Level Recorder LWDS Panel	71	0-120 in	0-to +10	3540 lbm/volt

Note: Patch Panel Data may be obtained from the voltmeters installed for a cooldown from outside the Control Room

ENCLOSURE II

Computer Determination of RC

Leak Rate

E.2.1.0 PURPOSE

This program is designed to perform all the calculations accomplished on Data Sheet 1303-1.1.1.1. The plant computer will automatically gather all inputs and average three minute intervals of the initial and final readings. This program is run from the programmer's console of the Bailey 855 computer. It may be run at any time the programmer's console is not being used by another program.

E.2.2.0 PROCEDURE

E.2.2.1 Turn on the programmer's selectric typewriter next to the Bailey 855 computer. Be sure that the "OUTPUT SELECT" switch is on "UTILITY COMPUTER."

E.2.2.2.1 If the computer printout on the selectric shows a question mark (?), type "r", then depress the "Return" Key. The computer will respond with an exclamation mark (!). Proceed to E.2.2.2.2.

E.2.2.2.2 If the printout on the selectric shows an exclamation mark (!), type "RC" and then press the "Return" key. (See sample printout: Attachment 1)

E.2.2.3 The computer will then request the time interval over which the test is to be run. Any interval from 1 to 8 hours in one hour intervals may be choosen. Enter a single digit, then press the "Return" Key.

E.2.2.4 The computer will now request known leakage. Enter "Identified Leakage" (as determined by Data Sheet 1303-1.1.2) in gallons per minute. Enter operator caused changes to the RCDT or the RCS (as detailed on Data Sheet 1303-1.1.3) in gallons.

<u>CAUTION</u>: For the above entries, be sure to enter a decimal point. If no decimal point is entered, the computer will insert one according to the format it expects to see.

E.2.2.5 The computer will now print out all required data. Be sure to attach data sheets detailing any entries made in step E.2.2.4.

ATTACHMENT 1

!rc

DATE: 01/20/75
TIME: 16: 3:38

REACTOR COOLANT LEAKAGE TEST
SP 1303-1.1

DESIRED INTERVAL (1-8 HOURS)
1

ENTER IDENTIFIED LEAKAGE FROM DS 1303-1.1.2 (GPM)

ENTER RCDT CHANGE (GAL)

ENTER RCS CHANGE (GAL)

TIME	TCA (F)	THA (F)	TCB (F)	THB (F)	TAVE (F)	PRZR LVL (IN)	MUTK LVL (IN)	RCDT LVL (VOLT)
16: 3:54	556.977	601.055	556.250	600.719	578.750	238.311	79.603	8.925
16: 8:54	557.031	601.070	556.180	600.719	578.742	230.178	79.095	8.945

LEAKAGE PLUS LOSSES (<30 GPM): 0.0473 GPM

GROSS RCS LEAK RATE (<10 GPM): -0.1463 GPM

NET UNIDENTIFIED LEAK RATE (<1 GPM) -0.3763 GPM

OPERATOR:

APPROVED:

K-5

Calculator printer strip copies with Program and data from sump leak rate calculations done in 1980

K-5

Page 1

```
000  91 R/S
001  99 PRT
002  91 R/S
003  99 PRT
004  98 ADV
005  91 R/S
006  42 STO
007  11  11
008  99 PRT
009  75  -
010  91 R/S
011  42 STO
012  12  12
013  99 PRT
014  95  =
015  65  ×
016  43 RCL
017  01  01
018  65  ×
019  43 RCL
020  02  02
021  95  =
022  42 STO
023  10  10
024  99 PRT
025  98 ADV
026  91 R/S
027  99 PRT
028  42 STO
029  21  21
030  75  -
031  91 R/S
032  99 PRT
033  42 STO
034  22  22
035  95  =
036  65  ×
037  43 RCL
038  03  03
039  65  ×
040  43 RCL
041  04  04
042  95  =
043  44 SUM
044  10  10
045  99 PRT
046  98 ADV
047  91 R/S
048  99 PRT
049  42 STO
050  31  31
051  75  -
052  91 R/S
053  99 PRT
054  42 STO
055  32  32
056  95  =
057  65  ×
058  43 RCL
059  05  05
```

```
060  95  =
061  44 SUM
062  10  10
063  99 PRT
064  98 ADV
065  43 RCL
066  10  10
067  99 PRT
068  55  ÷
069  43 RCL
070  06  06
071  65  ×
072  43 RCL
073  07  07
074  95  =
075  42 STO
076  20  20
077  99 PRT
078  55  ÷
079  06  6
080  00  0
081  95  =
082  99 PRT
083  98 ADV
084  98 ADV
085  98 ADV
086  91 R/S
087  00  0
088  00  0
089  00  0
090  00  0
091  00  0
```

```
        0.      00
   0.0775       01
   10678.       02
    3.208       03
 37.70739       04
     255.       05
 62.42197       06
   7.4805       07
        0.      08
```

```
000  00  0
001  00  0
002  00  0
003  00  0
004  00  0
005  00  0
006  00  0
007  00  0
008  00  0
009  00  0
010  00  0
```

```
020  76 LBL
021  16 A'
022  91 R/S
023  42 STO
024  00  00
025  01  1
026  00  0
027  01  1
028  99 PRT
029  91 R/S
030  99 PRT
031  42 STO
032  01  01
033  01  1
034  00  0
035  02  2
036  99 PRT
037  91 R/S
038  99 PRT
039  42 STO
040  02  02
041  01  1
042  00  0
043  03  3
044  99 PRT
045  91 R/S
046  99 PRT
047  42 STO
048  03  03
049  01  1
050  00  0
051  04  4
052  99 PRT
053  91 R/S
054  99 PRT
055  42 STO
056  04  04
057  01  1
058  00  0
059  05  5
060  99 PRT
061  98 ADV
062  98 ADV
063  91 R/S
064  76 LBL
065  11  A
066  42 STO
067  05  05
068  02  2
069  00  0
070  01  1
071  99 PRT
072  91 R/S
073  76 LBL
074  12  B
075  99 PRT
076  42 STO
077  06  06
078  02  2
```

Page 2

```
079  00  0
080  02  2
081  99  PRT
082  91  R/S
083  76  LBL
084  13  C
085  99  PRT
086  42  STO
087  07  07
088  02  2
089  00  0
090  03  3
091  99  PRT
092  91  R/S
093  76  LBL
094  14  D
095  99  PRT
096  42  STO
097  08  08
098  02  2
099  00  0
100  04  4
101  99  PRT
102  91  R/S
103  76  LBL
104  15  E
105  99  PRT
106  42  STO
107  09  09
108  02  2
109  00  0
110  05  5
111  99  PRT
112  98  ADV
113  43  RCL
114  00  00
115  99  PRT
116  43  RCL
117  05  05
118  42  STO
119  00  00
120  43  RCL
121  07  07
122  75  -
123  43  RCL
124  02  02
125  95  =
126  99  PRT
127  42  STO
128  10  10
129  43  RCL
130  08  08
131  85  +
132  43  RCL
133  04  04
134  95  =
135  99  PRT
136  42  STO
137  11  11
138  43  RCL
139  10  10
140  65  ×
141  43  RCL
142  20  20
143  85  +
144  43  RCL
145  11  11
146  65  ×
147  43  RCL
148  21  21
149  95  =
150  42  STO
151  12  12
152  43  RCL
153  06  06
154  55  ÷
155  01  1
156  00  0
157  00  0
158  95  =
159  59  INT
160  42  STO
161  13  13
162  43  RCL
163  06  06
164  55  ÷
165  01  1
166  00  0
167  00  0
168  95  =
169  75  -
170  43  RCL
171  13  13
172  95  =
173  65  ×
174  01  1
175  00  0
176  00  0
177  85  +
178  06  6
179  00  0
180  65  ×
181  43  RCL
182  13  13
183  85  +
184  02  2
185  04  4
186  65  ×
187  06  6
188  00  0
189  95  =
190  42  STO
191  14  14
192  43  RCL
193  01  01
194  55  ÷
195  01  1
196  00  0
197  00  0
198  95  =
199  59  INT
200  42  STO
201  13  13
202  43  RCL
203  01  01
204  55  ÷
205  01  1
206  00  0
207  00  0
208  75  -
209  43  RCL
210  13  13
211  95  =
212  65  ×
213  01  1
214  00  0
215  00  0
216  85  +
217  06  6
218  00  0
219  65  ×
220  43  RCL
221  13  13
222  95  =
223  94  +/-
224  85  +
225  43  RCL
226  14  14
227  95  =
228  35  1/X
229  65  ×
230  43  RCL
231  12  12
232  95  =
233  99  PRT
234  98  ADV
235  98  ADV
236  43  RCL
237  06  06
238  42  STO
239  01  01
240  43  RCL
241  07  07
242  42  STO
243  02  02
244  43  RCL
245  08  08
246  42  STO
247  03  03
248  43  RCL
249  08  08
250  42  STO
251  04  04
252  43  RCL
253  09  09
254  42  STO
255  04  04
256  91  R/S
257  00  0
258  00  0
259  00  0
260  00  0
261  00  0
```

```
262   00   0
263   00   0
264   00   0
```

```
           0.      15
           0.      16
           0.      17
           0.      18
           0.      19
278.6485739      20
325.0900028      21
[illegible]      22
           0.      23
           0.      24
           0.      25
           0.      26
           0.      27
           0.      28
           0.      29
           0.      30
           0.      31
           0.      32
           0.      33
           0.      34
           0.      35
           0.      36
           0.      37
```

2nd

```
020  76  LBL
021  16  A'
022  91  R/S
023  42  STO
024  00   00
025  01   1
026  00   0
027  01   1
028  99  PRT
029  91  R/S
030  99  PRT
031  42  STO
032  01   01
033  01   1
034  00   0
035  02   2
036  99  PRT
037  91  R/S
038  99  PRT
039  42  STO
040  02   02
041  01   1
042  00   0
043  03   3
044  99  PRT
045  91  R/S
046  99  PRT
047  42  STO
048  03   03
049  01   1
050  00   0
051  04   4
052  99  PRT
053  91  R/S
054  99  PRT
055  42  STO
056  04   04
057  01   1
058  00   0
059  05   5
060  99  PRT
061  98  ADV
062  98  ADV
063  91  R/S
064  76  LBL
065  11   A
066  42  STO
067  05   05
068  02   2
069  00   0
070  01   1
071  99  PRT
072  91  R/S
073  76  LBL
074  12   B
075  99  PRT
076  42  STO
077  06   06
078  02   2
079  00   0
```

3

Page 3

```
080  02   2
081  99  PRT
082  91  R/S
083  76  LBL
084  13   C
085  99  PRT
086  42  STO
087  07   07
088  02   2
089  00   0
090  03   3
091  99  PRT
092  91  R/S
093  76  LBL
094  14   D
095  99  PRT
096  42  STO
097  08   08
098  02   2
099  00   0
100  04   4
101  99  PRT
102  91  R/S
103  76  LBL
104  15   E
105  99  PRT
106  42  STO
107  09   09
108  02   2
109  00   0
110  05   5
111  99  PRT
112  98  ADV
113  43  RCL
114  00   00
115  99  PRT
116  43  RCL
117  05   05
118  42  STO
119  00   00
120  43  RCL
121  07   07
122  75   -
123  43  RCL
124  02   02
125  95   =
126  99  PRT
127  42  STO
128  10   10
129  43  RCL
130  08   08
131  85   +
132  43  RCL
133  04   04
134  95   =
135  99  PRT
136  42  STO
137  11   11
138  43  RCL
139  10   10
140  65   ×
```

```
141  43 RCL
142  20  20
143  85  +
144  43 RCL
145  11  11
146  65  ×
147  43 RCL
148  21  21
149  95  =
150  42 STO
151  12  12
152  43 RCL
153  06  06
154  55  ÷
155  01  1
156  00  0
157  00  0
158  95  =
159  59 INT
160  42 STO
161  13  13
162  43 RCL
163  06  06
164  55  ÷
165  01  1
166  00  0
167  00  0
168  95  =
169  75  -
170  43 RCL
171  13  13
172  95  =
173  65  ×
174  01  1
175  00  0
176  00  0
177  85  +
178  06  6
179  00  0
180  65  ×
181  43 RCL
182  13  13
183  85  +
184  02  2
185  04  4
186  65  ×
187  06  6
188  00  0
189  95  =
190  42 STO
191  14  14
192  43 RCL
193  01  01
194  55  ÷
195  01  1
196  00  0
197  00  0
198  95  =
199  59 INT
200  42 STO
201  13  13
```

```
202  43 RCL
203  01  01
204  55  ÷
205  01  1
206  00  0
207  00  0
208  75  -
209  43 RCL
210  13  13
211  95  =
212  65  ×
213  01  1
214  00  0
215  00  0
216  85  +
217  06  6
218  00  0
219  65  ×
220  43 RCL
221  13  13
222  95  =
223  94  +/-
224  85  +
225  43 RCL
226  14  14
227  95  =
228  35  1/X
229  65  ×
230  43 RCL
231  12  12
232  95  =
233  99 PRT
234  98 ADV
235  98 ADV
236  43 RCL
237  06  06
238  42 STO
239  01  01
240  43 RCL
241  07  07
242  42 STO
243  02  02
244  43 RCL
245  08  08
246  42 STO
247  03  03
248  43 RCL
249  09  09
250  42 STO
251  04  04
252  91 R/S
253  00  0
254  00  0
255  00  0
256  00  0
257  00  0
```

Page 4

```
          0.   15
          0.   16
          0.   17
          0.   18
          0.   19
278.6485739    20
325.0900028    21
          0.   22
          0.   23
          0.   24
          0.   25
          0.   26
          0.   27

       101.
       630.
       102.
      2.488
       103.
         6.
       104.
         0.
       105.

       201.
       550.
       202.
      2.214
       203.
         2.
       204.
         2.
       205.

    122078.
     -0.274
         2.
.4098787832

       201.
       115.
       202.
      3.167
       203.
         0.
       204.
         1.
       205.

    122178.
      0.953
         2.
.7860361344
```

Page 5

201.
446.
202.
2.453
203.
1.
204.
0.
205.

122278.
-0.714
2.
.2733040121

201.
530.
202.
2.444
203.
1.
204.
1.
205.

122378.
-0.009
1.
0.217373427

201.
455.
202.
2.914
203.
0.
204.
1.
205.

122478.
0.47
1.
.3245941869

201.
630.
202.
3.1
203.
0.
204.
1.
205.

122578.
0.186
1.
0.245549601

201.
600.
202.
2.502
203.
1.
204.
2.?
205.

122678.
-0.598
2.
.3429419564

201.
300.
202.
3.241
203.
0.
204.
2.
205.

122779.
0.739
2.
.6794454776

201.
635.
202.
2.5
203.
2.
204.
1.
205.

122878.
-0.741
4.
.6609555396

201.
300.
202.
2.5
203.
0.
204.
1.
205.

122978.
0.
1.
.2653795942

201.
310.
202.
3.15
203.
1.
204.
2.
205.

123078.
0.65
2.
.5733114336

201.
630.
202.
2.5
203.
1.
204.
1.
205.

123178.
-0.65
3.
.4842368509

201.
-26.
202.
2.267
203.
2.
204.
2.
205.

10179.
-0.233
3.
.8890086824

201.
545.
202.
2.75
203.
1.
204.
1.
205.

10279.
0.483
3.
.6128422251

201.
533.
202.
2.736
203.
1.
204.
3.
205.

10379.
-0.014
2.
.4525762785

201.
630.
202.
2.3
203.
2.
203.
2.3
203.
2.
204.
2. —?
205.

10479.
-0.436
5.
1.004648788

201.
605.
202.
2.255
203.
3.
204.
3.
205.

10579.
-0.045
5.
1.13986631

201.
-40.
202.
2.339
203.
1.
204.
5.
205.

10679.
0.084
4.
1.279001441

201.
-50.
202.
2.369
203.
1.
204.
5.
205.

10779.
0.03
6.
1.369859772

201.
500.
202.
2.54
203.
3.
204.
3.
205.

10879.
0.171
8.
1.479535714

201.
400. —?
202.
2.6
203.
4.
204.
6. —?
205.

10979.
0.06
7.
1.661122416

201.
-55.
202.
3.038
203.
1.
204.
6.
205.

11079.
0.438
7.
2.094042005

201.
0.
202.
2.946
203.
4.
204.
5.
205.

11179.
-0.092
10.
2.157367465
.
201.
250.
202.
2.42
203.
2.
204.
3.
205.

LEAK REPAIRS ?

11279.
-0.526
7.
1.322398056

201.
30.
202.
2.763
203.
3.
204.
4.
205.

11379.
0.343
6.
1.573935752

← S/O TO REPAIR LEAKS FOR INST BODY TO BONNET ISOL VALVES

201.
230.
202.
2.5
203.
2.
204.
3.
205.

11479.
-0.263
6.
1.203368873

101.
630.
102.
2.27
103.
1.
104.
1.
105.

201.
500.
202.
3.111
203.
0.
204.
3.
205.

13179.
0.841
1.
.4143951507

201.
545.
202.
2.359
203.
4.
204.
0.
205.

20179.
-0.752
7.
1.391303901

201.
620.
202.
2.36
203.
1.
204.
1.
205.

20279.
0.001
1.
.2205889162

201.
345.
202.
3.
203.
0.
204.
1.
205.

20379.
0.64
1.
.3917704981

201.
640.
202.
2.3
203.
1. —?
204.
1.
205.

20479.
-0.7
2.
.2818117672

201.
330.
202.
2.75
203.
1.
204.
1. —?
205.

20579.
0.45
2.
.6204574911

201.
235.
202.
2.75
203.
0
204.
1.
205.

20679.
0.
1.
.2347220237

201.
412.
202.
2.5
203.
0.
204.
0 ~~204.~~
205.

20779.
-0.25
1.
.1661859853

20879.		00
412.		01
2.5		02
0.		03
0.		04
20879.		05
412.		06
2.5		07
0.		08
204.		09
-0.25		10
1.		11
255.4278594		12

201.
310.
202.
2.5
203.
1.
204.
2.
205.

20879.
0.
1.
.2359143707

201.
530.
202.
2.5
203.
1.
204.
1.
205.

20979.
0.
3.
.6172594991

201.
438.
202.
2.95
203.
1.
204.
2. —?
205.

21079.
0.45
2.
.5587693544

201.
632.
202.
2.9
203.
3.
204.
5.
205.

21179.
-0.05
5.
1.037012603

201.
537.
202.
2.575
203.
4.
204.
4.
205.

21279.
-0.325
9.
2.047111364

201.
640.
202.
2.5
203.
1.
204.
1.
205.

21379.
-0.075
5.
1.067565783

201.
440.
202.
2.45
203.
1. —?
204.
2.
205.

21479.
-0.05
2.
.4820057401

201.
515.
202.
3.
203.
1.
204.
2.
205.

21579.
0.55
3.
.7651028638

201.
150.
202.
2.924
203.
1.
204.
5.
205.

21679.
-0.076
3.
0.77254471

Page 9

201.
-5.
202.
2.172
203.
3.
204.
2.
205.

21779.
-0.752
8.
1.804661355

201.
420.
202.
2.833333333
203.
1. ?
204.
2.
205.

21879.
.6613333333
3.
.6800877412

201.
-20.
202.
2.519
203.
1.
204.
1. ?
205.

21979.
-.3143333333
3.
.7652426495

201.
50.
202.
2.7
203.
1.
204.
1.
205.

22079.
0.181
2.
0.463983707

201.
145.
202.
2.547
203.
1.
204.
2
205.

22179.
-0.153
2.
.4063858019

201.
0.
202.
2.7
203.
1.
204.
2. ?
205.

22279.
0.153
3
~~[illegible]~~
.7624743373

201.
600.
202.
2.75
203.
0.
204.
1.
205.

22379.
0.05
2.
.3689513524

201.
410.
202.
2.37
203.
1.
204.
1.
205.

22479.
-0.38
2.
.4092432689

201.
600.
202.
2.75
203.
0.
204.
1.
205.

22579.
0.38
1.
.2780493296

201.
310.
202.
2.344
203.
1.
204.
1.
205.

22679.
-0.406
2.
.4228729801

201.
400.
202.
2.6
203.
0.
204.
1.
205.

22779.
0.256
1.
.2660564012

201.
155.
202.
2.702
203.
0.
204.
1.
205.

22879.
0.102
1.
.2688305379

201.
400.
202.
2.68
203.
1.
204.
0.
205.

30179.
-0.022
2.
.4115333783

201.
530.
202.
2.328
203.
1.
204.
0.
205.

30279.
-0.352
1.
.1483697417

201.
530.
202.
2.658
203.
1.
204.
2.
205.

30379.
0.33
1.
.2896139113

201.
110.
202.
2.952
203.
0.
204.
1.
205.

30479.
0.294
2.
.6204260054

201.
535.
202.
2.58
203.
1.
204.
2.
205.

30579.
-0.372
2.
.3205411943

DATA MISSING

201.
101.
152.
102.
2.322
103.
1.
104.
2.
105.

201.
530.
202.
2.463
203.
1.
204.
2.
205.

30879.
0.141
3.
.6119176462

201.
139.
202.
2.924
203.
0.
204.
3.
205.

30879.
0.461
2.
.6440339109

201.
330.
202.
2.6
203.
1. -?
204.
2.
205.

31079.
-0.324
4.
.7801920525

201.
615.
202.
2.5
203.
1.
204.
2.
205.

31179.
-0.1
3.
.5902835833

201.
400.
202.
2.963
203.
0.
204.
2.
205.

31279.
0.463
2.
.5970837512

201.
225.
202.
2.222
203.
1. ?
204.
3.
205.

31579.
-0.128
2.
.5057720068

201.
400.
202.
3.2
203.
1.
204.
3.
205.

31879.
0.2
3.
.7509102136

201.
620.
202.
2.58
203.
1.
204.
1.
205.

31379.
-0.383
3.
.5497136739

201.
600.
202.
2.75
203.
1.
204.
3.
205.

31679.
0.528
4.
.8746141742

201.
545.
202.
2.7
203.
2.
204.
2.
205.

31979.
-0.5
5.
.9618936746

201.
610.
202.
2.35
203.
1. ?
204.
1.
205.

31479.
-0.23
2.
.4098537299

201.
507.
202.
3.
203.
1.
204.
2.
205.

31779.
0.25
4.
.9877593041

201.
550.
202.
3.
203.
2.
204.
2.
205.

32079.
0.3
4.
0.957754037

201.
500.
202.
2.5
203.
2.
204.
3.
205.

32179.
-0.5
4.
.8352774996

201.
530.
202.
3.
203.
1.
204.
2.
205.

32279.
0.5
4.
.9793770737

201.
630.
202.
2.75
203.
0.
204.
3.
205.

32379.
-0.25
2.
.3870119081

201.
354.
202.
3.186
203.
1.
204.
3.
205.

2479.
0.436
4.
1.107360428

201.
600.
202.
2.5
203.
2.
204.
3.
205.

32579.
-0.686
5.
.9158985265

201.
532.
202.
2.696
203.
3.
204.
4.
205.

32679.
0.196
6.
1.420081542

201.
-601.
202.
2.2
203.
0.
204.
0.
205.

32779.
-0.496
4.
1.555756785

K-6

2301-301
Revision 0
08/19/77

DATA SHEET 1

RCS LEAK RATE

For Use When Computer is Available

Initial Conditions - To be taken at one minute intervals

Line	Parameter	Computer Point	t_1	t_2	t_3	Sum	÷	Result
Line 1	Time		1815	1816	1817			t_2= 1816
Line 2a	T_c Loop A	394 ~~393~~	326	+ 325.9	+ 325.9	= 977.8	÷3=	325.9 °F T_{CA}
Line 2b	T_H Loop A	390		+ assume	+ same	= as Tc	÷3=	°F T_{HA}
Line 2c	T_c Loop B	397 ~~396~~	325.1	+ 325.1	+ 3[illegible]	= 975.2	÷3=	325.06 °F T_{CB}
Line 2d	T_H Loop B	391		+ assume	[illegible]	as Tc	÷3=	°F T_{HB}
Line 2e	Unit Tave	(Sum of Lines 2a, ~~2b~~, 2c, and ~~2d~~ ÷ 2)					÷2=	325.48 °F Tave
Line 3	Przr Level	1682	123.9	+ 123.9	124	= 371.8	÷3=	123.93 in L_{PZR}
Line 4	MU T_k Level	347	71.3	+ 71.8	+ 71.2	= 214.3	÷3=	71.43 in L_{MUT}
Line 5	RCDT Level	(Patch Panel DVM #64)	1.88	+ 1.88	+ 1.88	= 5.64	÷3=	1.88 V L_{RCDT}
	RC Pressure		1250	+ 1250	+ 1250	= 3750	÷3=	1250 psig.

Final Conditions - To be taken at one minute intervals.

Line	Parameter	Computer Point	t_1	t_2	t_3	Sum	÷	Result
Line 6	Time		1915	1916	1917			t_2= 1916
Line 7a	T_c Loop A	394 ~~393~~	325.9	+ 325.9	+ 326	= 977.8	÷3=	325.9 °F T_{CA}
Line 7b	T_H Loop A	390		+ assume	same	as Tc	÷3=	°F T_{HA}
Line 7c	T_c Loop B	397 ~~396~~	325.1	+ 325	+ 325	= 975.1	÷3=	325 °F T_{CB}
Line 7d	T_H Loop B	391		+ assume	+ same as	= Tc.	÷3=	°F T_{HB}
Line 7e	Unit Tave	(Sum of Lines 7a, ~~7b~~, 7c, and ~~7d~~ ÷ 2)				650.9	÷2=	325.45 °F Tave
Line 8	Przr Level	1682	124.2	+ 124.5	+ 124.2	= 372.9	÷3=	124.3 in L_{PZR}
Line 9	MU T_k Level	347	69.2	+ 68.7	+ 68.5	= 206.4	÷3=	68.8 in L_{MUT}
Line 10	RCDT Level	(Patch Panel DVM #64)	2.02	+ 2.02	+ 2.02	= 6.06	÷3=	2.02 V L_{RCDT}
	RC Pressure		1250	+ 1250	+ 1250	= 3750	÷3=	1250 psig.

DATA SHEET 1 (cont'd)

NOTE: Carry Algebraic signs through all steps.

1. Mass change due to RCS Temperature change.

(Use line 2e and ~~Figure 1~~ Steam Tables to determine density)

SEE Additional Calculation * (1)

Line 11 a. Initial Density 56.7281 lbm/ft^3

(Use line 7e and ~~Figure 1~~ steam tables to determine density)

Line 12 b. Final Density 56.7291 lbm/ft^3

c. RCS Volume change (line 11 minus line 12 x 10,678* ft^3)

*NOTE: 10,678 ft^3 is the RCS Volume for 582°F minus the pressurizer. For 532°F use 10,673 ft^3. If more accuracy is required for other temperature >525°F use a linearly extrapolated volume. 325°F = 10,645 (2)

Line 11 56.7281 lbm/ft^3

-Line 12 56.7291 lbm/ft^3

Line 13 ~~10,678*~~ 10,645 ft^3 x -.0010 lbm/ft^3 = -10.64 lbm

2. Mass change in Pzrz. Level

(Line 3 minus Line 8 x 120.8 lbm/in)

Line 3 123.93 in

-Line 8- 124.3 in

Line 14 ~~120.8~~ 142.2 lbm/in x -.37 in = -52.6 lbm (3)

3. Mass change in MU Tank Level

(Line 4 minus Line 9 x 255 lbm/inch)

Line 4 71.43 in

-Line 9 68.8 in

Line 15 255 lbm/in x 2.63 in = 670.65 lbm

DATA SHEET 1 (cont'd)

4. Total RCS Mass Change

(Algebraic sum of lines 13, 14, and 15)

Line 13 -10.64 RCS Tave change of mass

Line 14 -52.6 Pressurizer mass change

Line 15 670.6 MUT mass change

Line 16 RCS 607.36 Δlbm

5. Total RCS change in gallons

a. Mean Tave (line 2e plus line 7e ÷ 2)

Line 2e 325.48 °F

+Line 7e 325.45 °F

Line 17 RCS 650.93 ÷ 2 = 325.46 °F T_{MEAN}

b. Use Figure 2 and Line 17 to find (4)

Line 18 Conversion factor from lbm to gallons: 0.131865 gal/lbm

c. RCS Inventory change (Line 16 times line 18)

Line 16 607.36 lbm

Line 19 xLine 18 0.131865 gal/lbm = 80.09 gal = RCS Volume Change

d. Operator caused changes to system

Line 20 (From Data Sheet 4): 0 gal

e. Total RCS Leakage

(Algebraic sum of lines 19 and 20)

Line 19 80.09 gal.

+Line 20 0 gal.

Line 21 RCS = 80.09 gal. Total Leakage

DATA SHEET 1 (cont'd)

6. Total Leak Rate

a. Duration of Test (Line 6 minus Line 1)

Line 6 ·19 h 16 m

-Line 1 18 h 16 m

Line 2 = 1 h 0 m = 60 min

b. Leak Rate (Line 21 divided by Line 22)

Line 21 80.09 ÷ 60

Line 2 ÷Line 22 1,335 = gpm Total Leak Rate (Identified and Unidentified)

7. Identified Leak Rate

a. Volume change in RCDT

(Use Figure 3 for level to volume conversion)

Line 5 1.88 V = 6,504 gal (5)

-Line 10 2.02 V = 6,531 gal

Line 2 RCDT Volume Change = -27 gal

b. Operator caused change to the RCDT

Line 2 (From Data Sheet 4: 0 gal

CAUTION: Removing water from the RCDT should be entered as a negative change to the water inventory.

Line 2 c. Identified leakage: 0 gpm (sign should be minus)

(From Data Sheet 3)

Line 2 d. Primary to Secondary OTSG Tube Leak: 0 gpm (Sign should be minus)

e. Identified Leakage to RC Drain Tank.

(Algebraic sum of Line 24, and 25).

Line 24 ⁻27 RCDT Volume change

Line 25 0 RCDT change by operator

.ne 28 ⁻27 gal Identified RCS Leakage to RCDT

F. Identified Leak Rate to RCDT

Line 28 ⁻27 gal.

Line 29 ÷ Line 22 60 m = ⁻.452 gpm Identified Leak Rate to RCDT (should be negative or zero)

g. Total Identified Leak Rate

(Sum of line 26, 27 and line 29)

Line 26 0 gpm Identified leakage (From Data Sheet 3)

Line 27 0 gpm Primary to Secondary leakage

+ Line 29 ⁻.452 gpm Identified Leak Rate to RCDT

Line 30 ⁻.452 gpm total.

Line 31 Abs value of line 30 .452 gpm total Identified Leakage.

LIMIT: Line 31 shall not exceed 10 gpm. (See Acceptance Criteria 7.1)

Line 27 shall not exceed 1 gpm (See Acceptance Criteria 7.5)

8. Unidentified RCS Leak Rate

(Subtract Line 31 from Line 23)

Line 23 1.335 gpm Total Leak Rate

-Line 31 0.452 gpm Identified Leak Rate

Line 32 0.883 gpm Unidentified Leak Rate (1 gpm maximum)

LIMIT: Line 32 shall not exceed 1 gpm (See Acceptance Criteria 7.2).

REMARKS: Leakage within acceptable limits.

Data from 12/18/78 @ 1815

PERFORMED BY T E Morck DATE 12/19/78

APPROVED BY B Mehler DATE 12-19-78

2301-3D1

Additional Calculations.

To interpolate from steam tables for 325° RC.

°F	PRESSURE 1,000	1265	1500	ρ
300	.017379	.0173599	.017343	
325.45 (final)		.0176276		56.72911
325.48 (initial)		.0176279		56.7281
350	.017909	.017885	.017865	

② To calculate RC Volume at low temperature.

From 2101-1.1 TEMP	Vol (incl press)	From 2301-3D1 Vol w/o pressurizer	
582	11,477.5	10,678	∴ 800gal in pressurizer
532	11,473.1	10,673	
325		10,645 gal.	interpolate
140	11,420	10,620	
70	11,413	10,613.	

③ Pressurizer @ saturation temp @ 1250 psig = 1265 psia.

	v_f
1250	.02250
1300	.02269

1265 = .022557 or ρ = 44.332.

$24\ \text{gal/in} \times .13368\ \frac{ft^3}{gal} \times 44.332\ \frac{lb}{ft^3} = 1422\ \text{lbm/in}.$

Calc. gal/lbm for RCS.

$\rho = (56.7291 + 56.7281) \div 2 = 56.7286$ lb/ft³

7.4805 gal/ft³ ÷ 56.7286 lb/ft³ = .131865 gal/lbm

⑤ RCDT interpolation

VDC	GAL	
1.6	6.45×10^3	
1.88		6.504×10^3
2.02		6.531×10^3
2.4	6.605×10^3	

(1) K-7

TMI-2

Turbine/Reactor Trip at 0400 on 03-28-79

Rm Tape NS 6104, Data at 3 Second Time Increment

Jon Putnam, B&W — Trip at Record 0760

Data 10 Prior to and 30 Minutes After Trip

TEST NO. NOW I6 = 0001
TEST NO. DESIRED I4 = 0001
BLOCK NO. NOW I8 = 0001
BLOCK NO. DESIRED I4 = 0001
STARTING RECORD NO. I5 = 00750
STARTING DATA SET NO. I2 = 01
DELOGGING INTERVAL I5 = 00001
PLAYBACK CHANNELS I2 =
01-02-03-04-05-06-07-08-09-10-11-12-99

SWITCH 0 IS QUIT SWITCH

		Power (%FP)	T_A(OUT) NR (°F)	T_B(OUT) NR (°F)	T_A(IN) NR (°F)	T_B(IN) NR (°F)	RCS LPA Flow (MPPH)	RCS PZR Level (inches)	RCS MUT Level (inches)	RCS PZR Spray Line (cc)	Drain Tank Press (PSIG)	RCS Press NR (PSIG)	Reactor Trip (cc)
0000750	3	+0097.4	+0606.1	+0606.1	+0559.8	+0556.5	+0067.1	+0220.5	+0077.7	+0010.0	+0003.1	+2151.3	+0010.0
0000750	3	[illegible]7.5	+0606.0	+0606.2	+0559.8	+0556.3	+0067.3	+0220.7	+0077.7	+0010.0	+0002.9	+2151.5	+0010.0
0000750	3	+0097.5	+0606.1	+0606.1	+0559.6	+0556.4	+0067.7	+0220.6	+0077.7	+0010.0	+0003.3	+2151.1	+0010.0
0000750	3	+0097.4	+0606.1	+0606.1	+0559.7	+0556.4	+0067.1	-0220.9	+0077.7	+0010.0	+0002.9	+2151.3	+0010.0
0000750	3	+0097.4	+0606.1	+0606.1	+0559.8	+0556.3	+0066.7	-0220.8	+0077.7	+0010.0	+0003.5	+2151.9	+0010.0
0000750	3	+0097.4	+0606.1	+0606.2	+0559.9	+0556.4	+0066.8	→0220.8	+0077.8	+0010.0	+0003.0	+2152.6	+0010.0
0000750	3	+0097.4	+0606.1	+0606.3	+0559.9	+0556.5	+0067.5	-0221.0	+0077.8	+0010.0	+0003.4	+2151.7	+0010.0
0000750	3	+0097.4	+0606.1	+0606.2	+0559.7	+0556.6	+0067.0	-0221.0	+0077.8	+0010.0	+0003.3	+2151.9	+0010.0
0000750	3	+0097.4	+0606.1	+0606.[illegible]	+0559.8	+0556.6	+0067.2	-0221.1	+0077.8	+0010.0	+0003.0	+2152.0	+0010.0
0000750	3	+0097.5	+0606.2	+0606.4	+0559.8	+0556.7	+0067.9	-0221.0	+0077.8	+0010.0	+0003.5	+2151.5	+0010.0
0000750	3	+0097.6	+0606.1	+0606.4	+0559.7	+0556.9	+0066.8	→0221.1	+0077.9	+0010.0	+0003.1	+2152.5	+0010.0
0000750	3	+0097.5	+0606.1	+0606.3	+0559.7	+0556.8	+0067.[illegible]	-0221.3	+0077.9	+0010.0	+0003.5	+2151.5	+0010.0
0000750	3	+0097.5	+0606.1	+0606.3	+0559.9	+0556.8	+0066.8	-0221.2	+0077.9	+0010.0	+0003.1	+2153.9	+0010.0
0000750	3	+0097.5	+0606.1	+0606.4	+0560.0	+0556.9	+0066.5	-0221.5	+0078.0	+0010.0	+0003.2	+2153.6	+0010.0
0000750	3	+0097.5	+0606.2	+0606.5	+0560.0	+0557.1	+0066.9	-0221.6	+0078.0	+0010.0	+0003.5	+2152.3	+0010.0
0000750	3	+0097.5	+0606.2	+0606.4	+0560.2	+0556.9	+0067.0	→0221.5	+0078.0	+0010.0	+0003.2	+2152.8	+0010.0
0000750	3	+0097.5	+0606.2	+0606.5	+0560.2	+0556.8	+0067.0	-0221.6	+0078.1	+0010.0	+0003.5	+2152.7	+0010.0
0000750	3	+0097.6	+0606.3	+0606.5	+0560.1	+0556.8	+0067.0	-0221.8	+0078.1	+0010.0	+0003.2	+2152.8	+0010.0
0000750	3	+0096.7	+0606.3	+0606.4	+0560.1	+0556.8	+0067.2	-0221.8	+0078.1	+0010.0	+0003.3	+2153.1	+0010.0
0000750	3	+0096.8	+0606.2	+0606.4	+0560.1	+0556.9	+0067.2	-0221.5	+0078.2	+0010.0	+0003.4	+2151.8	+0010.0
0000751	3	+0096.8	+0606.2	+0606.4	+0560.2	+0557.0	+0067.1	→0221.2	+0078.2	+0010.0	+0003.2	+2151.0	+0010.0
0000751	3	+0096.8	+0606.2	+0606.3	+0560.1	+0557.0	+0067.1	-0221.0	+0078.2	+0010.0	+0003.7	+2150.7	+0010.0
0000751	3	+0097.0	+0606.2	+0606.3	+0559.9	+0556.9	+0066.9	-0220.7	+0078.3	+0010.0	+0003.4	+2148.7	+0010.0
0000751	3	+0096.9	+0606.1	+0606.2	+0560.0	+0556.9	+0067.2	-0220.3	+0078.3	+0010.0	+0003.4	+2148.5	+0010.0
0000751	3	+0096.9	+0606.0	+0606.2	+0560.1	+0556.8	+0067.4	-0220.0	+0078.3	+0010.0	+0003.5	+2147.6	+0010.0
0000751	3	+0096.8	+0606.0	+0606.1	+0559.8	+0556.7	+0067.3	→0219.7	+0078.3	+0010.0	+0003.0	+2147.0	+0010.0
0000751	3	+0096.8	+0606.0	+0606.1	+0559.7	+0556.6	+0067.0	-0219.3	+0078.3	+0010.0	+0003.7	+2147.2	+0010.0
0000751	3	+0096.9	+0606.0	+0606.1	+0559.7	+0556.7	+0067.0	-0219.1	+0078.3	+0010.0	+0003.2	+2146.8	+0010.0
0000751	3	+0096.8	+0605.9	+0606.0	+0559.8	+0556.7	+0067.1	-0218.7	+0078.3	+0010.0	+0003.5	+2145.0	+0010.0
0000751	3	+0096.8	+0605.9	+0606.0	+0559.7	+0556.5	+0066.7	-0218.3	+0078.3	+0010.0	+0003.3	+2143.9	+0010.0
0000751	3	+0096.8	+0605.9	+0605.9	+0559.7	+0556.4	+0067.5	→0218.1	+0078.2	+0010.0	+0003.2	+2144.8	+0010.0
0000751	3	+0096.8	+0605.8	+0605.9	+0559.6	+0556.5	+0067.6	-0217.8	+0078.2	+0010.0	+0003.6	+2142.9	+0010.0
0000751	3	+0096.7	+0605.8	+0605.9	+0559.8	+0556.4	+0067.0	-0217.6	+0078.1	+0010.0	+0003.0	+2142.5	+0010.0
0000751	3	+0096.7	+0605.8	+0605.8	+0559.5	+0556.4	+0067.0	-0217.3	+0078.1	+0010.0	+0003.5	+2142.8	+0010.0
0000751	3	+0096.7	+0605.7	+0605.8	+0559.4	+0556.5	+0067.0	-0217.2	+0078.0	+0010.0	+0003.0	+2142.8	+0010.0
0000751	3	+0096.7	+0605.7	+0605.7	+0559.4	+0556.6	+0066.9	→0216.9	+0077.9	+0010.0	+0003.2	+2142.0	+0010.0
0000751	3	+0097.4	+0605.7	+0605.7	+0559.3	+0556.4	+0067.0	-0216.9	+0077.9	+0010.0	+0003.5	+2142.2	+0010.0
0000751	3	+0097.3	+0605.6	+0605.7	+0559.1	+0556.1	+0067.0	-0216.9	+0077.8	+0010.0	+0003.0	+2142.9	+0010.0
0000751	3	+0097.2	+0605.7	+0605.8	+0559.3	+0556.1	+0067.2	-0216.9	+0077.8	+0010.0	+0003.4	+2143.8	+0010.0
0000751	3	+0097.3	+0605.6	+0605.8	+0559.1	+0556.1	+0067.2	-0217.3	+0077.7	+0010.0	+0003.3	+2143.7	+0010.0
0000752	3	+0097.3	+0605.6	+0605.8	+0559.3	+0556.2	+0067.3	→0217.2	+0077.6	+0010.0	+0003.0	+2142.5	+0010.0
0000752	3	+0097.3	+0605.6	+0605.8	+0559.3	+0556.0	+0067.2	-0217.3	+0077.6	+0010.0	+0003.5	+2143.8	+0010.0
0000752	3	+0097.2	+0605.6	+0605.8	+0559.4	+0556.1	+0067.2	-0217.5	+0077.5	+0010.0	+0003.0	+2144.5	+0010.0
0000752	3	+0097.2	+0605.6	+0605.8	+0559.2	+0556.1	+0067.5	-0217.7	+0077.5	+0010.0	+0003.1	+2145.3	+0010.0
0000752	3	+0097.3	+0605.7	+0605.8	+0559.2	+0556.0	+0067.3	-0217.9	+0077.4	+0010.0	+0003.3	+2143.9	+0010.0
0000752	3	+0097.3	+0605.7	+0605.9	+0559.5	+0556.1	+0067.1	→0218.0	+0077.4	+0010.0	+0003.0	+2146.0	+0010.0
0000752	3	+0097.3	+0605.7	+0605.9	+0559.5	+0556.1	+0066.8	-0218.3	+0077.3	+0010.0	+0003.4	+2146.4	+0010.0
0000752	3	+0097.3	+0605.7	+0605.9	+0559.5	+0556.2	+0067.2	-0218.3	+0077.3	+0010.0	+0002.9	+2145.9	+0010.0
0000752	3	+0097.2	+0605.8	+0605.9	+0559.3	+0556.3	+0067.0	-0218.5	+0077.3	+0010.0	+0003.4	+2146.9	+0010.0
0000752	3	+0097.3	+0605.7	+0606.0	+0559.3	+0556.4	+0066.9	-0218.7	+0077.2	+0010.0	+0003.2	+2147.6	+0010.0
0000752	3	+0097.2	+0605.8	+0606.0	+0559.3	+0556.5	+0067.1	[illegible]18.9	+0077.2	+0010.0	+0003.2	+2148.1	+0010.0
[illegible]	[illegible]	[illegible]	+0605.8	[illegible]	+0559.1	+0556.4	+0067.2	[illegible].2	+0077.2	+0010.0	+0003.4	+2147.6	+0010.0

O NC TRIP

0000752	3	+0097.3	+0605.8	+0606.0	+0559.1	+0555.4	+0067.2	-0219.2	+0077.2	+0010.0	+0003.4	+2147.6	+0010.0
0000752	3	+0097.4	+0605.8	+0606.0	+0559.3	+0556.5	+0067.1	-0219.2	+0077.1	+0010.0	+0002.8	+2148.5	+0010.0
0000752	3	+0097.3	+0605.9	+0606.0	+0559.4	+0556.3	+0066.9	-0219.4	+0077.1	+0010.0	+0003.5	+2149.4	+0010.0
0000752	3	+0097.4	+0605.9	+0606.0	+0559.3	+0556.4	+0067.1	-0219.6	+0077.1	+0010.0	+0003.0	+2150.1	+0010.0
0000752	3	+0097.3	+0605.9	+0606.0	+0559.3	+0556.4	+0066.9	-0219.8	+0077.1	+0010.0	+0003.4	+2150.9	+0010.0
0000752	3	+0097.3	+0605.9	+0606.0	+0559.6	+0556.5	+0067.3	-0220.0	+0077.1	+0010.0	+0003.4	+2149.8	+0010.0
0000752	3	+0097.3	+0605.9	+0606.0	+0559.9	+0556.6	+0067.5	-0220.1	+0077.1	+0010.0	+0003.1	+2150.4	+0010.0
0000752	3	+0097.4	+0606.0	+0606.1	+0559.8	+0556.5	+0067.0	-0220.4	+0077.1	+0010.0	+0003.5	+2151.4	+0010.0
0000752	3	+0097.5	+0605.9	+0606.1	+0559.8	+0556.6	+0067.0	-0220.3	+0077.1	+0010.0	+0003.0	+2150.6	+0010.0
0000753	3	+0097.4	+0606.0	+0606.2	+0559.8	+0556.6	+0067.1	-0220.7	+0077.1	+0010.0	+0003.4	+2151.2	+0010.0
0000753	3	+0097.4	+0606.1	+0606.2	+0560.0	+0556.5	+0066.7	-0220.7	+0077.1	+0010.0	+0003.1	+2152.5	+0010.0
0000753	3	+0097.4	+0606.1	+0606.3	+0560.1	+0556.6	+0067.0	-0221.0	+0077.1	+0010.0	+0003.2	+2152.8	+0010.0
0000753	3	+0097.4	+0606.2	+0606.2	+0559.9	+0556.8	+0067.1	-0221.1	+0077.1	+0010.0	+0003.4	+2152.0	+0010.0
0000753	3	+0097.4	+0606.1	+0606.2	+0559.9	+0556.7	+0067.4	-0221.1	+0077.1	+0010.0	+0003.0	+2153.4	+0010.0
0000753	3	+0097.4	+0606.2	+0606.3	+0559.9	+0556.5	+0066.5	-0221.2	+0077.2	+0010.0	+0003.5	+2152.3	+0610.0
0000753	3	+0097.5	+0606.2	+0606.3	+0559.8	+0556.5	+0066.9	-0221.5	+0077.2	+0010.0	+0003.1	+2152.2	+0010.0
0000753	3	+0097.4	+0606.2	+0606.3	+0560.0	+0556.7	+0066.9	-0221.3	+0077.3	+0010.0	+0003.3	+2152.8	+0010.0
0000753	3	+0097.4	+0606.2	+0606.4	+0560.0	+0556.7	+0066.9	-0221.6	+0077.3	+0010.0	+0003.5	+2153.0	+0010.0
0000753	3	+0097.5	+0606.2	+0606.4	+0560.0	+0556.8	+0066.5	-0221.5	+0077.3	+0010.0	+0003.0	+2154.3	+0010.0
0000753	3	+0097.5	+0606.2	+0606.4	+0560.1	+0556.8	+0067.0	-0221.7	+0077.4	+0010.0	+0003.7	+2152.6	+0010.0
0000753	3	+0096.7	+0606.1	+0606.4	+0560.0	+0556.9	+0067.0	-0221.4	+0077.4	+0010.0	+0003.1	+2151.1	+0010.0
0000753	3	+0096.8	+0606.2	+0606.3	+0559.9	+0557.0	+0066.9	-0221.4	+0077.4	+0010.0	+0003.3	+2151.2	+0010.0
0000753	3	+0096.9	+0606.1	+0606.3	+0559.9	+0556.9	+0067.1	-0221.1	+0077.5	+0010.0	+0003.4	+2151.1	+0010.0
0000753	3	+0097.0	+0606.2	+0606.3	+0560.1	+0556.9	+0067.2	-0221.1	+0077.5	+0010.0	+0003.1	+2150.4	+0010.0
0000753	3	+0096.9	+0606.2	+0606.3	+0559.9	+0556.9	+0067.3	-0220.6	+0077.5	+0010.0	+0003.7	+2149.7	+0010.0
0000753	3	+0096.9	+0606.2	+0606.2	+0559.8	+0556.8	+0067.3	-0220.3	+0077.5	+0010.0	+0003.1	+2150.1	+0010.0
0000753	3	+0097.0	+0606.1	+0606.2	+0559.9	+0556.8	+0067.2	-0220.1	+0077.6	+0010.0	+0003.6	+2148.9	+0010.0
0000753	3	+0097.0	+0606.1	+0606.2	+0559.9	+0556.8	+0067.4	-0219.8	+0077.6	+0010.0	+0003.4	+2148.7	+0010.0
0000753	3	+0097.0	+0606.1	+0606.1	+0560.1	+0556.9	+0067.4	-0219.6	+0077.6	+0010.0	+0003.3	+2147.2	+0010.0
0000754	3	+0096.9	+0606.0	+0606.1	+0560.0	+0556.9	+0067.5	-0219.4	+0077.6	+0010.0	+0003.7	+2146.8	+0010.0
0000754	3	+0096.8	+0606.0	+0606.1	+0559.9	+0556.8	+0066.8	-0219.2	+0077.6	+0010.0	+0003.2	+2146.7	+0010.0
0000754	3	+0096.9	+0606.0	+0606.0	+0559.9	+0556.5	+0066.7	-0219.1	+0077.5	+0010.0	+0003.8	+2146.5	+0010.0
0000754	3	+0096.8	+0605.9	+0606.0	+0559.8	+0556.5	+0066.7	-0219.0	+0077.5	+0010.0	+0003.2	+2146.9	+0010.0
0000754	3	+0096.8	+0606.0	+0606.0	+0559.9	+0556.6	+0067.0	-0218.8	+0077.5	+0010.0	+0003.5	+2145.8	+0010.0
0000754	3	+0096.8	+0605.9	+0605.9	+0559.9	+0556.6	+0067.0	-0218.5	+0077.5	+0010.0	+0003.5	+2146.3	+0010.0
0000754	3	+0096.8	+0605.9	+0605.9	+0559.8	+0556.7	+0066.5	-0218.2	+0077.5	+0010.0	+0003.4	+2144.7	+0010.0
0000754	3	+0096.9	+0605.9	+0605.9	+0559.6	+0556.7	+0067.2	-0218.3	+0077.4	+0010.0	+0003.6	+2144.4	+0010.0
0000754	3	+0096.8	+0605.9	+0605.9	+0559.6	+0556.6	+0067.3	-0218.0	+0077.4	+0010.0	+0003.2	+2145.3	+0010.0
0000754	3	+0096.7	+0605.8	+0605.8	+0559.4	+0556.8	+0067.0	-0217.8	+0077.4	+0008.0	+0003.7	+2145.0	+0010.0
0000754	3	+0096.7	+0605.8	+0605.8	+0559.7	+0556.6	+0067.1	-0217.7	+0077.3	+0010.0	+0003.1	+2144.1	+0010.0
0000754	3	+0096.8	+0605.7	+0605.8	+0559.5	+0556.5	+0067.2	-0217.7	+0077.3	+0010.0	+0003.6	+2144.8	+0010.0
0000754	3	+0096.7	+0605.7	+0605.8	+0559.3	+0556.3	+0067.5	-0217.4	+0077.2	+0010.0	+0003.2	+2142.8	+0010.0
0000754	3	+0096.7	+0605.7	+0605.8	+0559.4	+0556.2	+0067.4	-0217.4	+0077.2	+0010.0	+0003.2	+2143.4	+0010.0
0000754	3	+0096.7	+0605.7	+0605.7	+0559.3	+0556.1	+0067.2	-0217.3	+0077.1	+0010.0	+0003.3	+2143.0	+0010.0
0000754	3	+0096.9	+0605.6	+0605.7	+0559.2	+0556.1	+0067.1	-0217.0	+0077.1	+0010.0	+0003.1	+2143.3	+0010.0
0000754	3	+0097.4	+0605.6	+0605.6	+0559.3	+0556.2	+0067.1	-0216.9	+0077.0	+0010.0	+0003.4	+2142.7	+0010.0
0000754	3	+0097.3	+0605.7	+0605.7	+0559.3	+0556.1	+0067.4	-0217.2	+0076.9	+0010.0	+0003.1	+2142.2	+0010.0
0000754	3	+0097.2	+0605.7	+0605.7	+0559.3	+0556.0	+0067.4	-0217.1	+0076.9	+0010.0	+0003.3	+2142.8	+0010.0
0000754	3	+0097.2	+0605.7	+0605.7	+0559.4	+0556.0	+0067.3	-0217.5	+0076.8	+0010.0	+0003.2	+2143.5	+0010.0
0000755	3	+0097.3	+0605.7	+0605.8	+0559.4	+0556.1	+0067.2	-0217.4	+0076.8	+0010.0	+0002.9	+2142.8	+0010.0
0000755	3	+0097.3	+0605.7	+0605.8	+0559.5	+0556.0	+0067.0	-0217.4	+0076.7	+0010.0	+0003.6	+2144.9	+0010.0
0000755	3	+0097.2	+0605.6	+0605.8	+0559.6	+0556.2	+0067.2	-0217.5	+0076.6	+0010.0	+0003.0	+2144.5	+0010.0
0000755	3	+0097.2	+0605.6	+0605.8	+0559.5	+0556.3	+0067.0	-0217.7	+0076.6	+0010.0	+0003.7	+2145.2	+0010.0
0000755	3	+0097.2	+0605.7	+0605.8	+0559.5	+0556.4	+0066.9	-0217.8	+0076.5	+0010.0	+0003.2	+2146.2	+0010.0
0000755	3	+0097.2	+0605.7	+0605.8	+0559.5	+0556.4	+0067.0	-0218.0	+0076.5	+0010.0	+0003.5	+2146.0	+0010.0
0000755	3	+0097.3	+0605.6	+0605.8	+0559.2	+0556.4	+0067.3	-0217.9	+0076.5	+0010.0	+0003.5	+2146.5	+0010.0
0000755	3	+0097.2	+0605.6	+0605.9	+0559.2	+0556.3	+0067.4	-0218.2	+0076.4	+0010.0	+0003.6	+2147.1	+0010.0
0000755	3	+0097.3	+0605.7	+0605.9	+0559.3	+0556.2	+0066.9	-0218.2	+0076.4	+0010.0	+0003.6	+2146.6	+0010.0
0000755	3	+0097.3	+0605.7	+0605.9	+0559.3	+0556.1	+0067.0	-0218.4	+0076.3	+0010.0	+0003.5	+2147.3	+0010.0
0000755	3	+0097.3	+0605.7	+0605.9	+0559.3	+0556.2	+0067.2	-0218.5	+0076.3	+0010.0	+0003.3	+2147.6	+0010.0
0000755	3	+0097.3	+0605.7	+0605.9	+0559.4	+0556.3	+0067.1	-0218.7	+0076.3	+0010.0	+0003.6	+2148.7	+0010.0
0000755	3	+0097.3	+0605.8	+0606.0	+0559.3	+0556.1	+0066.9	-0218.9	+0076.3	+0010.0	+0003.1	+2147.6	+0010.0
0000755	3	+0097.3	+0605.8	+0606.0	+0559.3	+0556.1	+0067.0	-0219.0	+0076.2	+0010.0	+0003.5	+2148.8	+0010.0
0000755	3	+0097.4	+0605.8	+0605.9	+0559.2	+0556.3	+0067.0	-0219.1	+0076.2	+0010.0	+0003.3	+2148.7	+0010.0
0000755	3	+0097.3	+0605.7	+0606.0	+0559.3	+0556.2	+0067.3	-0219.3	+0076.2	+0010.0	+0003.0	+2149.3	+0010.0
0000755	3	+0097.3	+0605.8	+0606.0	+0559.4	+0556.3	+0067.[illegible]	-0219.5	+0076.2	+0010.0	+0003.5	+2149.3	+0010.0
[illegible]	[illegible]	+0097.3	+0605.9	+0606.1	+0559.4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

0000755	3	+0097.3	+0605.8	+0606.0	+0559.7	+0556.4	+0067.1	-0219.9	+0076.2	+0010.0	+0003.2	+2150.6	+0010.0
0000756	3	+0097.3	+0605.9	+0606.1	+0559.6	+0556.6	+0067.2	-0220.1	+0076.2	+0010.0	+0003.0	+2150.5	+0010.0
0000756	3	+0097.4	+0605.9	+0606.1	+0559.5	+0556.6	+0067.1	-0220.2	+0076.1	+0010.0	+0003.4	+2150.2	+0010.0
0000756	3	+0097.4	+0605.9	+0606.1	+0559.5	+0556.6	+0067.2	-0220.2	+0076.2	+0010.0	+0002.9	+2151.1	+0010.0
0000756	3	+0097.4	+0606.0	+0606.2	+0559.5	+0556.6	+0067.2	-0220.6	+0076.2	+0010.0	+0003.6	+2150.5	+0010.0
0000756	3	+0097.4	+0606.0	+0606.2	+0559.5	+0556.5	+0066.9	-0220.8	+0076.2	+0010.0	+0003.0	+2151.1	+0010.0
0000756	3	+0097.4	+0606.0	+0606.2	+0559.5	+0556.7	+0066.8	-0220.9	+0076.2	+0010.0	+0003.5	+2150.9	+0010.0
0000756	3	+0097.5	+0606.1	+0606.2	+0559.6	+0556.7	+0066.9	-0220.8	+0076.2	+0010.0	+0003.2	+2151.5	+0010.0
0000756	3	+0097.4	+0606.0	+0606.2	+0559.7	+0556.6	+0067.3	-0221.0	+0076.2	+0010.0	+0003.4	+2152.4	+0010.0
0000756	3	+0097.5	+0606.1	+0606.3	+0559.7	+0556.8	+0067.5	-0221.1	+0076.2	+0010.0	+0003.4	+2151.9	+0010.0
0000756	3	+0097.5	+0606.1	+0606.3	+0559.8	+0556.7	+0067.3	-0221.3	+0076.3	+0010.0	+0003.2	+2154.3	+0010.0
0000756	3	+0097.4	+0606.1	+0606.3	+0559.9	+0556.7	+0067.2	-0221.5	+0076.3	+0010.0	+0003.7	+2152.9	+0010.0
0000756	3	+0097.5	+0606.1	+0606.3	+0560.1	+0556.8	+0067.0	-0221.7	+0076.3	+0010.0	+0003.0	+2153.6	+0010.0
0000756	3	+0097.4	+0606.2	+0606.4	+0560.1	+0556.8	+0067.2	-0221.7	+0076.3	+0010.0	+0003.7	+2154.5	+0010.0
0000756	3	+0097.5	+0606.2	+0606.4	+0560.1	+0556.8	+0066.5	-0221.8	+0076.4	+0010.0	+0003.2	+2154.2	+0010.0
0000756	3	+0097.5	+0606.3	+0606.4	+0559.8	+0556.9	+0066.8	-0222.0	+0076.4	+0010.0	+0003.4	+2153.5	+0010.0
0000756	3	+0096.8	+0606.3	+0606.4	+0559.9	+0557.0	+0067.1	-0222.1	+0076.4	+0010.0	+0003.6	+2154.4	+0010.0
0000756	3	+0096.7	+0606.2	+0606.4	+0560.0	+0557.0	+0067.1	-0221.9	+0076.5	+0010.0	+0003.2	+2152.8	+0010.0
0000756	3	+0096.8	+0606.2	+0606.3	+0560.2	+0556.9	+0066.9	-0221.7	+0076.5	+0010.0	+0003.8	+2152.5	+0010.0
0000756	3	+0096.8	+0606.2	+0606.3	+0560.2	+0556.9	+0067.3	-0221.5	+0076.6	+0010.0	+0003.2	+2151.7	+0010.0
0000756	3	+0096.9	+0606.1	+0606.3	+0560.2	+0556.9	+0066.9	-0221.2	+0076.6	+0010.0	+0003.6	+2150.3	+0010.0
0000757	3	+0096.9	+0606.2	+0606.3	+0560.0	+0556.8	+0066.9	-0221.0	+0076.6	+0010.0	+0003.4	+2150.2	+0010.0
0000757	3	+0096.8	+0606.1	+0606.3	+0560.0	+0556.7	+0067.4	-0220.7	+0076.7	+0010.0	+0003.2	+2149.0	+0010.0
0000757	3	+0096.9	+0606.1	+0606.2	+0559.9	+0556.7	+0066.8	-0220.4	+0076.7	+0010.0	+0003.6	+2147.5	+0010.0
0000757	3	+0096.9	+0606.1	+0606.1	+0559.8	+0556.7	+0066.5	-0220.3	+0076.7	+0010.0	+0003.2	+2148.4	+0010.0
0000757	3	+0096.8	+0606.0	+0606.2	+0559.7	+0556.6	+0067.1	-0220.1	+0076.7	+0010.0	+0003.6	+2148.0	+0010.0
0000757	3	+0096.8	+0605.9	+0606.1	+0559.8	+0556.5	+0067.7	-0219.8	+0076.7	+0010.0	+0003.2	+2147.4	+0010.0
0000757	3	+0096.9	+0606.0	+0606.1	+0559.6	+0556.6	+0067.3	-0219.6	+0076.7	+0010.0	+0003.5	+2147.0	+0010.0
0000757	3	+0096.8	+0605.8	+0606.0	+0559.5	+0556.5	+0067.2	-0219.3	+0076.7	+0010.0	+0003.5	+2145.8	+0010.0
0000757	3	+0096.8	+0605.9	+0606.1	+0559.7	+0556.7	+0067.3	-0219.1	+0076.7	+0010.0	+0003.2	+2145.9	+0010.0
0000757	3	+0096.8	+0605.9	+0606.0	+0559.5	+0556.6	+0066.8	-0219.0	+0076.7	+0010.0	+0003.5	+2145.1	+0010.0
0000757	3	+0096.8	+0605.9	+0606.0	+0559.4	+0556.5	+0067.3	-0213.7	+0076.6	+0010.0	+0003.0	+2144.8	+0010.0
0000757	3	+0096.8	+0605.8	+0605.9	+0559.3	+0556.4	+0067.1	-0218.7	+0076.6	+0010.0	+0003.3	+2145.2	+0010.0
0000757	3	+0096.7	+0605.8	+0605.9	+0559.5	+0556.6	+0067.3	-0218.4	+0076.6	+0010.0	+0003.5	+2144.4	+0010.0
0000757	3	+0096.7	+0605.8	+0605.9	+0559.8	+0556.6	+0067.0	-0218.6	+0076.6	+0010.0	+0002.9	+2144.5	+0010.0
0000757	3	+0096.7	+0605.8	+0605.8	+0559.5	+0556.4	+0067.4	-0218.4	+0076.5	+0010.0	+0003.4	+2144.0	+0010.0
0000757	3	+0096.7	+0605.8	+0605.8	+0559.4	+0556.5	+0067.1	-0218.0	+0076.5	+0010.0	+0003.0	+2143.5	+0010.0
0000757	3	+0096.7	+0605.7	+0605.8	+0559.4	+0556.4	+0067.2	-0218.0	+0076.5	+0010.0	+0003.0	+2143.7	+0010.0
0000757	3	+0096.7	+0605.7	+0605.8	+0559.5	+0556.2	+0067.1	-0217.8	+0076.4	+0010.0	+0003.4	+2142.9	+0010.0
0000757	3	+0096.7	+0605.7	+0605.8	+0559.4	+0556.3	+0066.7	-0217.9	+0076.4	+0010.0	+0002.9	+2142.7	+0010.0
0000757	3	+0096.7	+0605.6	+0605.8	+0559.3	+0556.3	+0066.8	-0217.7	+0076.3	+0010.0	+0003.5	+2143.5	+0010.0
0000758	3	+0096.7	+0605.6	+0605.7	+0559.4	+0556.4	+0067.1	-0217.7	+0076.3	+0010.0	+0003.1	+2143.5	+0010.0
0000758	3	+0096.6	+0605.6	+0605.7	+0559.4	+0556.4	+0067.1	-0217.4	+0076.2	+0010.0	+0003.2	+2142.1	+0010.0
0000758	3	+0096.7	+0605.6	+0605.7	+0559.4	+0556.4	+0067.4	-0217.5	+0076.2	+0010.0	+0003.4	+2142.9	+0010.0
0000758	3	+0096.7	+0605.5	+0605.7	+0559.4	+0556.3	+0067.2	-0217.1	+0076.2	+0010.0	+0002.9	+2142.4	+0010.0
0000758	3	+0096.9	+0605.6	+0605.6	+0559.4	+0556.2	+0067.0	-0217.4	+0076.1	+0010.0	+0003.6	+2142.8	+0010.0
0000758	3	+0097.2	+0605.4	+0605.6	+0559.3	+0556.2	+0067.4	-0217.5	+0076.1	+0010.0	+0003.0	+2143.3	+0010.0
0000758	3	+0097.2	+0605.5	+0605.6	+0559.3	+0556.2	+0067.1	-0217.3	+0076.0	+0010.0	+0003.4	+2143.7	+0010.0
0000758	3	+0097.1	+0605.5	+0605.7	+0559.2	+0556.2	+0067.1	-0217.6	+0075.9	+0010.0	+0003.2	+2145.0	+0010.0
0000758	3	+0097.0	+0605.6	+0605.7	+0559.5	+0556.3	+0067.5	-0218.0	+0075.9	+0010.0	+0003.2	+2144.8	+0010.0
0000758	3	+0097.1	+0605.5	+0605.8	+0559.4	+0556.4	+0066.9	-0218.0	+0075.8	+0010.0	+0003.6	+2145.9	+0010.0
0000758	3	+0097.1	+0605.6	+0605.8	+0559.4	+0556.5	+0067.5	-0218.1	+0075.8	+0010.0	+0003.1	+2145.5	+0010.0
0000758	3	+0097.1	+0605.6	+0605.8	+0559.5	+0556.4	+0067.4	-0218.4	+0075.7	+0010.0	+0003.7	+2146.0	+0010.0
0000758	3	+0097.0	+0605.6	+0605.9	+0559.7	+0556.3	+0067.4	-0218.4	+0075.7	+0010.0	+0003.2	+2147.0	+0010.0
0000758	3	+0097.1	+0605.8	+0605.9	+0559.4	+0556.3	+0067.1	-0218.8	+0075.6	+0010.0	+0003.4	+2148.1	+0010.0
0000758	3	+0097.1	+0605.7	+0605.9	+0559.4	+0556.3	+0067.2	-0218.9	+0075.6	+0010.0	+0003.4	+2147.1	+0010.0
0000758	3	+0097.2	+0605.7	+0605.9	+0559.4	+0556.4	+0067.3	-0218.8	+0075.5	+0010.0	+0003.2	+2147.6	+0010.0
0000758	3	+0097.2	+0605.7	+0605.9	+0559.5	+0556.5	+0066.7	-0219.1	+0075.5	+0010.0	+0003.7	+2147.3	+0010.0
0000758	3	+0097.1	+0605.7	+0605.9	+0559.7	+0556.4	+0066.9	-0219.2	+0075.5	+0010.0	+0003.3	+2148.7	+0010.0
0000758	3	+0097.1	+0605.8	+0605.9	+0559.7	+0556.5	+0066.8	-0219.3	+0075.4	+0010.0	+0003.5	+2148.2	+0010.0
0000758	3	+0097.1	+0605.8	+0605.9	+0559.7	+0556.5	+0067.0	-0219.3	+0075.4	+0010.0	+0003.7	+2147.7	+0010.0
0000759	3	+0097.1	+0605.7	+0606.0	+0559.6	+0556.6	+0066.9	-0219.4	+0075.4	+0010.0	+0003.2	+2149.4	+0010.0
0000759	3	+0097.1	+0605.7	+0606.0	+0559.8	+0556.6	+0066.8	-0219.4	+0075.4	+0010.0	+0003.8	+2148.9	+0010.0
0000759	3	+0097.1	+0605.7	+0606.0	+0559.9	+0556.6	[illegible]	-0219.6	+0075.4	+0010.0	+0003.2	+2149.9	+0010.0
0000759	3	+0097.1	+0605.8	+0608.0	+0559.6	+0556.5	[illegible]	-0219.8	+0075.4	+0010.0	+0003.6	+2149.1	+0010.0

			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+0067.3	[illegible]	[illegible]	+0010.0	+0003.5	+2150.0	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.6	+0556.6	+0067.1	-0219.8	+0075.3	+0010.0	+0003.4	+2149.0	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.7	+0556.5	+0067.2	-0219.5	+0075.3	+0010.0	+0003.8	+2148.7	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.1	+0559.6	+0556.5	+0067.1	-0219.7	+0075.3	+0010.0	+0003.2	+2149.2	+0010.0
	0000759	3	+0097.2	+0605.9	[illegible]	+0559.7	+0556.5	+0067.1	-0219.6	+0075.3	+0010.0	+0003.6	+2149.3	+0010.0
	0000759	3	+0097.1	+0605.8	+0606.0	+0559.8	+0556.5	+0067.3	-0219.7	+0075.3	+0010.0	+0003.4	+2149.5	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.5	+0556.7	+0067.4	-0219.7	+0075.3	+0010.0	+0003.3	+2148.5	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.5	+0556.6	+0066.9	-0219.7	+0075.3	+0010.0	+0003.7	+2148.5	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.7	+0556.7	+0067.3	-0219.8	+0075.2	+0010.0	+0003.2	+2150.6	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.6	+0556.5	+0067.1	-0219.7	+0075.2	+0010.0	+0003.7	+2147.9	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.5	+0556.5	+0066.9	-0219.7	+0075.2	+0010.0	+0003.3	+2147.1	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.1	+0559.5	+0556.4	+0067.2	-0219.7	+0075.2	+0010.0	+0003.2	+2148.2	+0010.0
	0000759	3	+0097.1	+0605.8	+0606.1	+0559.4	+0556.5	+0067.5	-0220.0	+0075.2	+0010.0	+0003.6	+2148.9	+0010.0
	0000759	3	+0097.2	+0605.9	+0606.1	+0559.3	+0556.5	+0067.4	-0219.7	+0075.2	+0010.0	+0002.9	+2149.1	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.5	+0556.3	+0066.9	-0219.6	+0075.1	+0010.0	+0003.5	+2147.1	+0010.0
	0000759	3	+0097.2	+0605.8	+0606.0	+0559.5	+0556.4	+0067.1	-0219.9	+0075.1	+0010.0	+0003.2	+2148.7	+0010.0
	0000760	3	+0097.2	+0605.8	+0606.0	+0559.7	+0556.4	+0066.9	-0219.6	+0075.1	+0010.0	+0003.0	+2149.3	+0010.0
	0000760	3	+0097.2	+0605.8	+0606.0	+0559.5	+0556.7	+0067.4	-0219.9	+0075.1	+0010.0	+0003.6	+2148.8	+0010.0
	0000760	3	+0097.1	+0605.8	+0606.1	+0559.6	+0556.7	+0067.5	-0219.8	+0075.1	+0010.0	+0003.0	+2149.5	+0010.0
	0000760	3	+0097.1	+0605.8	+0606.1	+0559.6	+0556.6	+0067.4	-0219.7	+0075.1	+0010.0	+0003.5	+2149.3	+0010.0
	0000760	3	+0097.2	+0605.8	+0606.1	+0559.2	+0556.5	+0067.1	-0219.9	+0075.1	+0010.0	+0003.2	+2147.8	+0010.0
	0000760	3	+0097.2	+0605.9	+0606.1	+0559.4	+0556.4	+0067.1	-0220.0	+0075.1	+0010.0	+0003.1	+2148.9	+0010.0
	0000760	3	+0097.2	+0605.8	+0606.1	+0559.3	+0556.4	+0067.5	-0220.1	+0075.1	+0010.0	+0003.6	+2148.1	+0010.0
	0000760	3	+0097.2	+0605.8	+0606.1	+0559.3	+0556.5	+0067.5	-0220.0	+0075.1	+0010.0	+0003.1	+2146.8	+0010.0
	0000760	3	+0097.2	+0605.8	+0606.0	+0559.3	+0556.4	+0067.2	-0219.9	+0075.1	+0010.0	+0003.6	+2148.0	+0010.0
3	0000760	3	+0097.1	+0605.9	+0606.1	+0559.7	+0556.4	+0067.2	-0220.3	+0075.1	+0010.0	+0003.1	+2155.2	+0010.0
6	0000760	3	+0097.1	+0606.2	+0606.3	+0560.5	+0557.1	+0066.0	-0226.4	+0075.1	+0010.0	+0004.0	+2292.6	+0010.0
9	0000760	3	+0095.5	+0606.7	+0606.8	+0568.0	+0563.0	+0066.3	-0241.7	+0075.3	+0010.0	+0006.2	+2312.6	+0010.0
12	0000760	3	+0006.0	+0609.2	+0608.8	+0571.6	+0567.1	+0065.5	-0252.5	+0075.4	+0010.0	+0005.9	+2346.0	+0000.0
15	0000760	3	+0003.8	+0611.1	+0610.9	+0571.0	+0567.3	+0065.9	-0255.2	+0075.4	+0010.0	+0006.2	+2146.9	+0000.0
18	0000760	3	+0002.9	+0603.6	+0603.3	+0572.7	+0568.8	+0066.5	-0242.8	+0075.3	+0000.0	+0006.6	+1979.6	+0000.0
21	0000760	3	+0002.4	+0596.2	+0593.9	+0577.3	+0572.8	+0066.6	-0220.5	+0075.2	+0000.0	+0007.0	+2000.4	+0000.0
24	0000760	3	+0002.0	+0592.9	+0589.9	+0578.2	+0574.0	+0066.1	-0203.9	+0075.1	+0000.0	+0007.0	+1961.6	+0000.0
27	0000760	3	+0001.8	+0590.8	+0587.9	+0576.8	+0572.8	+0066.2	-0190.4	+0075.0	+0000.0	+0007.9	+1936.8	+0000.0
30	0000760	3	+0001.5	+0587.4	+0584.4	+0577.0	+0572.8	+0066.4	-0180.8	+0074.7	+0000.0	+0007.9	+1917.4	+0000.0
33	0000760	3	+0001.4	+0584.4	+0581.4	+0577.9	+0573.8	+0066.4	-0174.0	+0074.3	+0000.0	+0008.2	+1900.7	+0000.0
36	0000761	3	+0001.2	+0582.8	+0580.3	+0577.3	+0573.7	+0066.9	-0168.9	+0073.9	+0000.0	+0009.2	+1886.0	+0000.0
39	0000761	3	+0001.1	+0581.8	+0579.7	+0576.8	+0572.9	+0066.6	-0164.6	+0073.6	+0000.0	+0009.2	+1870.2	+0000.0
42	0000761	3	+0001.0	+0580.3	+0578.5	+0576.7	+0572.6	+0066.5	-0161.2	+0073.2	+0000.0	+0009.6	+1856.8	-0000.1
45	0000761	3	+0000.9	+0579.3	+0577.6	+0576.8	+0572.8	+0066.0	-0159.2	+0072.7	+0010.0	+0010.1	+1844.6	+0010.0
48	0000761	3	+0000.8	+0578.9	+0577.4	+0576.3	+0572.7	+0066.3	-0158.1	+0072.3	+0010.0	+0009.6	+1834.2	+0010.0
51	0000761	3	+0000.7	+0578.5	+0577.3	+0576.0	+0572.5	+0066.4	-0157.5	+0071.7	+0010.0	+0009.9	+1824.0	+0010.0
54	0000761	3	+0000.6	+0578.0	+0576.8	+0576.2	+0572.4	+0066.1	-0157.5	+0070.8	-0002.0	+0011.5	+1815.1	+0006.7
57	0000761	3	+0000.6	+0577.7	+0576.4	+0576.2	+0572.6	+0066.1	-0157.8	+0070.3	+0000.0	+0011.0	+1807.3	+0000.0
60	0000761	3	+0000.5	+0577.7	+0576.2	+0576.1	+0572.5	+0066.0	-0157.9	+0069.6	+0000.0	+0011.5	+1798.4	+0000.0
1,3	0000761	3	+0000.5	+0577.6	+0576.1	+0576.1	+0572.4	+0066.2	-0158.4	+0068.9	+0000.0	+0012.1	+1790.5	+0000.0
6	0000761	3	+0000.4	+0577.3	+0575.8	+0576.1	+0572.3	+0066.0	-0159.0	+0068.1	+0000.0	+0012.7	+1783.1	+0000.0
9	0000761	3	+0000.4	+0577.2	+0575.6	+0576.2	+0572.2	+0066.0	-0159.7	+0066.7	+0000.0	+0013.4	+1775.7	+0000.0
12	0000761	3	+0000.4	+0577.2	+0575.5	+0576.1	+0572.2	+0065.9	-0161.1	+0065.5	+0001.9	+0013.6	+1767.3	+0001.3
15	0000761	3	+0000.3	+0577.2	+0575.5	+0576.2	+0572.1	+0066.3	-0162.6	+0064.8	+0010.0	+0014.4	+1759.1	+0007.3
18	0000761	3	+0000.3	+0577.2	+0575.5	+0576.4	+0572.3	+0065.6	-0164.4	+0064.6	+0010.0	+0014.5	+1751.7	+0007.4
21	0000761	3	+0000.3	+0577.2	+0575.4	+0576.5	+0572.4	+0066.5	-0166.6	+0063.5	+0010.0	+0015.0	+1744.7	+0010.0
24	0000761	3	+0000.3	+0577.3	+0575.5	+0576.6	+0572.4	+0066.0	-0168.8	+0062.3	+0000.7	+0015.7	+1737.1	+0000.1
27	0000761	3	+0000.2	+0577.4	+0575.5	+0576.7	+0572.6	+0066.1	-0170.9	+0061.8	+0000.0	+0016.5	+1730.2	+0000.0
30	0000761	3	+0000.2	+0577.4	+0575.6	+0576.9	+0572.7	+0065.8	-0173.1	+0060.8	+0000.0	+0017.2	+1722.8	+0000.0
33	0000761	3	+0000.2	+0577.5	+0575.6	+0577.1	+0572.7	+0065.7	-0175.5	+0059.4	+0000.0	+0017.7	+1714.7	+0000.0
36	0000762	3	+0000.1	+0577.6	+0575.7	+0577.1	+0572.8	+0065.9	-0178.0	+0058.4	+0000.0	+0017.2	+1708.6	+0000.0
39	0000762	3	+0000.1	+0577.6	+0575.8	+0577.3	+0572.9	+0066.3	-0180.6	+0058.1	+0000.0	+0018.5	+1701.8	+0000.0
42	0000762	3	+0000.1	+0577.7	+0575.8	+0577.3	+0572.9	+0066.1	-0183.1	+0058.4	-0000.1	+0017.9	+1693.8	-0001.4
45	0000762	3	+0000.1	+0577.8	+0575.9	+0577.4	+0573.1	+0065.7	-0185.7	+0058.8	+0010.0	+0019.6	+1686.5	+0010.0
48	0000762	3	+0000.1	+0577.9	+0576.0	+0577.6	+0573.2	+0066.2	-0188.5	+0059.1	+0010.0	+0019.5	+1679.8	+0010.0
51	0000762	3	+0000.1	+0578.0	+0576.1	+0577.7	+0573.3	+0065.4	-0191.1	+0059.5	+0010.0	+0020.9	+1672.7	+0010.0
54	0000762	3	+0000.1	+0578.1	+0576.2	+0577.9	+0573.5	+0065.5	-0193.9	+0059.8	-0002.6	+0019.8	+1665.4	+0002.9
57	0000762	3	+0000.0	+0578.2	+0576.3	+0578.0	+0573.6	+0066.0	-0196.5	+0060.2	+0000.0	+0021.8	+1658.9	+0000.0
60	0000762	3	+0000.0	+0578.3	+0576.4	+0578.2	+0573.8	+0065.9	-0199.0	+0060.6	+0000.0	+0021.6	+1652.6	+0000.0
	0000762	3	+0000.0	+0578.4	+0576.5	+0578.3	+0573.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Turb Trip

Reactor Trip

THE PRESSURE INDICATION BELOW 1900 PSIG NOT NECESSARILY ACCURATE (INSTRUMENT RANGE 1900-2500 PSIG)

	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+0000.0	+0023.1	+1640.1	+0000.0
	0000762	,	+0000.0	+0578.6	+0576.7	+0578.6	+0574.0	+0065.4	-0207.3	+0062.0	+0000.0	+0023.0	+1633.5	+0000.0
	0000762	1	+0000.0	+0578.8	+0576.9	+0578.6	+0574.2	+0066.5	-0210.1	+0062.2	+0000.0	+0024.4	+1626.8	+0000.0
	0000762	1	+0000.0	+0578.7	+0577.1	+0578.7	+0574.2	+0065.5	-0213.4	+0062.2	-0000.7	+0025.9	+1619.5	-0003.2
	0000762	3	+0000.0	+0578.5	+0577.1	+0578.9	+0574.4	+0065.9	-0216.6	+0062.3	+0010.0	+0025.7	+1608.8	+0010.0
	0000762	3	+0000.0	+0578.5	+0577.1	+0578.9	+0574.7	+0065.6	-0219.7	+0062.3	+0010.0	+0028.8	+1592.0	+0010.0
	0000762	3	+0000.0	+0578.5	+0577.3	+0578.8	+0574.8	+0065.6	-0222.8	+0062.4	+0010.0	+0027.3	+1585.2	+0010.0
	0000762	3	+0000.0	+0578.4	+0577.3	+0578.7	+0574.9	+0065.9	-0225.7	+0062.4	+0010.0	+0027.3	+1585.0	+0010.0
150	0000762	3	+0000.0	+0578.3	+0577.3	+0578.8	+0574.9	+0065.5	-0229.2	+0062.5	+0000.2	+0032.1	+1583.9	+0000.8
	0000762	3	+0000.0	+0578.3	+0577.4	+0578.8	+0575.1	+0065.7	-0232.0	+0062.5	+0000.0	+0029.6	+1583.7	+0000.0
	0000763	3	+0000.0	+0578.4	+0577.4	+0578.8	+0575.2	+0065.5	-0235.4	+0062.6	+0000.0	+0032.4	+1583.8	+0000.0
	0000763	1	+0000.0	+0578.3	+0577.5	+0578.7	+0575.2	+0065.5	-0238.5	+0062.6	+0000.0	+0033.0	+1583.8	+0000.0
	0000763	3	+0000.0	+0578.3	+0577.5	+0578.8	+0575.3	+0065.5	-0241.4	+0062.7	+0000.0	+0034.0	+1583.8	+0000.0
	0000763	3	+0000.0	+0578.3	+0577.5	+0578.7	+0575.3	+0065.7	-0244.6	+0062.7	+0000.0	+0035.6	+1583.8	+0000.0
	0000763	3	+0000.0	+0578.3	+0577.5	+0578.7	+0575.4	+0065.4	-0247.9	+0062.7	+0000.0	+0036.3	+1583.7	+0000.0
	0000763	3	-0000.0	+0578.3	+0577.6	+0578.7	+0575.4	+0065.8	-0250.7	+0062.8	-0000.2	+0037.4	+1583.7	+0000.0
	0000763	3	-0000.0	+0578.2	+0577.6	+0578.6	+0575.4	+0065.6	-0254.2	+0062.8	+0010.0	+0041.5	+1583.6	+0010.0
1	0000763	3	-0000.0	+0578.2	+0577.6	+0578.6	+0575.4	+0065.9	-0257.3	+0062.8	+0010.0	+0042.2	+1583.4	+0010.0
180	0000763	3	-0000.0	+0578.3	+0577.6	+0578.7	+0575.4	+0065.6	-0260.5	+0062.9	+0010.0	+0049.2	+1583.4	+0010.0
	0000763	3	-0000.0	+0578.3	+0577.6	+0578.7	+0575.5	+0065.5	-0263.5	+0062.9	+0010.0	+0055.1	+1583.4	+0010.0
	0000763	3	-0000.0	+0578.3	+0577.6	+0578.7	+0575.6	+0066.1	-0266.9	+0062.9	+0002.7	+0073.1	+1583.6	+0003.3
	0000763	3	-0000.0	+0578.3	+0577.7	+0578.7	+0575.6	+0065.4	-0269.6	+0063.0	+0000.0	+0091.1	+1583.6	+0000.0
	0000763	3	-0000.0	+0578.3	+0577.7	+0578.8	+0575.8	+0066.1	-0273.2	+0063.0	+0000.0	+0113.4	+1583.7	+0000.0
	0000763	3	-0000.0	+0578.3	+0577.7	+0578.8	+0575.8	+0065.7	-0276.2	+0063.0	+0000.0	+0121.7	+1583.9	+0000.0
	0000763	3	-0000.0	+0578.3	+0577.8	+0578.9	+0575.8	+0065.6	-0279.4	+0063.1	+0000.0	+0119.5	+1583.9	+0000.0
	0000763	3	-0000.0	+0578.3	+0577.8	+0578.9	+0575.8	+0065.6	-0281.9	+0063.1	+0000.0	+0117.1	+1583.9	+0000.0
	0000763	3	-0000.0	+0578.4	+0577.8	+0578.9	+0575.8	+0065.3	-0285.3	+0063.1	+0000.0	+0116.2	+1583.9	+0000.0
	0000763	3	-0000.0	+0578.4	+0577.8	+0578.9	+0575.8	+0065.5	-0288.5	+0063.2	+0000.0	+0116.6	+1583.9	+0000.0
210	0000763	3	-0000.0	+0578.4	+0577.8	+0579.0	+0575.9	+0065.4	-0291.4	+0063.2	+0000.0	+0116.7	+1584.0	+0000.0
	0000763	3	-0000.0	+0578.4	+0577.9	+0578.9	+0575.8	+0065.3	-0294.5	+0063.2	-0002.3	+0116.7	+1583.7	-0000.2
	0000764	3	-0000.0	+0578.4	+0577.9	+0578.8	+0575.8	+0065.6	-0297.4	+0063.3	+0010.0	+0116.5	+1583.8	+0010.0
	0000764	3	-0000.0	+0578.4	+0577.9	+0578.9	+0575.8	+0065.8	-0300.3	+0063.3	+0010.0	+0116.4	+1583.6	+0010.0
	0000764	3	-0000.0	+0578.5	+0577.9	+0578.9	+0575.9	+0065.6	-0303.6	+0063.3	+0010.0	+0116.6	+1583.6	+0010.0
	0000764	3	-0000.0	+0578.5	+0577.9	+0579.0	+0575.9	+0065.5	-0306.2	+0063.4	+0010.0	+0115.7	+1583.6	+0010.0
	0000764	3	-0000.0	+0578.5	+0578.0	+0579.0	+0576.0	+0065.6	-0309.5	+0063.4	+0010.0	+0114.8	+1583.6	+0010.0
	0000764	3	-0000.0	+0578.5	+0578.0	+0579.1	+0576.0	+0065.7	-0312.3	+0063.4	+0000.1	+0114.4	+1583.7	-0000.1
	0000764	3	-0000.0	+0578.5	+0578.0	+0579.1	+0576.1	+0065.8	-0314.9	+0063.5	+0000.0	+0116.9	+1583.8	+0000.0
	0000764	3	-0000.0	+0578.5	+0578.0	+0579.2	+0576.1	+0065.6	-0317.4	+0063.5	+0000.0	+0114.6	+1583.9	+0000.0
240	0000764	3	-0000.0	+0578.5	+0578.0	+0579.1	+0576.1	+0065.3	-0320.9	+0063.5	+0000.0	+0118.2	+1583.9	+0000.0
	0000764	3	-0000.0	+0578.6	+0578.0	+0579.2	+0576.1	+0065.6	-0324.1	+0063.6	+0000.0	+0115.2	+1584.0	+0000.0
	0000764	3	-0000.0	+0578.6	+0578.1	0579.2	+0576.1	+0065.3	-0326.7	+0063.6	+0000.0	+0118.0	+1584.0	+0000.0
1	0000764	3	-0000.0	+0578.6	+0578.1	+0579.2	+0576.1	+0065.8	-0329.8	+0063.6	+0000.0	+0116.4	+1583.9	+0000.0
	0000764	3	-0000.0	+0578.6	+0578.1	+0579.1	+0576.1	+0065.3	-0332.7	+0063.7	+0003.7	+0117.1	+1583.8	+0000.8
	0000764	3	-0000.0	+0578.6	+0578.1	+0579.1	+0576.1	+0065.7	-0335.9	+0063.7	+0010.0	+0118.3	+1583.8	+0010.0
	0000764	3	-0000.0	+0578.6	+0578.1	+0579.1	+0576.1	+0065.4	-0338.9	+0063.7	+0010.0	+0118.6	+1583.7	+0010.0
	0000764	3	-0000.0	+0578.6	+0578.1	+0579.1	+0576.2	+0065.4	-0342.2	+0063.8	+0010.0	+0118.8	+1583.6	+0010.0
	0000764	3	-0000.0	+0578.6	+0578.1	+0579.2	+0576.2	+0065.6	-0345.4	+0063.8	+0010.0	+0118.2	+1583.6	+0010.0
	0000764	3	-0000.0	+0578.6	+0578.1	+0579.2	+0576.2	+0065.6	-0348.0	+0063.8	-0002.7	+0118.4	+1583.6	+0005.3
270	0000764	3	-0000.0	+0578.6	+0578.1	+0579.2	+0576.2	+0065.8	-0350.9	+0063.9	+0000.1	+0118.2	+1583.6	+0000.3
	0000764	3	-0000.0	+0578.7	+0578.1	+0579.3	+0576.2	+0065.4	-0354.5	+0063.9	+0000.0	+0118.1	+1583.8	+0000.0
	0000765	3	-0000.0	+0578.7	+0578.2	+0579.3	+0576.3	+0065.3	-0357.4	+0064.0	+0000.0	+0118.7	+1583.8	+0000.0
	0000765	3	-0000.0	+0578.7	+0578.2	+0579.4	+0576.3	+0065.6	-0360.2	+0064.0	+0000.0	+0118.1	+1583.9	+0000.0
1	0000765	3	-0000.0	+0578.7	+0578.2	+0579.3	+0576.4	+0065.5	-0363.2	+0064.0	+0000.0	+0118.4	+1584.0	+0000.0
	0000765	3	-0000.0	+0578.8	+0578.2	+0579.3	+0576.3	+0065.7	-0365.5	+0064.1	+0000.0	+0118.6	+1584.0	+0000.0
	0000765	3	-0000.0	+0579.2	+0578.3	+0579.3	+0576.3	+0065.6	-0367.7	+0064.1	+0000.0	+0120.1	+1584.0	+0000.0
	0000765	3	-0000.1	+0579.4	+0578.4	+0579.4	+0576.4	+0065.4	-0369.8	+0064.3	+0000.0	+0118.6	+1584.0	+0000.0
	0000765	3	-0000.0	+0579.5	+0578.6	+0579.7	+0576.3	+0065.4	-0371.6	+0064.4	+0010.0	+0118.5	+1583.9	-0001.9
	0000765	3	-0000.1	+0579.8	+0578.9	+0579.9	+0576.4	+0065.4	-0373.3	+0064.5	+0009.9	+0120.5	+1583.8	+0010.0
300	0000765	3	-0000.1	+0580.1	+0579.3	+0580.1	+0576.6	+0065.2	-0374.5	+0064.9	+0010.0	+0119.6	+1583.7	+0010.0
	0000765	3	-0000.1	+0580.3	+0579.6	+0580.3	+0576.9	+0065.6	-0376.0	+0065.3	+0010.0	+0122.4	+1583.7	+0007.4
	0000765	3	-0000.1	+0580.5	+0579.8	+0580.6	+0577.2	+0065.5	-0375.9	+0065.7	+0007.8	+0119.5	+1583.7	+0010.0
	0000765	3	-0000.1	+0580.8	+0580.2	+0580.9	+0577.5	+0065.5	-0374.9	+0066.0	+0001.2	+0115.2	+1583.7	-0000.1
	0000765	3	-0000.0	+0581.1	+0580.5	+0581.1	+0577.8	+0065.1	-0373.8	+0066.4	+0000.0	+0119.0	+1583.9	+0000.0
	0000765	3	-0000.1	+0581.3	+0580.8	+0581.4	+0578.2	+0065.4	-0372.6	+0066.8	+0000.0	+0118.7	+1584.0	+0000.0
	0000765	3	-0000.0	+0581.5	+0581.0	+0581.6	+0578.4	+0065.3	-0372.1	+0067.2	+0000.0	+0120.8	+1584.0	+0000.0
	0000765	3	-0000.1	+0581.8	+0581.3	+0581.6	+0578.6	+0064.6	-0372.0	+0067.8	+0000.0	+0115.0	+1584.1	+0000.0
	[illegible]	3	-0000.0	+0582.0	+0581.5	+0581.4	+0578.6	+0063.0	-0372.7	+0068.7	+0000.0	+0120.1	+1584.1	+0000.0

0000765	3	-0000.0	+0582.1	+0581.7	+0581.2	+0578.5	+0063.7	-0374.4	+0068.?	+0000.0	+0119.8	+1584.1	+0000.0
0000765	3	-0000.0	+0582.2	+0581.8	+0581.3	+0578.5	+0064.2	-0377.2	+0069.0	+0000.0	+0117.5	+1583.9	+0000.0
0000765	3	-0000.1	+0582.3	+0581.9	+0581.3	+0578.6	+0063.7	-0379.7	+0069.2	+0010.0	+0118.5	+1583.9	+0010.0
0000766	3	-0000.0	+0582.5	+0582.1	+0581.4	+0578.7	+0064.0	-0382.3	+0069.5	+0010.0	+0121.0	+1583.8	+0010.0
0000766	3	-0000.1	+0582.7	+0582.3	+0581.6	+0578.9	+0063.9	-0385.7	+0069.8	+0010.0	+0120.6	+1583.8	+0010.0
0000766	3	-0000.1	+0582.8	+0582.5	+0581.8	+0579.1	+0063.9	-0388.9	+0070.1	+0010.0	+0115.3	+1583.7	+0010.0
0000766	3	-0000.1	+0583.0	+0582.7	+0582.0	+0579.2	+0064.2	-0392.0	+0070.4	+0010.0	+0119.6	+1583.8	+0010.0
0000766	3	-0000.0	+0583.2	+0582.8	+0582.2	+0579.4	+0064.1	-0395.3	+0070.6	+0001.9	+0144.4	+1583.8	+0002.4
0000766	3	-0000.0	+0583.4	+0583.0	+0582.4	+0579.6	+0064.1	-0398.2	+0070.9	+0000.0	+0139.2	+1583.8	+0000.0
0000766	3	-0000.0	+0583.6	+0583.2	+0582.7	+0579.9	+0064.2	-0399.0	+0071.2	+0000.0	+0117.5	+1583.9	+0000.0
0000766	3	-0000.1	+0583.8	+0583.4	+0582.9	+0580.1	+0064.8	-0399.0	+0071.5	+0000.0	+0134.6	+1584.0	+0000.0
0000766	3	-0000.1	+0584.1	+0583.7	+0583.2	+0580.3	+0065.0	-0399.0	+0071.9	+0000.0	+0137.9	+1584.1	+0000.0
0000766	3	-0000.1	+0584.3	+0583.9	+0583.4	+0580.6	+0064.7	-0399.0	+0072.0	+0000.0	+0145.2	+1584.1	+0000.0
0000766	3	-0000.1	+0584.6	+0584.2	+0583.7	+0580.8	+0065.0	-0399.0	+0072.4	+0000.0	+0153.2	+1584.1	+0000.0
0000766	3	-0000.0	+0584.9	+0584.5	+0583.9	+0581.1	+0064.8	-0399.0	+0072.7	+0000.0	+0151.9	+1584.0	+0000.0
0000766	3	-0000.1	+0585.[illegible]	+0584.7	+0584.2	+0581.3	+0064.9	-0399.0	+0073.0	+0010.0	+0150.6	+1584.0	+0010.0
0000766	3	-0000.1	+0585.4	+0585.0	+0584.4	+0581.6	+0064.8	-0399.0	+0073.3	+0006.0	+0151.0	+1583.8	+0006.4
0000766	3	-0000.1	+0585.7	+0585.3	+0584.7	+0581.8	+0064.8	-0399.0	+0073.6	+0010.0	+0151.9	+1583.7	+0010.0
0000766	3	-0000.1	+0586.0	+0585.6	+0585.0	+0582.2	+0065.0	-0399.0	+0073.9	+0010.0	+0151.8	+1583.7	+0010.0
0000766	3	-0000.1	+0586.3	+0585.8	+0585.3	+0582.5	+0064.9	-0399.0	+0074.1	+0010.0	+0149.4	+1583.7	+0010.0
0000766	3	-0000.1	+0586.5	+0586.1	+0585.6	+0582.8	+0064.9	-0399.0	+0074.4	+0001.3	+0149.9	+1583.8	-0000.3
0000766	3	-0000.1	+0586.8	+0586.4	+0585.9	+0583.0	+0064.3	-0399.0	+0074.7	+0000.1	+0155.6	+1583.8	+0000.1
0000766	3	-0000.1	+0587.1	+0586.7	+0586.2	+0583.3	+0064.7	-0399.0	+0075.0	+0000.0	+0153.6	+1583.8	+0000.0
0000767	3	-0000.1	+0587.4	+0586.9	+0586.5	+0583.6	+0064.4	-0399.0	+0075.3	+0000.0	+0149.9	+1583.8	+0000.0
0000767	3	-0000.1	+0587.6	+0587.2	+0586.8	+0583.9	+0064.2	-0399.0	+0075.6	+0000.0	+0155.6	+1584.0	+0000.0
0000767	3	-0000.1	+0587.9	+0587.5	+0587.0	+0584.2	+0064.4	-0399.0	+0075.8	+0000.0	+0153.4	+1584.0	+0000.0
00007[illegible]	3	-0000.0	+0588.2	+0587.8	+0587.3	+0584.5	+0064.2	-0399.0	+0076.0	+0000.0	+0151.6	+1584.0	+0000.0
0000767	3	-0000.1	+0588.4	+0588.0	+0587.6	+0584.7	+0064.4	-0399.0	+0076.2	+0000.0	+0156.4	+1584.0	+0000.0
0000767	3	-0000.1	+0588.7	+0588.3	+0587.9	+0584.9	+0064.3	-0399.0	+0076.4	+0000.0	+0156.6	+1584.0	+0000.0
0000767	3	-0000.1	+0589.0	+0588.6	+0588.1	+0585.2	+0064.3	-0399.0	+0076.6	+0000.0	+0158.2	+1584.0	+0000.0
0000767	3	-0000.1	+0589.2	+0588.9	+0588.4	+0585.5	+0064.4	-0399.0	+0076.8	+0000.0	+0157.3	+1584.1	+0000.0
0000767	3	-0000.1	+0589.5	+0589.1	+0588.7	+0585.7	+0064.3	-0399.0	+0076.9	+0000.0	+0095.7	+1583.9	+0000.0
0000767	3	-0000.0	+0589.8	+0589.4	+0588.9	+0586.0	+0064.5	-0399.0	+0076.9	+0000.2	+0135.5	+1583.8	-0000.0
0000767	3	-0000.1	+0590.0	+0589.7	+0589.1	+0586.2	+0064.1	-0399.0	+0076.8	+0010.0	+0154.1	+1583.8	-0000.0
0000767	3	-0000.1	+0590.3	+0589.9	+0589.4	+0586.5	+0064.2	-0399.0	+0076.8	+0010.0	+0150.5	+1583.8	-0010.0
0000767	3	-0000.1	+0590.6	+0590.2	+0589.6	+0586.8	+0064.3	-0399.0	+0076.8	+0010.0	+0135.4	+1583.7	+0005.4
0000767	3	-0000.1	+0590.9	+0590.5	+0589.9	+0587.1	+0064.0	-0399.0	+0076.7	+0010.0	+0150.7	+1583.6	+0010.0
0000767	3	-0000.1	+0591.1	+0590.7	+0590.2	+0587.3	+0063.9	-0399.0	+0076.6	+0010.0	+0158.0	+1583.6	+0006.3
0000767	3	-0000.1	+0591.4	+0591.0	+0590.5	+0587.6	+0064.0	-0399.0	+0076.4	+0010.0	+0130.1	+1583.6	+0010.0
0000767	3	-0000.1	+0591.7	+0591.3	+0590.8	+0587.9	+0063.8	-0399.0	+0076.2	+0010.0	+0152.0	+1583.6	+0010.0
0000767	3	-0000.1	+0591.9	+0591.6	+0591.1	+0588.2	+0063.9	-0399.0	+0076.0	+0002.4	+0145.6	+1583.7	+0003.4
0000767	3	-0000.0	+0592.2	+0591.8	+0591.4	+0588.5	+0063.9	-0399.0	+0075.9	+0000.0	+0150.8	+1583.7	+0000.0
0000767	3	-0000.1	+0592.5	+0592.1	+0591.7	+0588.8	+0063.7	-0399.0	+0075.6	+0000.0	+0098.4	+1583.6	+0000.0
0000768	3	-0000.1	+0592.8	+0592.4	+0592.0	+0589.1	+0063.9	-0399.0	+0075.5	+0000.0	+0137.5	+1583.8	+0000.0
0000768	3	-0000.1	+0593.0	+0592.6	+0592.2	+0589.3	+0064.1	-0399.0	+0075.4	+0000.0	+0159.5	+1583.9	+0000.0
0000768	3	-0000.1	+0593.3	+0592.9	+0592.5	+0589.6	+0063.5	-0399.0	+0075.3	+0000.0	+0146.0	+1583.8	+0000.0
0000768	3	-0000.1	+0593.5	+0593.2	+0592.8	+0589.9	+0063.6	-0399.0	+0075.2	+0000.0	+0136.0	+1583.9	+0000.0
0000768	3	-0000.1	+0593.8	+0593.4	+0593.0	+0590.1	+0063.7	-0399.0	+0075.1	+0000.0	+0136.7	+1584.0	+0000.0
0000768	3	-0000.1	+0594.0	+0593.7	+0593.3	+0590.3	+0063.7	-0399.0	+0075.1	+0000.0	+0151.4	+1584.0	+0000.0
0000768	3	-0000.0	+0594.3	+0594.0	+0593.5	+0590.6	+0063.7	-0399.0	+0075.0	+0000.0	+0151.9	+1583.9	+0000.0
0000768	3	-0000.1	+0594.6	+0594.2	+0593.9	+0590.8	+0063.9	-0399.0	+0074.9	+0000.0	+0150.1	+1583.7	+0000.0
0000768	3	-0000.1	+0594.8	+0594.5	+0594.0	+0591.1	+0063.6	-0399.0	+0074.9	+0009.8	+0148.6	+1584.1	-0000.9
0000768	3	-0000.1	+0595.1	+0594.7	+0594.2	+0591.3	+0063.5	-0399.0	+0074.9	+0010.0	+0154.5	+1583.7	+0010.0
0000768	3	-0000.1	+0595.3	+0595.0	+0594.5	+0591.6	+0063.8	-0399.0	+0074.9	+0010.0	+0153.4	+1583.6	+0010.0
0000768	3	-0000.1	+0595.6	+0595.3	+0594.8	+0591.8	+0064.0	-0399.0	+0074.9	+0010.0	+0146.3	+1583.6	+0010.0
0000768	3	-0000.1	+0595.9	+0595.5	+0595.0	+0592.1	+0063.3	-0399.0	+0074.9	+0010.0	+0148.2	+1583.6	+0010.0
0000768	3	-0000.1	+0596.1	+0595.8	+0595.3	+0592.4	+0063.6	-0399.0	+0074.9	+0010.0	+0153.9	+1583.6	+0010.0
0000768	3	-0000.1	+0596.4	+0596.0	+0595.6	+0592.7	+0063.5	-0399.0	+0074.9	+0010.0	+0145.1	+1583.5	+0010.0
0000768	3	-0000.1	+0596.6	+0596.3	+0595.8	+0592.9	+0063.9	-0399.0	+0074.9	+0010.0	+0148.1	+1583.6	+0010.0
0000768	3	-0000.1	+0596.8	+0596.5	+0596.1	+0593.1	+0063.3	-0399.0	+0074.9	+0010.0	+0149.7	+1583.5	+0007.3
0000768	3	-0000.1	+0597.0	+0596.6	+0596.2	+0593.3	+0063.7	-0399.0	+0074.9	-0003.1	+0146.7	+1583.6	+0010.0
0000768	3	-0000.1	+0597.1	+0596.7	+0596.3	+0593.4	+0063.9	-0399.0	+0074.9	+0000.5	+0145.5	+1583.6	+0004.4
0000768	3	-0000.1	+0597.1	+0596.8	+0596.2	+0593.5	+0064.4	-0399.0	+0074.9	+0000.0	+0146.9	+1583.6	+0000.9
0000769	3	-0000.1	+0597.0	+0596.7	+0595.9	+0593.4	+0064.2	-0399.0	+0074.9	+0000.0	+0144.9	+1583.6	+0000.0
0000769	3	-0000.1	+0596.7	+0596.5	+0595.7	+0593.3	+0064.3	-0399.0	+0074.9	+0000.0	+0145.3	+1583.8	+0000.0
0000769	3	-0000.1	+0596.5	+0596.2	+0595.4	+0593.1	+0064.[illegible]	-0399.0	+0074.9	+0000.0	+0143.8	+1583.8	+0000.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0000769	3	-0000.1	+0596.1	+0595.9	+0595.1	+0592.7	+0064.6	-0399.0	+0074.9	+0000.0	+0144.7	+1583.9	+0000.0
	0000769	3	-0000.1	+0595.9	+0595.7	+0594.9	+0592.5	+0064.4	-0399.0	+0074.9	+0000.0	+0147.8	+1583.9	+0000.0
	0000769	3	-0000.1	+0595.8	+0595.5	+0594.6	+0592.4	+0065.0	-0399.0	+0074.9	+0000.0	+0139.9	+1583.9	+0000.0
	0000769	3	-0000.1	+0595.6	+0595.4	+0594.4	+0592.2	+0064.8	-0399.0	+0074.9	+0000.0	+0147.2	+1583.9	+0000.0
540	0000769	3	-0000.1	+0595.4	+0595.2	+0594.2	+0592.0	+0064.7	-0399.0	+0074.9	+0000.0	+0143.9	+1583.8	+0000.0
	0000769	3	-0000.1	+0595.2	+0595.0	+0593.8	+0591.8	+0065.4	-0399.0	+0074.9	+0000.0	+0138.8	+1583.8	+0000.0
	0000769	3	-0000.1	+0595.0	+0594.8	+0593.4	+0591.6	+0065.3	-0399.0	+0074.9	-0002.6	+0146.0	+1583.0	-0003.0
	0000769	3	-0000.1	+0594.8	+0594.6	+0593.2	+0591.4	+0064.9	-0399.0	+0074.9	+0010.0	+0143.0	+1583.6	+0010.0
	0000769	3	-0000.1	+0594.5	+0594.4	+0593.0	+0591.1	+0065.2	-0399.0	+0074.9	+0010.0	+0140.6	+1583.6	+0010.0
	0000769	3	-0000.1	+0594.3	+0594.1	+0592.9	+0590.9	+0065.5	-0399.0	+0074.9	+0010.0	+0142.7	+1583.6	+0010.0
	0000769	3	-0000.1	+0594.1	+0593.9	+0592.7	+0590.7	+0065.7	-0399.0	+0075.0	+0010.0	+0142.8	+1583.5	+0010.0
	0000769	3	-0000.1	+0593.8	+0593.6	+0592.5	+0590.4	+0065.4	-0399.0	+0074.9	+0010.0	+0140.2	+1583.5	+0010.0
	0000769	3	-0000.1	+0593.6	+0593.4	+0592.2	+0590.2	+0065.7	-0399.0	+0075.0	+0002.7	+0139.2	+1583.6	+0004.0
	0000769	3	-0000.1	+0593.3	+0593.1	+0592.0	+0589.9	+0065.5	-0399.0	+0075.0	+0000.0	+0139.6	+1583.6	+0000.0
570	0000769	3	-0000.1	+0593.1	+0592.9	+0591.8	+0589.8	+0065.4	-0399.0	+0075.0	+0000.0	+0139.5	+1583.6	+0000.0
	0000769	3	-0000.1	+0592.8	+0592.6	+0591.6	+0589.5	+0065.7	-0399.0	+0075.0	+0000.0	+0140.8	+1583.8	+0000.0
	0000770	3	-0000.1	+0592.5	+0592.4	+0591.4	+0589.2	+0065.6	-0399.0	+0075.3	+0000.0	+0139.9	+1583.8	+0000.0
	0000770	3	-0000.1	+0592.3	+0592.1	+0591.2	+0589.0	+0065.5	-0399.0	+0076.1	+0000.0	+0136.5	+1583.9	+0000.0
	0000770	3	-0000.1	+0592.0	+0591.8	+0591.0	+0588.7	+0065.3	-0399.0	+0076.5	+0000.0	+0138.3	+1583.8	+0000.0
	0000770	3	-0000.1	+0591.8	+0591.6	+0590.7	+0588.4	+0066.1	-0399.0	+0076.7	+0000.0	+0137.8	+1583.9	+0000.0
	0000770	3	-0000.1	+0591.5	+0591.4	+0590.5	+0588.2	+0066.2	-0399.0	+0076.9	+0000.0	+0134.9	+1583.9	+0000.0
	0000770	3	-0000.1	+0591.3	+0591.1	+0590.2	+0588.0	+0065.9	-0399.0	+0077.0	+0000.0	+0138.4	+1584.0	+0000.0
	0000770	3	-0000.1	+0591.0	+0590.9	+0589.9	+0587.7	+0065.7	-0399.0	+0076.9	+0000.0	+0135.9	+1583.9	+0000.0
	0000770	3	-0000.1	+0590.8	+0590.7	+0589.7	+0587.5	+0066.3	-0399.0	+0076.9	+0000.0	+0131.0	+1583.9	+0000.0
	0000770	3	-0000.1	+0590.6	+0590.5	+0589.5	+0587.3	+0065.8	-0399.0	+0076.9	+0000.0	+0135.1	+1583.9	+0000.0
	0000770	3	-0000.1	+0590.4	+0590.3	+0589.3	+0587.1	+0066.1	-0399.0	+0076.8	+0000.0	+0137.8	+1583.8	+0000.0
	0000770	3	-0000.1	+0590.2	+0590.1	+0589.0	+0586.9	+0066.5	-0399.0	+0076.7	+0000.1	+0133.5	+1583.8	+0000.0
	0000770	3	-0000.1	+0590.0	+0589.9	+0588.8	+0586.7	+0066.8	-0399.0	+0076.5	+0001.9	+0131.0	+1583.7	+0001.2
	0000770	3	-0000.1	+0589.9	+0589.8	+0588.7	+0586.5	+0066.9	-0399.0	+0076.4	+0010.0	+0130.5	+1583.7	+0010.0
	0000770	3	-0000.1	+0589.7	+0589.6	+0588.5	+0586.4	+0066.5	-0399.0	+0076.2	+0010.0	+0132.0	+1583.6	+0010.0
	0000770	3	-0000.1	+0589.6	+0589.5	+0588.3	+0586.2	+0066.7	-0390.4	+0076.1	+0010.0	+0131.9	+1583.6	+0010.0
	0000770	3	-0000.1	+0589.4	+0589.4	+0588.2	+0586.1	+0066.6	-0394.6	+0075.8	+0010.0	+0130.0	+1583.5	+0010.0
	0000770	3	-0000.1	+0589.3	+0589.2	+0588.0	+0586.0	+0066.3	-0392.9	+0075.7	+0010.0	+0129.9	+1583.6	+0010.0
	0000770	3	-0000.1	+0589.2	+0589.1	+0587.9	+0585.8	+0066.4	-0390.9	+0075.6	+0006.7	+0128.6	+1583.6	+0007.5
	0000770	3	-0000.1	+0589.0	+0588.9	+0587.8	+0585.7	+0066.4	-0389.0	+0075.7	+0000.6	+0130.0	+1583.6	+0001.2
	0000770	3	-0000.0	+0588.9	+0588.8	+0587.6	+0585.5	+0067.1	-0387.3	+0075.6	+0000.0	+0127.3	+1583.6	+0000.0
	0000771	3	-0000.1	+0588.7	+0588.7	+0587.5	+0585.4	+0067.1	-0385.7	+0075.6	+0000.0	+0126.5	+1583.6	+0000.0
	0000771	3	-0000.1	+0588.6	+0588.5	+0587.5	+0585.4	+0066.6	-0384.1	+0075.6	+0000.0	+0127.4	+1583.7	+0000.0
	0000771	3	-0000.1	+0588.5	+0588.5	+0587.5	+0585.3	+0066.4	-0383.6	+0075.7	+0000.0	+0126.2	+1583.6	+0000.0
	0000771	3	-0000.1	+0588.4	+0588.3	+0587.4	+0585.2	+0066.4	-0382.3	+0075.7	+0000.0	+0124.3	+1583.8	+0000.0
	0000771	3	-0000.1	+0588.3	+0588.2	+0587.3	+0585.1	+0066.6	-0381.7	+0076.5	+0000.0	+0125.8	+1583.8	+0000.0
	0000771	3	-0000.1	+0588.2	+0588.2	+0587.2	+0584.9	+0066.3	-0381.2	+0076.9	+0000.0	+0127.4	+1583.9	+0000.0
	0000771	3	-0000.1	+0588.1	+0588.1	+0587.0	+0584.8	+0066.5	-0380.6	+0077.2	+0000.0	+0126.2	+1584.0	+0000.0
	0000771	3	-0000.1	+0588.0	+0587.9	+0586.9	+0584.7	+0066.7	-0379.7	+0077.5	+0000.0	+0125.0	+1583.9	+0000.0
660	0000771	3	-0000.1	+0587.9	+0587.8	+0586.8	+0584.6	+0066.7	-0378.9	+0077.7	+0000.0	+0124.3	+1584.0	+0000.0
	0000771	3	-0000.1	+0587.8	+0587.7	+0586.7	+0584.4	+0066.6	-0378.5	+0077.9	+0000.0	+0124.8	+1584.0	+0000.0
	0000771	3	-0000.1	+0587.7	+0587.7	+0586.5	+0584.3	+0066.3	-0378.6	+0078.1	+0000.0	+0125.3	+1583.8	+0000.0
	0000771	3	-0000.1	+0587.6	+0587.5	+0586.5	+0584.3	+0066.6	-0378.7	+0078.2	+0000.0	+0124.0	+1583.8	+0000.0
	0000771	3	-0000.1	+0587.5	+0587.4	+0586.5	+0584.1	+0066.4	-0378.6	+0078.2	+0000.0	+0125.2	+1583.7	+0000.0
	0000771	3	-0000.1	+0587.5	+0587.4	+0586.4	+0584.1	+0066.3	-0378.9	+0078.3	+0000.0	+0123.6	+1583.8	+0000.0
	0000771	3	-0000.1	+0587.4	+0587.4	+0586.2	+0584.0	+0066.3	-0379.3	+0078.4	+0000.0	+0122.0	+1583.6	+0000.0
	0000771	3	-0000.1	+0587.3	+0587.3	+0586.1	+0583.9	+0066.3	-0379.5	+0078.5	+0000.0	+0121.4	+1583.6	+0000.0
	0000771	3	-0000.1	+0587.2	+0587.1	+0586.0	+0583.8	+0066.5	-0379.1	+0078.6	+0000.0	+0121.9	+1583.6	+0000.0
	0000771	3	-0000.1	+0587.1	+0587.1	+0586.0	+0583.8	+0066.5	-0379.1	+0078.7	+0000.0	+0123.5	+1583.6	+0000.0
11.5	0000771	3	-0000.1	+0587.0	+0587.0	+0585.9	+0583.7	+0066.5	-0379.5	+0078.8	+0000.0	+0122.4	+1583.6	+0000.0
	0000771	3	-0000.0	+0586.9	+0586.9	+0585.8	+0583.6	+0067.0	-0379.6	+0078.9	+0000.0	+0122.3	+1583.6	+0000.0
	0000772	3	-0000.1	+0586.9	+0586.8	+0585.7	+0583.5	+0066.8	-0379.8	+0079.0	+0000.0	+0122.4	+1583.6	+0000.0
	0000772	3	-0000.1	+0586.8	+0586.7	+0585.7	+0583.4	+0066.4	-0380.0	+0079.1	+0000.0	+0122.5	+1583.7	+0000.0
	0000772	3	-0000.1	+0586.7	+0586.6	+0585.6	+0583.4	+0066.4	-0380.2	+0079.2	+0000.0	+0122.0	+1583.6	+0000.0
	0000772	3	-0000.1	+0586.6	+0586.6	+0585.5	+0583.3	+0066.3	-0380.3	+0079.3	+0000.0	+0121.9	+1583.8	+0000.0
	0000772	3	-0000.1	+0586.5	+0586.5	+0585.4	+0583.2	+0066.8	-0380.4	+0079.3	+0000.0	+0121.9	+1583.8	+0000.0
	0000772	3	-0000.1	+0586.4	+0586.4	+0585.4	+0583.2	+0066.8	-0380.4	+0079.4	+0000.0	+0122.9	+1583.8	+0000.0
	0000772	3	-0000.1	+0586.3	+0586.3	+0585.3	+0583.1	+0066.7	-0380.4	+0079.4	+0000.0	+0122.6	+1583.9	+0000.0
	0000772	3	-0000.1	+0586.2	+0586.2	+0585.2	+0582.9	+0066.7	-0380.4	+0079.5	+0000.0	+0123.0	+1583.9	+0000.0
	0000772	3	-0000.1	+0586.1	+0586.1	+0585.1	+0582.8	+00[illegible]	-0380.5	+0079.5	+0000.0	+0123.7	+1584.0	+0000.0

	[illegible]	3	-0000.1	[illegible]	+0586.1	+0585.1	+0582.8	+0066.4	-0380.5	+0079.5	+0000.0	+0123.7	+1584.0	+0000.0
	0000772	3	-0000.1	+0586.0	+0586.0	+0585.0	+0582.7	+0066.6	-0380.4	+0079.5	+0000.0	+0123.3	+1583.9	+0000.0
	0000772	3	-0000.1	+0585.9	+0585.9	+0584.9	+0582.6	+0066.7	-0380.4	+0079.5	+0000.0	+0124.0	+1584.0	+0000.0
	0000772	3	-0000.1	+0585.8	+0585.8	+0584.7	+0582.5	+0066.5	-0380.3	+0079.5	+0000.0	+0123.7	+1584.0	+0000.0
	0000772	3	-0000.1	+0585.7	+0585.7	+0584.6	+0582.4	+0066.7	-0380.3	+0079.6	+0000.0	+0124.4	+1584.0	+0000.0
	0000772	3	-0000.0	+0585.6	+0585.6	+0584.5	+0582.3	+0066.6	-0380.2	+0079.6	+0000.0	+0125.1	+1584.0	+0000.0
	0000772	3	-0000.1	+0585.5	+0585.5	+0584.4	+0582.2	+0067.0	-0380.2	+0079.6	+0000.0	+0125.0	+1583.9	+0000.0
	0000772	3	-0000.1	+0585.4	+0585.4	+0584.3	+0582.1	+0066.7	-0380.1	+0079.7	+0000.0	+0125.8	+1584.0	+0000.0
	0000772	3	-0000.1	+0585.2	+0585.2	+0584.2	+0582.0	+0066.7	-0379.5	+0079.7	+0000.0	+0126.9	+1583.9	+0000.0
	0000772	3	-0000.1	+0585.1	+0585.1	+0584.0	+0581.8	+0067.2	-0379.3	+0079.7	+0000.0	+0127.3	+1583.9	+0000.0
12.5	0000772	3	-0000.1	+0585.0	+0585.0	+0583.9	+0581.7	+0066.8	-0379.0	+0079.8	+0000.0	+0127.6	+1583.9	+0000.0
	0000772	3	-0000.1	+0584.8	+0584.8	+0583.6	+0581.5	+0066.8	-0378.8	+0079.9	+0000.0	+0128.7	+1583.8	+0000.0
	0000773	3	-0000.1	+0584.7	+0584.7	+0583.5	+0581.3	+0067.1	-0378.1	+0080.0	+0000.0	+0129.1	+1583.8	+0000.0
	0000773	3	-0000.1	+0584.5	+0584.5	+0583.3	+0581.2	+0066.9	-0377.4	+0080.0	+0000.0	+0129.9	+1583.8	+0000.0
	0000773	3	-0000.1	+0584.4	+0584.4	+0583.2	+0581.0	+0066.9	-0376.9	+0080.1	+0000.0	+0130.8	+1583.8	+0000.0
	0000773	3	-0000.1	+0584.2	+0584.2	+0583.0	+0580.9	+0067.6	-0376.4	+0080.1	+0000.0	+0131.4	+1583.7	+0000.0
	0000773	3	-0000.1	+0584.1	+0584.1	+0582.8	+0580.7	+0067.6	-0375.6	+0080.1	+0000.0	+0132.4	+1583.6	+0000.0
	0000773	3	-0000.1	+0583.9	+0583.9	+0582.7	+0580.6	+0067.3	-0375.4	+0080.2	+0000.0	+0133.3	+1583.7	+0000.0
	0000773	3	-0000.1	+0583.8	+0583.8	+0582.5	+0580.4	+0067.4	-0374.7	+0080.2	+0000.0	+0134.3	+1583.7	+0000.0
	0000773	3	-0000.1	+0583.6	+0583.6	+0582.4	+0580.3	+0067.6	-0374.3	+0080.2	+0000.0	+0135.0	+1583.6	+0000.0
13.0	0000773	3	-0000.1	+0583.4	+0583.4	+0582.2	+0580.1	+0067.4	-0373.7	+0080.3	+0000.0	+0135.8	+1583.7	+0000.0
	0000773	3	-0000.1	+0583.2	+0583.3	+0582.0	+0579.9	+0067.2	-0373.3	+0080.3	+0000.0	+0137.1	+1583.6	+0000.0
	0000773	3	-0000.1	+0583.1	+0583.1	+0581.8	+0579.8	+0067.6	-0372.6	+0080.3	+0000.0	+0138.0	+1583.7	+0000.0
	0000773	3	-0000.1	+0582.9	+0582.9	+0581.7	+0579.6	+0067.7	-0372.4	+0080.3	+0000.0	+0138.7	+1583.7	+0000.0
	0000773	3	-0000.0	+0582.8	+0582.8	+0581.5	+0579.5	+0067.5	-0372.2	+0080.4	+0000.0	+0139.9	+1583.7	+0000.0
	0000773	3	-0000.1	+0582.6	+0582.6	+0581.3	+0579.2	+0067.2	-0371.9	+0080.4	+0000.0	+0141.0	+1583.6	+0000.0
	0000773	3	-0000.1	+0582.3	+0582.3	+0581.1	+0579.1	+0067.6	-0371.3	+0080.4	+0000.0	+0142.2	+1583.7	+0000.0
	0000773	3	-0000.1	+0582.1	+0582.1	+0580.9	+0578.8	+0067.8	-0370.6	+0080.5	+0000.0	+0142.9	+1583.7	+0000.0
	0000773	3	-0000.1	+0581.9	+0581.8	+0580.7	+0578.6	+0067.1	-0369.9	+0080.4	+0000.0	+0144.2	+1583.7	+0000.0
	0000773	3	-0000.0	+0581.7	+0581.5	+0580.4	+0578.2	+0067.3	-0368.8	+0080.5	+0000.0	+0145.5	+1583.7	+0000.0
13.5	0000773	3	-0000.1	+0581.4	+0581.2	+0580.1	+0577.9	+0066.7	-0367.3	+0080.5	+0000.0	+0146.7	+1583.7	+0000.0
	0000773	3	-0000.1	+0581.1	+0580.8	+0579.8	+0577.6	+0067.1	-0366.0	+0080.6	+0000.0	+0147.8	+1583.7	+0000.0
	0000774	3	-0000.1	+0580.7	+0580.5	+0579.5	+0577.2	+0066.7	-0364.5	+0080.6	+0000.0	+0149.3	+1583.8	+0000.0
	0000774	3	-0000.1	+0580.4	+0580.2	+0579.2	+0576.9	+0066.8	-0363.1	+0080.6	+0000.0	+0150.3	+1583.8	+0000.0
	0000774	3	-0000.1	+0580.1	+0579.8	+0578.9	+0576.6	+0066.4	-0362.0	+0080.6	+0000.0	+0151.6	+1583.8	+0000.0
	0000774	3	-0000.1	+0579.8	+0579.5	+0578.6	+0576.2	+0066.6	-0360.7	+0080.7	+0000.0	+0153.0	+1583.8	+0000.0
	0000774	3	-0000.1	+0579.5	+0579.2	+0578.2	+0576.0	+0066.5	-0359.8	+0080.7	+0000.0	+0154.5	+1583.8	+0000.0
	0000774	3	-0000.1	+0579.2	+0578.9	+0577.9	+0575.6	+0066.4	-0359.2	+0080.7	+0000.0	+0155.9	+1583.8	+0000.0
	0000774	3	-0000.1	+0578.8	+0578.5	+0577.6	+0575.2	+0066.2	-0358.2	+0080.7	+0000.0	+0157.1	+1583.9	+0000.0
	0000774	3	-0000.0	+0578.5	+0578.2	+0577.2	+0574.9	+0066.6	-0357.1	+0080.9	+0000.0	+0158.3	+1583.8	+0000.0
14.0	0000774	3	-0000.1	+0578.2	+0577.8	+0576.9	+0574.5	+0066.2	-0356.4	+0080.8	+0000.0	+0160.2	+1583.9	+0000.0
	0000774	3	-0000.0	+0577.8	+0577.5	+0576.6	+0574.2	+0066.6	-0355.3	+0080.8	+0000.0	+0162.0	+1584.0	+0000.0
	0000774	3	-0000.1	+0577.5	+0577.2	+0576.2	+0573.8	+0066.8	-0354.7	+0080.8	+0000.0	+0163.7	+1583.9	+0000.0
	0000774	3	-0000.1	+0577.2	+0576.8	+0575.9	+0573.5	+0066.8	-0354.7	+0080.9	+0000.0	+0165.3	+1584.0	+0000.0
	0000774	3	-0000.1	+0576.8	+0576.5	+0575.6	+0573.2	+0066.5	-0354.6	+0080.9	+0000.0	+0166.7	+1584.0	+0000.0
	0000774	3	-0000.1	+0576.5	+0576.1	+0575.2	+0572.8	+0066.4	-0354.3	+0080.9	+0000.0	+0168.8	+1584.0	+0000.0
	0000774	3	-0000.1	+0576.2	+0575.8	+0574.9	+0572.5	+0066.9	-0354.1	+0080.9	+0000.0	+0170.6	+1584.1	+0000.0
	0000774	3	-0000.1	+0575.9	+0575.4	+0574.5	+0572.1	+0066.2	-0354.4	+0081.0	+0000.0	+0172.2	+1584.2	+0000.0
	0000774	3	-0000.1	+0575.5	+0575.1	+0574.1	+0571.8	+0066.4	-0354.2	+0081.0	+0000.0	+0174.0	+1584.2	+0000.0
	0000774	3	-0000.1	+0575.1	+0574.7	+0573.8	+0571.4	+0066.3	-0353.9	+0081.0	+0000.0	+0175.4	+1584.2	+0000.0
14.5	0000774	3	-0000.1	+0574.8	+0574.4	+0573.5	+0571.1	+0066.2	-0354.0	+0081.0	+0000.0	+0177.4	+1584.1	+0000.0
	0000774	3	-0000.1	+0574.5	+0574.1	+0573.1	+0570.8	+0066.5	-0354.5	+0081.0	+0000.0	+0179.6	+1584.1	+0000.0
	0000775	3	-0000.1	+0574.2	+0573.8	+0572.8	+0570.4	+0066.2	-0354.9	+0081.1	+0000.0	+0181.6	+1584.2	+0000.0
	0000775	3	-0000.1	+0573.8	+0573.4	+0572.4	+0570.1	+0065.8	-0354.8	+0081.1	+0000.0	+0183.3	+1584.2	+0000.0
	0000775	3	-0000.1	+0573.5	+0573.0	+0572.0	+0569.7	+0066.4	-0354.7	+0081.1	+0000.0	+0185.1	+1584.2	+0000.0
	0000775	3	-0000.1	+0573.2	+0572.7	+0571.7	+0569.4	+0066.1	-0354.8	+0081.1	+0000.0	+0187.1	+1584.2	+0000.0
	0000775	3	-0000.1	+0572.8	+0572.4	+0571.3	+0569.1	+0066.0	-0355.2	+0081.1	+0000.0	+0189.2	+1584.2	+0000.0
	0000775	3	-0000.1	+0572.5	+0572.1	+0571.0	+0568.7	+0065.9	-0355.1	+0081.2	+0000.0	+0191.6	+1584.2	+0000.0
	0000775	3	-0000.1	+0572.2	+0571.8	+0570.7	+0568.4	+0066.0	-0355.4	+0081.2	+0000.0	+0160.5	+1584.2	+0000.0
	0000775	3	-0000.1	+0571.9	+0571.5	+0570.3	+0569.1	+0065.4	-0361.5	+0081.2	+0000.0	+0138.2	+1584.0	+0000.0
15.0	0000775	3	-0000.1	+0571.6	+0571.2	+0570.0	+0567.7	+0066.1	-0360.3	+0081.2	+0000.0	+0114.6	+1584.0	+0000.0
	0000775	3	-0000.1	+0571.3	+0570.9	+0569.7	+0567.4	+0066.1	-0360.5	+0081.2	+0000.0	+0092.4	+1584.0	+0000.0
	0000775	3	-0000.1	+0571.0	+0570.6	+0569.4	+0567.1	+0066.4	-0361.9	+0081.3	+0000.0	+0073.4	+1584.0	+0000.0
	0000775	3	-0000.1	+0570.6	+0570.2	+0569.1	+0566.8	+0066.3	-0362.4	+0081.3	+0000.0	+0058.2	+1584.0	+0000.0
	0000775	3	-0000.1	+0570.3	+0570.0	+0568.8	+0566.4	+0066	-0362.3	+0081.3	+0000.0	+0046.9	+1583.9	+0000.0
	0000775	3	-0000.1	+0570.0	+0569.7	+0568.4	+0566.1	+006	0361.9	+0081.3	+0000.0	+0037.1	+1584.0	+0000.0

← DRAIN TANK RUPTURE DISK ACTUATES J.K.F.

	0000775	3	-0000.1	+0569.1	+0568.7	+0567.3	+0565.1	+0066.0	-0359.7	+0081.4	+0000.0	+0019.1	+1584.0	+0000.0
	0000775	3	-0000.1	+0568.8	+0568.4	+0567.0	+0564.8	+0066.2	-0358.9	+0081.4	+0000.0	+0015.9	+1584.0	+0000.0
155	0000775	3	-0000.1	+0568.5	+0568.1	+0566.7	+0564.5	+0066.2	-0358.5	+0081.4	+0000.0	+0013.8	+1584.0	+0000.0
	0000775	3	-0000.1	+0568.2	+0567.8	+0566.4	+0564.2	+0065.9	-0358.4	+0081.5	+0000.0	+0011.7	+1584.0	+0000.0
	0000776	3	-0000.1	+0567.9	+0567.6	+0566.1	+0563.9	+0066.1	-0357.9	+0081.5	+0000.0	+0010.8	+1584.0	+0000.0
	0000776	3	-0000.1	+0567.7	+0567.4	+0565.9	+0563.8	+0065.9	-0358.2	+0081.5	+0000.0	+0009.8	+1584.0	+0000.0
	0000776	3	-0000.1	+0567.5	+0567.3	+0565.7	+0563.6	+0066.1	-0358.4	+0081.5	+0000.0	+0009.2	+1584.0	+0000.0
	0000776	3	-0000.1	+0567.4	+0567.1	+0565.6	+0563.4	+0065.9	-0358.9	+0081.5	+0000.0	+0008.8	+1584.0	+0000.0
	0000776	3	-0000.0	+0567.3	+0567.0	+0565.5	+0563.3	+0065.6	-0360.1	+0081.6	+0000.0	+0008.7	+1583.9	+0000.0
	0000776	3	-0000.1	+0567.2	+0566.9	+0565.4	+0563.2	+0065.4	-0361.9	+0081.6	+0000.0	+0008.9	+1584.0	+0000.0
	0000776	3	-0000.1	+0567.0	+0566.8	+0565.2	+0563.1	+0065.7	-0363.3	+0081.6	+0000.0	+0009.1	+1583.9	+0000.0
	0000776	3	-0000.1	+0567.0	+0566.7	+0565.2	+0562.9	+0065.8	-0364.3	+0081.6	+0000.0	+0009.1	+1583.9	+0000.0
160	0000776	3	-0000.1	+0566.9	+0566.6	+0565.0	+0562.8	+0065.4	-0365.2	+0081.6	+0000.0	+0009.4	+1583.9	+0000.0
	0000776	3	-0000.1	+0566.8	+0566.5	+0564.9	+0562.8	+0065.7	-0366.0	+0081.7	+0000.0	+0009.2	+1583.9	+0000.0
	0000776	3	-0000.1	+0566.7	+0566.4	+0564.8	+0562.7	+0065.5	-0366.4	+0081.7	+0000.0	+0009.7	+1583.9	+0000.0
	0000776	3	-0000.1	+0566.6	+0566.3	+0564.7	+0562.5	+0065.3	-0366.3	+0081.7	+0000.0	+0009.9	+1583.8	+0000.0
	0000776	3	-0000.1	+0566.5	+0566.2	+0564.6	+0562.4	+0065.6	-0366.3	+0081.8	+0000.0	+0010.2	+1583.8	+0000.0
	0000776	3	-0000.1	+0566.4	+0566.2	+0564.5	+0562.3	+0065.6	-0366.6	+0081.9	+0000.0	+0010.6	+1583.8	+0000.0
	0000776	3	-0000.1	+0566.4	+0566.1	+0564.4	+0562.2	+0065.7	-0366.8	+0081.9	+0000.0	+0011.1	+1583.7	+0000.0
	0000776	3	-0000.1	+0566.3	+0566.1	+0564.3	+0562.2	+0065.4	-0366.9	+0082.0	+0000.0	+0011.4	+1583.8	+0000.0
	0000776	3	-0000.1	+0566.2	+0566.0	+0564.2	+0562.1	+0065.4	-0366.8	+0082.1	+0000.0	+0011.8	+1583.8	+0000.0
	0000776	3	-0000.1	+0566.1	+0565.9	+0564.1	+0562.0	+0066.1	-0366.6	+0082.2	+0000.0	+0012.1	+1583.7	+0000.0
165	0000776	3	-0000.1	+0566.1	+0565.8	+0564.1	+0561.9	+0065.8	-0366.6	+0082.3	+0000.0	+0012.3	+1583.7	+0000.0
	0000776	3	-0000.1	+0566.0	+0565.8	+0563.9	+0561.9	+0066.0	-0366.3	+0082.3	+0000.0	+0012.7	+1583.7	+0000.0
	0000777	3	-0000.1	+0565.9	+0565.7	+0563.9	+0561.7	+0066.6	-0366.2	+0082.5	+0000.0	+0013.0	+1583.6	+0000.0
	0000777	3	-0000.1	+0565.8	+0565.6	+0563.8	+0561.7	+0066.0	-0366.4	+0082.5	+0000.0	+0013.4	+1583.7	+0000.0
	0000777	3	-0000.1	+0565.7	+0565.5	+0563.7	+0561.6	+0066.1	-0366.3	+0082.7	+0000.0	+0013.6	+1583.7	+0000.0
	0000777	3	-0000.1	+0565.7	+0565.5	+0563.6	+0561.5	+0065.8	-0366.2	+0082.8	+0000.0	+0013.7	+1583.7	+0000.0
	0000777	3	-0000.1	+0565.6	+0565.4	+0563.5	+0561.4	+0065.6	-0366.1	+0082.9	+0000.0	+0014.1	+1583.7	+0000.0
	0000777	3	-0000.1	+0565.5	+0565.3	+0563.5	+0561.3	+0065.6	-0366.0	+0083.0	+0000.0	+0014.4	+1583.4	+0000.0
	0000777	3	-0000.1	+0565.5	+0565.2	+0563.4	+0561.2	+0065.5	-0366.4	+0083.1	+0000.0	+0014.5	+1583.7	+0000.0
	0000777	3	-0000.1	+0565.4	+0565.1	+0563.3	+0561.2	+0065.8	-0366.6	+0083.2	+0000.0	+0014.7	+1583.9	+0000.0
170	0000777	3	-0000.1	+0565.3	+0565.1	+0563.2	+0561.1	+0065.8	-0366.6	+0083.4	+0000.0	+0014.9	+1583.8	+0000.0
	0000777	3	-0000.1	+0565.2	+0565.0	+0563.1	+0561.0	+0066.0	-0366.3	+0083.4	+0000.0	+0015.2	+1583.9	+0000.0
	0000777	3	-0000.1	+0565.0	+0564.9	+0563.0	+0560.9	+0066.1	-0366.4	+0083.6	+0000.0	+0015.1	+1583.9	+0000.0
	0000777	3	-0000.0	+0564.9	+0564.8	+0562.8	+0560.8	+0066.8	-0365.8	+0083.7	+0000.0	+0015.4	+1583.9	+0000.0
	0000777	3	-0000.1	+0564.8	+0564.7	+0562.7	+0560.7	+0066.0	-0365.7	+0083.8	+0000.0	+0015.7	+1583.9	+0000.0
	0000777	3	-0000.1	+0564.6	+0564.5	+0562.5	+0560.6	+0066.4	-0365.3	+0083.9	+0000.0	+0015.7	+1583.8	+0000.0
	0000777	3	-0000.1	+0564.4	+0564.3	+0562.3	+0560.4	+0066.5	-0364.5	+0084.0	+0000.0	+0015.9	+1583.8	+0000.0
	0000777	3	-0000.1	+0564.3	+0564.2	+0562.1	+0560.2	+0067.1	-0363.7	+0084.2	+0000.0	+0016.0	+1583.8	+0000.0
	0000777	3	-0000.1	+0564.1	+0564.0	+0562.0	+0560.0	+0066.7	-0362.9	+0084.3	+0000.0	+0016.3	+1583.9	+0000.0
	0000777	3	-0000.1	+0563.9	+0563.8	+0561.8	+0559.8	+0066.8	-0361.7	+0084.4	+0000.0	+0016.3	+1583.9	+0000.0
175	0000777	3	-0000.1	+0563.7	+0563.6	+0561.6	+0559.5	+0066.8	-0360.4	+0084.5	+0000.0	+0016.4	+1583.9	+0000.0
	0000777	3	-0000.1	+0563.5	+0563.4	+0561.4	+0559.4	+0066.5	-0359.4	+0084.6	+0000.0	+0016.6	+1584.0	+0000.0
	0000778	3	-0000.1	+0563.3	+0563.2	+0561.2	+0559.1	+0066.6	-0358.0	+0084.7	+0000.0	+0016.7	+1584.0	+0000.0
	0000778	3	-0000.1	+0563.1	+0563.0	+0561.0	+0559.0	+0066.6	-0357.1	+0084.9	+0000.0	+0016.6	+1584.0	+0000.0
	0000778	3	-0000.1	+0562.9	+0562.8	+0560.8	+0558.8	+0066.5	-0356.2	+0085.0	+0000.0	+0016.9	+1584.1	+0000.0
	0000778	3	-0000.1	+0562.7	+0562.6	+0560.6	+0558.7	+0066.7	-0355.5	+0085.1	+0000.0	+0016.9	+1584.2	+0000.0
	0000778	3	-0000.1	+0562.6	+0562.5	+0560.5	+0558.6	+0066.9	-0355.4	+0085.2	+0000.0	+0017.0	+1584.2	+0000.0
	0000778	3	-0000.1	+0562.4	+0562.4	+0560.3	+0558.4	+0066.2	-0355.3	+0085.2	+0000.0	+0017.3	+1584.1	+0000.0
	0000778	3	-0000.1	+0562.2	+0562.2	+0560.1	+0558.2	+0067.0	-0355.6	+0085.3	+0000.0	+0017.3	+1584.2	+0000.0
	0000778	3	-0000.1	+0562.1	+0562.1	+0559.9	+0558.1	+0067.3	-0355.5	+0085.3	+0000.0	+0017.3	+1584.2	+0000.0
180	0000778	3	-0000.1	+0561.9	+0561.9	+0559.8	+0557.9	+0066.7	-0355.1	+0085.3	+0000.0	+0017.3	+1584.2	+0000.0
	0000778	3	-0000.1	+0561.8	+0561.8	+0559.7	+0557.8	+0066.6	-0355.7	+0085.3	+0000.0	+0017.4	+1584.2	+0000.0
	0000778	3	-0000.1	+0561.6	+0561.6	+0559.5	+0557.6	+0066.8	-0355.3	+0085.3	+0000.0	+0017.4	+1584.1	+0000.0
	0000778	3	-0000.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

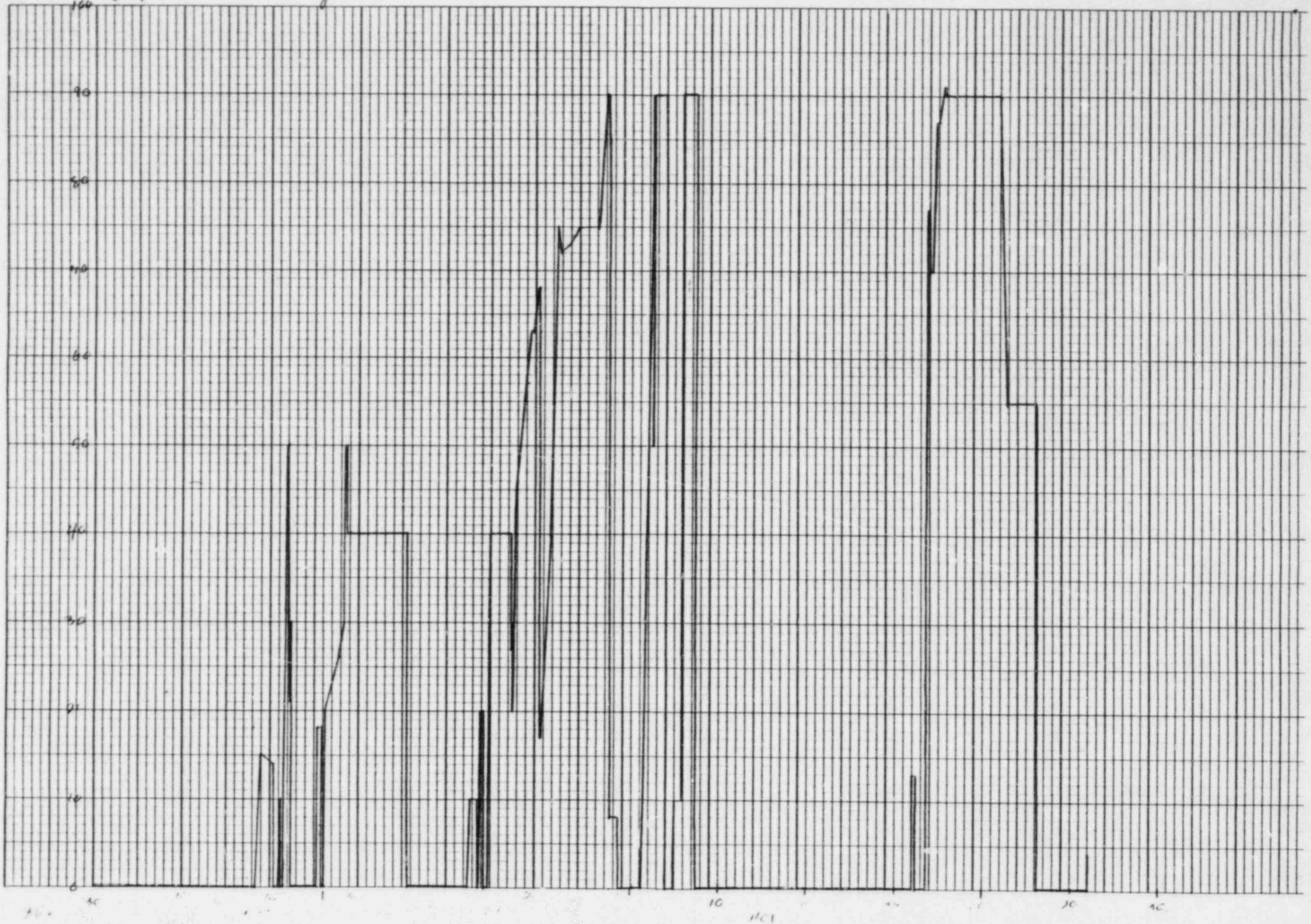
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+0066.5	-0358.3	+0085.6	+0000.0	+0017.7	+1584.1	+0000.0
	0000779	3	-0000.1	+0559.8	+0559.9	+0557.6	+0555.8	+0066.6	-0358.5	+0085.6	+0000.0	+0017.6	+1584.1	+0000.0
	0000779	3	-0000.1	+0559.7	+0559.7	+0557.4	+0555.7	+0066.4	-0358.9	+0085.6	+0000.0	+0017.7	+1584.1	+0000.0
	0000779	3	-0000.1	+0559.5	+0559.6	+0557.3	+0555.5	+0066.8	-0359.2	+0085.6	+0000.0	+0017.7	+1584.1	+0000.0
	0000779	3	-0000.1	+0559.3	+0559.4	+0557.1	+0555.4	+0067.0	-0359.0	+0085.7	+0000.0	+0017.7	+1584.1	+0000.0
	0000779	3	-0000.1	+0559.3	+0559.3	+0557.0	+0555.2	+0066.2	-0358.7	+0085.6	+0000.0	+0017.8	+1584.1	+0000.0
	0000779	3	-0000.1	+0559.1	+0559.2	+0556.9	+0555.1	+0066.1	-0359.1	+0085.7	+0000.0	+0017.8	+1584.2	+0000.0
19.0	0000779	3	-0000.1	+0559.0	+0559.0	+0556.7	+0555.0	+0066.5	-0359.3	+0085.7	+0000.0	+0017.8	+1584.2	+0000.0
	0000779	3	-0000.1	+0558.8	+0558.9	+0556.6	+0554.8	+0066.7	-0358.9	+0085.7	+0000.0	+0017.7	+1584.2	+0000.0
	0000779	3	-0000.1	+0558.7	+0558.8	+0556.4	+0554.6	+0065.8	-0359.2	+0085.7	+0000.0	+0017.9	+1584.2	+0000.0
	0000779	3	-0000.1	+0558.6	+0558.7	+0556.3	+0554.5	+0066.2	-0359.3	+0085.7	+0000.0	+0017.8	+1584.1	+0000.0
	0000779	3	-0000.1	+0558.5	+0558.5	+0556.1	+0554.4	+0066.4	-0359.6	+0085.7	+0000.0	+0017.8	+1584.2	+0000.0
	0000779	3	-0000.1	+0558.3	+0558.4	+0556.0	+0554.2	+0066.5	-0359.3	+0085.7	+0000.0	+0017.8	+1584.1	+0000.0
	0000779	3	-0000.1	+0558.2	+0558.3	+0555.8	+0554.1	+0066.5	-0359.8	+0085.7	+0000.0	+0017.8	+1584.1	+0000.0
	0000779	3	-0000.1	+0558.1	+0558.1	+0555.7	+0554.0	+0066.1	-0360.4	+0085.8	+0000.0	+0017.7	+1584.1	+0000.0
	0000779	3	-0000.0	+0558.0	+0558.0	+0555.6	+0553.9	+0066.6	-0360.3	+0085.8	+0000.0	+0017.7	+1584.2	+0000.0
	0000779	3	-0000.1	+0557.8	+0557.9	+0555.5	+0553.7	+0066.3	-0360.1	+0085.8	+0000.0	+0017.6	+1584.1	+0000.0
19.5	0000779	3	-0000.1	+0557.7	+0557.8	+0555.3	+0553.6	+0066.6	-0360.1	+0085.8	+0000.0	+0017.7	+1584.2	+0000.0
	0000779	3	-0000.1	+0557.6	+0557.7	+0555.2	+0553.5	+0066.4	-0360.4	+0085.8	+0000.0	+0017.7	+1584.2	+0000.0
	0000780	3	-0000.1	+0557.4	+0557.5	+0555.0	+0553.3	+0065.8	-0360.2	+0085.8	+0000.0	+0017.6	+1584.2	+0000.0
	0000780	3	-0000.1	+0557.3	+0557.4	+0554.9	+0553.2	+0065.8	-0360.2	+0085.8	+0000.0	+0017.6	+1584.2	+0000.0
	0000780	3	-0000.1	+0557.2	+0557.3	+0554.8	+0553.1	+0066.0	-0360.4	+0085.8	+0000.0	+0017.5	+1584.2	+0000.0
	0000780	3	-0000.1	+0557.1	+0557.1	+0554.7	+0553.0	+0065.3	-0360.4	+0085.8	+0000.0	+0017.6	+1584.2	+0000.0
	0000780	3	-0000.1	+0557.0	+0557.1	+0554.6	+0552.9	+0066.4	-0360.7	+0085.8	+0000.0	+0017.6	+1584.2	+0000.0
	0000780	3	-0000.1	+0556.9	+0556.9	+0554.4	+0552.7	+0065.9	-0361.0	+0085.8	+0000.0	+0017.5	+1584.2	+0000.0
	0000780	3	-0000.1	+0556.8	+0556.8	+0554.3	+0552.6	+0065.9	-0361.3	+0085.7	+0000.0	+0017.4	+1584.2	+0000.0
	0000780	3	-0000.1	+0556.6	+0556.7	+0554.1	+0552.5	+0066.1	-0360.8	+0085.7	+0000.0	+0017.4	+1584.2	+0000.0
20.0	0000780	3	-0000.1	+0556.5	+0556.6	+0554.1	+0552.3	+0066.1	-0361.3	+0085.7	+0000.0	+0017.4	+1584.2	+0000.0
	0000780	3	-0000.1	+0556.4	+0556.5	+0553.9	+0552.2	+0065.8	-0361.0	+0085.7	+0000.0	+0017.2	+1584.2	+0000.0
	0000780	3	-0000.1	+0556.2	+0556.3	+0553.8	+0552.1	+0066.3	-0360.9	+0085.7	+0000.0	+0017.1	+1584.2	+0000.0
	0000780	3	-0000.0	+0556.2	+0556.3	+0553.7	+0552.0	+0066.2	-0361.2	+0085.7	+0000.0	+0017.1	+1584.2	+0000.0
	0000780	3	-0000.1	+0556.1	+0556.1	+0553.6	+0551.9	+0066.2	-0361.8	+0085.7	+0000.0	+0017.2	+1584.2	+0000.0
	0000780	3	-0000.1	+0556.0	+0556.0	+0553.5	+0551.7	+0065.7	-0361.7	+0085.7	+0000.0	+0017.0	+1584.2	+0000.0
	0000780	3	-0000.1	+0555.9	+0555.9	+0553.3	+0551.6	+0065.4	-0361.4	+0085.7	+0000.0	+0017.1	+1584.1	+0000.0
	0000780	3	-0000.1	+0555.7	+0555.8	+0553.2	+0551.5	+0066.1	-0361.4	+0085.7	+0000.0	+0017.0	+1584.1	+0000.0
	0000780	3	-0000.1	+0555.6	+0555.6	+0553.1	+0551.3	+0065.6	-0361.0	+0085.7	+0000.0	+0016.9	+1584.1	+0000.0
	0000780	3	-0000.1	+0555.5	+0555.5	+0552.9	+0551.2	+0065.7	-0361.2	+0085.7	+0000.0	+0016.9	+1584.0	+0000.0
20.5	0000780	3	-0000.1	+0555.4	+0555.4	+0552.8	+0551.1	+0065.7	-0361.1	+0085.8	+0000.0	+0016.7	+1584.0	+0000.0
	0000780	3	-0000.1	+0555.3	+0555.3	+0552.7	+0550.9	+0065.3	-0361.6	+0085.8	+0000.0	+0016.7	+1584.0	+0000.0
	0000781	3	-0000.1	+0555.2	+0555.2	+0552.6	+0550.8	+0065.2	-0361.7	+0085.8	+0000.0	+0016.6	+1584.0	+0000.0
	0000781	3	-0000.0	+0555.1	+0555.1	+0552.4	+0550.7	+0065.4	-0361.5	+0085.8	+0000.0	+0016.5	+1583.9	+0000.0
	0000781	3	-0000.1	+0554.9	+0554.9	+0552.3	+0550.6	+0065.5	-0361.4	+0085.8	+0000.0	+0016.6	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.8	+0554.8	+0552.2	+0550.5	+0065.0	-0361.8	+0085.8	+0000.0	+0016.5	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.7	+0554.7	+0552.1	+0550.4	+0065.1	-0361.5	+0085.8	+0000.0	+0016.2	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.6	+0554.6	+0552.0	+0550.3	+0065.2	-0361.4	+0085.7	+0000.0	+0016.4	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.5	+0554.5	+0551.9	+0550.1	+0064.9	-0361.5	+0085.5	+0000.0	+0016.3	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.4	+0554.4	+0551.7	+0550.0	+0065.1	-0361.6	+0085.4	+0000.0	+0016.3	+1583.8	+0000.0
21.0	0000781	3	-0000.1	+0554.3	+0554.3	+0551.6	+0549.9	+0064.8	-0362.1	+0085.3	+0000.0	+0016.1	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.2	+0554.2	+0551.6	+0549.8	+0064.5	-0361.9	+0085.2	+0000.0	+0016.0	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.2	+0554.1	+0551.5	+0549.7	+0064.5	-0362.5	+0085.0	+0000.0	+0016.0	+1583.8	+0000.0
	0000781	3	-0000.0	+0554.1	+0554.0	+0551.5	+0549.6	+0064.6	-0362.8	+0084.9	+0000.0	+0016.0	+1583.8	+0000.0
	0000781	3	-0000.1	+0554.0	+0553.9	+0551.4	+0549.5	+0064.1	-0363.2	+0084.8	+0000.0	+0016.0	+1583.8	+0000.0
	0000781	3	-0000.1	+0553.9	+0553.8	+0551.3	+0549.4	+0064.5	-0363.6	+0084.7	+0000.0	+0015.9	+1583.8	+0000.0
	0000781	3	-0000.1	+0553.9	+0553.8	+0551.3	+0549.4	+0064.3	-0364.1	+0084.4	+0000.0	+0015.9	+1583.8	+0000.0
	0000781	3	-0000.1	+0553.9	+0553.7	+0551.3	+0549.3	+0063.9	-0364.4	+0084.4	+0000.0	+0015.9	+1583.8	+0000.0
	0000781	3	-0000.1	+0553.8	+0553.6	+0551.2	+0549.3	+0064.3	-0364.5	+0084.3	+0000.0	+0015.7	+1583.9	+0000.0
	0000781	3	-0000.1	+0553.7	+0553.6	+0551.2	+0549.2	+0064.5	-0364.7	+0084.2	+0000.0	+0015.8	+1584.0	+0000.0
21.5	0000781	3	-0000.1	+0553.7	+0553.5	+0551.2	+0549.2	+0063.7	-0365.0	+0084.1	+0000.0	+0015.5	+1584.0	+0000.0
	0000781	3	-0000.1	+0553.6	+0553.4	+0551.1	+0549.1	+0064.3	-0365.5	+0084.0	+0000.0	+0015.7	+1584.0	+0000.0
	0000782	3	-0000.1	+0553.6	+0553.4	+0551.0	+0549.0	+0063.9	-0365.9	+0084.0	+0000.0	+0015.7	+1584.1	+0000.0
	0000782	3	-0000.1	+0553.6	+0553.3	+0551.0	+0549.0	+0063.7	-0366.2	+0083.9	+0000.0	+0015.6	+1584.1	+0000.0
	0000782	3	-0000.1	+0553.5	+0553.3	+0550.9	+0548.9	+0064.1	-0366.3	+0083.8	+0000.0	+0015.4	+1584.1	+0000.0
	0000782	3	-0000.1	+0553.5	+0553.2	+0550.9	+0548.8	+0063.3	-0366.1	+0083.7	+0000.0	+0015.6	+1584.1	+0000.0
	0000782	3	-0000.1	+0553.4	+0553.2	+0550.8	+0548.8	+0063.4	-0366.9	+0083.6	+0000.0	+0015.5	+1584.2	+0000.0
	0000782	3	-0000.1	+0553.4	+0553.1	+0550.8	+0548.7	+0063.0	-0367.0	+0083.6	+0000.0	+0015.4	+1584.1	+0000.0
	0000782	3	-0000.1	+0553.3	+0553.1	+0550.7	+0548.7	+0063.7	-0367.4	+0083.5	+0000.0	+0015.4	+1584.[illegible]	+0000.0

0000782	3	-0000.1	+0553.3	+0553.0	+0550.7	+0548.6	+0063.4	-0367.1	+0083.4	+0000.0	+0015.3	+1584.2	+0000.0
0000782	3	-0000.1	+0553.2	+0553.0	+0550.6	+0548.6	+0063.2	-0367.4	+0083.3	+0000.0	+0015.2	+1584.2	+0000.0
0000782	3	-0000.1	+0553.2	+0552.9	+0550.6	+0548.4	+0063.2	-0367.5	+0083.2	+0000.0	+0015.1	+1584.2	+0000.0
0000782	3	-0000.1	+0553.1	+0552.8	+0550.5	+0548.4	+0063.7	-0367.7	+0083.2	+0000.0	+0015.1	+1584.2	+0000.0
0000782	3	-0000.1	+0553.1	+0552.8	+0550.3	+0548.4	+0063.1	-0368.2	+0083.1	+0000.0	+0015.0	+1584.2	+0000.0
0000782	3	-0000.1	+0553.1	+0552.8	+0550.4	+0548.3	+0063.2	-0368.0	+0083.0	+0000.0	+0014.8	+1584.1	+0000.0
0000782	3	-0000.1	+0553.0	+0552.7	+0550.4	+0548.2	+0063.2	-0368.4	+0082.9	+0000.0	+0014.8	+1584.2	+0000.0
0000782	3	-0000.1	+0552.9	+0552.7	+0550.2	+0548.2	+0063.3	-0368.2	+0082.9	+0000.0	+0014.9	+1584.1	+0000.0
0000782	3	-0000.1	+0552.9	+0552.6	+0550.2	+0548.1	+0063.3	-0368.5	+0082.8	+0000.0	+0014.7	+1584.1	+0000.0
0000782	3	-0000.1	+0552.9	+0552.6	+0550.1	+0548.0	+0063.3	-0369.2	+0082.7	+0000.0	+0014.6	+1584.1	+0000.0
0000782	3	-0000.1	+0552.8	+0552.5	+0550.1	+0548.0	+0062.8	-0369.2	+0082.6	+0000.0	+0014.5	+1584.0	+0000.0
0000782	3	-0000.1	+0552.8	+0552.5	+0550.0	+0547.9	+0063.4	-0369.1	+0082.5	+0000.0	+0014.4	+1584.0	+0000.0
0000782	3	-0000.1	+0552.7	+0552.4	+0550.0	+0547.9	+0063.0	-0368.9	+0082.4	+0000.0	+0014.5	+1584.0	+0000.0
0000783	3	-0000.1	+0552.7	+0552.4	+0549.9	+0547.9	+0063.4	-0369.3	+0082.4	+0000.0	+0014.3	+1583.9	+0000.0
0000783	3	-0000.1	+0552.6	+0552.3	+0549.9	+0547.8	+0063.2	-0368.8	+0082.3	+0000.0	+0014.3	+1583.9	+0000.0
0000783	3	-0000.1	+0552.6	+0552.3	+0549.8	+0547.8	+0063.0	-0369.3	+0082.2	+0000.0	+0014.3	+1583.8	+0000.0
0000783	3	-0000.1	+0552.6	+0552.2	+0549.8	+0547.7	+0062.8	-0369.5	+0082.1	+0000.0	+0013.9	+1583.8	+0000.0
0000783	3	-0000.1	+0552.5	+0552.2	+0549.8	+0547.7	+0062.5	-0369.4	+0082.1	+0000.0	+0014.0	+1583.8	+0000.0
0000783	3	-0000.1	+0552.5	+0552.1	+0549.8	+0547.6	+0063.2	-0369.9	+0082.0	+0000.0	+0014.1	+1583.8	+0000.0
0000783	3	-0000.1	+0552.5	+0552.1	+0549.7	+0547.6	+0063.1	-0369.9	+0081.9	+0000.0	+0013.9	+1583.8	+0000.0
0000783	3	-0000.1	+0552.5	+0552.1	+0549.7	+0547.6	+0062.4	-0369.8	+0081.8	+0000.0	+0013.8	+1583.9	+0000.0
0000783	3	-0000.1	+0552.4	+0552.1	+0549.7	+0547.5	+0062.4	-0370.1	+0081.7	+0000.0	+0013.8	+1583.8	+0000.0
0000783	3	-0000.1	+0552.4	+0552.0	+0549.7	+0547.5	+0062.6	-0370.4	+0081.7	+0000.0	+0013.8	+1583.8	+0000.0
0000783	3	-0000.1	+0552.4	+0552.0	+0549.7	+0547.5	+0063.0	-0370.6	+0081.6	+0000.0	+0013.6	+1583.8	+0000.0
0000783	3	-0000.1	+0552.4	+0552.0	+0549.7	+0547.5	+0063.0	-0371.0	+0081.5	+0000.0	+0013.7	+1583.8	+0000.0
0000783	3	-0000.1	+0552.4	+0552.0	+0549.7	+0547.5	+0062.1	-0371.0	+0081.4	+0000.0	+0013.7	+1583.8	+0000.0
0000783	3	-0000.1	+0552.3	+0552.0	+0549.6	+0547.5	+0062.4	-0370.8	+0081.4	+0000.0	+0013.6	+1583.8	+0000.0
0000783	3	-0000.1	+0552.3	+0552.0	+0549.7	+0547.5	+0062.2	-0371.4	+0081.3	+0000.0	+0013.5	+1583.8	+0000.0
0000783	3	-0000.1	+0552.3	+0551.9	+0549.7	+0547.5	+0062.1	-0371.4	+0081.2	+0000.0	+0013.4	+1583.9	+0000.0
0000783	3	-0000.1	+0552.3	+0551.9	+0549.7	+0547.5	+0062.7	-0371.6	+0081.1	+0000.0	+0013.4	+1583.9	+0000.0
0000783	3	-0000.1	+0552.3	+0551.9	+0549.6	+0547.4	+0062.1	-0371.8	+0081.0	+0000.0	+0013.4	+1584.0	+0000.0
0000783	3	-0000.1	+0552.3	+0551.9	+0549.6	+0547.4	+0061.9	-0372.0	+0081.0	+0000.0	+0013.4	+1584.0	+0000.0
0000783	3	-0000.1	+0552.2	+0551.9	+0549.6	+0547.3	+0062.5	-0372.1	+0080.9	+0000.0	+0013.7	+1584.1	+0000.0
0000784	3	-0000.1	+0552.3	+0551.9	+0549.6	+0547.3	+0062.2	-0372.1	+0080.8	+0000.0	+0013.6	+1584.1	+0000.0
0000784	3	-0000.1	+0552.3	+0551.9	+0549.6	+0547.3	+0062.0	-0373.5	+0080.7	+0000.0	+0013.4	+1584.1	+0000.0
0000784	3	-0000.1	+0552.2	+0551.9	+0549.6	+0547.3	+0061.7	-0373.6	+0080.7	+0000.0	+0013.4	+1584.2	+0000.0
0000784	3	-0000.1	+0552.2	+0551.9	+0549.6	+0547.3	+0062.2	-0374.3	+0080.6	+0000.0	+0013.3	+1584.1	+0000.0
0000784	3	-0000.1	+0552.3	+0551.8	+0549.7	+0547.3	+0061.8	-0374.8	+0080.5	+0000.0	+0013.2	+1584.2	+0000.0
0000784	3	-0000.1	+0552.3	+0551.9	+0549.7	+0547.3	+0061.2	-0375.0	+0080.4	+0000.0	+0013.2	+1584.1	+0000.0
0000784	3	-0000.1	+0552.3	+0551.9	+0549.7	+0547.3	+0061.5	-0374.9	+0080.3	+0000.0	+0013.1	+1584.2	+0000.0
0000784	3	-0000.1	+0552.4	+0551.9	+0549.7	+0547.3	+0061.6	-0374.7	+0080.3	+0000.0	+0013.1	+1584.0	+0000.0
0000784	3	-0000.1	+0552.4	+0552.0	+0549.8	+0547.3	+0061.4	-0374.9	+0080.2	+0000.0	+0013.0	+1584.0	+0000.0
0000784	3	-0000.1	+0552.5	+0552.0	+0549.8	+0547.3	+0061.3	-0375.3	+0080.1	+0000.0	+0012.8	+1584.0	+0000.0
0000784	3	-0000.1	+0552.5	+0552.0	+0549.8	+0547.3	+0061.2	-0377.0	+0080.0	+0000.0	+0012.7	+1584.0	+0000.0
0000784	3	-0000.1	+0552.5	+0552.0	+0549.8	+0547.4	+0061.3	-0378.1	+0079.9	+0000.0	+0012.7	+1583.9	+0000.0
0000784	3	-0000.1	+0552.6	+0552.1	+0549.9	+0547.4	+0061.0	-0378.3	+0079.9	+0000.0	+0012.6	+1583.9	+0000.0
0000784	3	-0000.1	+0552.6	+0552.1	+0550.0	+0547.5	+0061.2	-0378.4	+0079.8	+0000.0	+0012.5	+1583.8	+0000.0
0000784	3	-0000.1	+0552.7	+0552.2	+0550.0	+0547.5	+0061.2	-0378.8	+0079.7	+0000.0	+0012.5	+1583.8	+0000.0
0000784	3	-0000.1	+0552.8	+0552.2	+0550.1	+0547.6	+0060.7	-0379.3	+0079.6	+0000.0	+0012.3	+1583.7	+0000.0
0000784	3	-0000.1	+0552.9	+0552.3	+0550.2	+0547.6	+0060.8	-0379.3	+0079.5	+0000.0	+0012.3	+1583.7	+0000.0
0000784	3	-0000.1	+0552.9	+0552.3	+0550.3	+0547.7	+0061.4	-0379.3	+0079.5	+0000.0	+0012.3	+1583.7	+0000.0
0000784	3	-0000.1	+0553.0	+0552.4	+0550.4	+0547.7	+0060.5	-0379.5	+0079.4	+0000.0	+0012.2	+1583.7	+0000.0
0000784	3	-0000.1	+0553.1	+0552.4	+0550.4	+0547.8	+0060.6	-0379.3	+0079.3	+0000.0	+0012.1	+1583.8	+0000.0
0000785	3	-0000.1	+0553.1	+0552.4	+0550.5	+0547.8	+0060.3	-0379.0	+0079.2	+0000.0	+0012.1	+1583.7	+0000.0
0000785	3	-0000.1	+0553.1	+0552.4	+0550.5	+0547.8	+0060.4	-0378.9	+0079.2	+0000.0	+0012.2	+1583.8	+0000.0
0000785	3	-0000.1	+0553.1	+0552.3	+0550.5	+0547.8	+0060.6	-0378.7	+0079.1	+0000.0	+0012.2	+1583.8	+0000.0
0000785	3	-0000.1	+0553.1	+0552.3	+0550.5	+0547.8	+0059.9	-0378.5	+0079.0	+0000.0	+0012.0	+1583.8	+0000.0
0000785	3	-0000.1	+0553.0	+0552.3	+0550.5	+0547.7	+0060.1	-0378.[illegible]	+0078.9	+0000.0	+0011.9	+1583.9	+0000.0
0000785	3	-0000.1	+0553.0	+0552.2	+0550.5	+0547.7	+0059.9	-0378.6	+0078.8	+0000.0	+0011.9	+1583.9	+0000.0
0000785	3	-0000.1	+0553.0	+0552.2	+0550.4	+0547.6	+0059.9	-0378.1	+0078.8	+0000.0	+0011.8	+1584.0	+0000.0
0000785	3	-0000.1	+0552.9	+0552.1	+0550.3	+0547.6	+0060.4	-0377.4	+0078.7	+0000.0	+0011.9	+1584.0	+0000.0
0000785	3	-0000.1	+0552.8	+0552.1	+0550.3	+0547.5	+0060.1	-0377.0	+0078.6	+0000.0	+0011.9	+1584.1	+0000.0
0000785	3	-0000.1	+0552.8	+0552.0	+0550.2	+0547.4	+0060.2	-0376.9	+0078.6	+0000.0	+0011.8	+1584.1	+0000.0
0000785	3	-0000.1	+0552.7	+0552.0	+0550.1	+0547.3	+0060.1	-0377.1	+0078.5	+0000.0	+0011.8	+1584.1	+0000.0
0000785	3	-0000.1	+0552.7	+0551.9	+0550.1	+0547.3	+006[illegible]	-0376.7	+0078.4	+0000.0	+0011.8	+1584.1	+0000.0
[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	+0011.7	+1584.1	[illegible]

0000785	3	-0000.1	+0552.6	+0551.9	+0550.1	+0547.2	+0060.5	-0376.5	+0078.3	+0000.0	+0011.7	+1584.1	+0000.0
0000785	3	-0000.1	+0552.6	+0551.8	+0550.0	+0547.1	+0060.4	-0375.6	+0078.3	+0000.0	+0011.7	+1584.1	+0000.0
0000785	3	-0000.1	+0552.5	+0551.7	+0550.0	+0547.1	+0060.0	-0374.8	+0078.2	+0000.0	+0011.7	+1584.2	+0000.0
0000785	3	-0000.1	+0552.5	+0551.7	+0549.9	+0547.0	+0060.1	-0374.1	+0078.1	+0000.0	+0011.6	+1584.1	+0000.0
0000785	3	-0000.1	+0552.4	+0551.6	+0549.8	+0546.9	+0059.8	-0373.3	+0078.0	+0000.0	+0011.5	+1584.0	+0000.0
0000785	3	-0000.1	+0552.4	+0551.6	+0549.7	+0546.8	+0060.1	-0372.8	+0077.9	+0000.0	+0011.5	+1584.0	+0000.0
0000785	3	-0000.1	+0552.3	+0551.5	+0549.7	+0546.8	+0060.5	-0372.6	+0077.8	+0000.0	+0011.5	+1584.0	+0000.0
0000785	3	-0000.1	+0552.3	+0551.5	+0549.5	+0546.7	+0060.2	-0372.2	+0072.7	+0000.0	+0011.3	+1584.0	+0000.0
0000786	3	-0000.1	+0552.2	+0551.4	+0549.5	+0546.7	+0060.2	-0371.8	+0077.6	+0000.0	+0011.4	+1583.9	+0000.0
0000786	3	-0000.1	+0552.1	+0551.4	+0549.5	+0546.6	+0060.3	-0371.4	+0077.5	+0000.0	+0011.4	+1583.9	+0000.0
0000786	3	-0000.1	+0552.1	+0551.3	+0549.4	+0546.5	+0060.1	-0371.2	+0077.3	+0000.0	+0011.3	+1583.8	+0000.0
0000786	3	-0000.1	+0552.1	+0551.3	+0549.4	+0546.5	+0060.3	-0371.2	+0077.2	+0000.0	+0011.2	+1583.8	+0000.0
0000786	3	-0000.1	+0552.0	+0551.2	+0549.3	+0546.5	+0059.9	-0371.4	+0077.1	+0000.0	+0011.2	+1583.8	+0000.0
0000786	3	-0000.1	+0552.0	+0551.2	+0549.3	+0546.4	+0060.2	-0371.3	+0077.0	+0000.0	+0011.1	+1583.7	+0000.0
0000786	3	-0000.1	+0552.0	+0551.1	+0549.3	+0546.4	+0060.2	-0371.4	+0076.9	+0000.0	+0011.1	+1583.7	+0000.0
0000786	3	-0000.1	+0551.9	+0551.1	+0549.3	+0546.4	+0060.2	-0371.6	+0076.8	+0000.0	+0011.1	+1583.7	+0000.0
0000786	3	-0000.1	+0551.9	+0551.1	+0549.3	+0546.3	+0060.0	-0371.5	+0076.7	+0000.0	+0010.9	+1583.7	+0000.0
0000786	3	-0000.1	+0551.9	+0551.1	+0549.2	+0546.3	+0059.7	-0371.8	+0076.7	+0000.0	+0010.8	+1583.7	+0000.0
0000786	3	-0000.1	+0551.9	+0551.0	+0549.2	+0546.3	+0059.9	-0372.0	+0076.6	+0000.0	+0010.8	+1583.6	+0000.0
0000786	3	-0000.1	+0551.9	+0551.0	+0549.2	+0546.3	+0059.6	-0371.9	+0076.5	+0000.0	+0010.8	+1583.6	+0000.0
0000786	3	-0000.1	+0551.9	+0551.0	+0549.2	+0546.3	+0060.0	-0372.1	+0076.5	+0000.0	+0010.9	+1583.7	+0000.0
0000786	3	-0000.1	+0551.8	+0551.0	+0549.2	+0546.3	+0059.0	-0372.2	+0076.4	+0000.0	+0010.8	+1583.6	+0000.0
0000786	3	-0000.1	+0551.8	+0550.9	+0549.2	+0546.2	+0059.7	-0372.3	+0076.3	+0000.0	+0010.8	+1583.6	+0000.0
0000786	3	-0000.1	+0551.8	+0550.9	+0549.2	+0546.2	+0059.4	-0372.6	+0076.2	+0000.0	+0010.8	+1583.6	+0000.0
0000786	3	-0000.1	+0551.8	+0550.9	+0549.2	+0546.2	+0059.4	-0372.9	+0076.2	+0000.0	+0010.7	+1583.7	+0000.0
0000786	3	-0000.1	+0551.8	+0550.9	+0549.2	+0546.2	+0059.7	-0373.0	+0076.1	+0000.0	+0010.6	+1583.7	+0000.0
0000786	3	-0000.1	+0551.8	+0550.7	+0549.2	+0546.3	+0060.3	-0373.3	+0076.0	+0000.0	+0010.5	+1583.7	+0000.0
0000786	3	-0000.1	+0551.8	+0550.9	+0549.2	+0546.2	+0058.9	-0373.1	+0076.0	+0000.0	+0010.6	+1583.8	+0000.0
0000787	3	-0000.1	+0551.7	+0550.9	+0549.2	+0546.2	+0059.4	-0373.8	+0075.9	+0000.0	+0010.6	+1583.8	+0000.0
0000787	3	-0000.1	+0551.8	+0550.9	+0549.2	+0546.2	+0058.8	-0373.9	+0075.8	+0000.0	+0010.5	+1583.9	+0000.0
0000787	3	-0000.1	+0551.8	+0550.9	+0549.2	+0546.2	+0059.7	-0373.7	+0075.8	+0000.0	+0010.5	+1583.9	+0000.0
0000787	3	-0000.0	+0551.7	+0550.8	+0549.2	+0546.1	+0059.6	-0373.6	+0075.7	+0000.0	+0010.6	+1584.0	+0000.0
0000787	3	-0000.0	+0551.7	+0550.8	+0549.1	+0546.1	+0059.0	-0373.8	+0075.6	+0000.0	+0010.6	+1584.0	+0000.0
0000787	3	-0000.0	+0551.7	+0550.8	+0549.1	+0546.1	+0059.6	-0374.2	+0075.6	+0000.0	+0010.4	+1584.1	+0000.0
0000787	3	-0000.1	+0551.7	+0550.8	+0549.1	+0546.1	+0059.4	-0373.9	+0075.5	+0000.0	+0010.5	+1584.1	+0000.0
0000787	3	-0000.1	+0551.7	+0550.8	+0549.1	+0546.0	+0059.1	-0373.6	+0075.4	+0000.0	+0010.3	+1584.1	+0000.0
0000787	3	-0000.1	+0551.7	+0550.7	+0549.0	+0546.0	+0059.2	-0374.1	+0075.3	+0000.0	+0010.3	+1584.0	+0000.0
0000787	3	-0000.1	+0551.6	+0550.7	+0549.0	+0546.0	+0059.1	-0374.1	+0075.3	+0000.0	+0010.4	+1584.0	+0000.0
0000787	3	-0000.0	+0551.6	+0550.7	+0549.0	+0546.0	+0058.9	-0374.3	+0075.2	+0000.0	+0010.1	+1584.0	+0000.0
0000787	3	-0000.0	+0551.6	+0550.7	+0549.0	+0545.9	+0059.0	-0374.5	+0075.1	+0000.0	+0010.1	+1584.0	+0000.0
0000787	3	-0000.1	+0551.6	+0550.7	+0548.9	+0545.9	+0058.6	-0374.2	+0075.1	+0000.0	+0010.0	+1583.9	+0000.0
0000787	3	-0000.1	+0551.6	+0550.7	+0548.9	+0545.8	+0059.4	-0374.4	+0075.0	+0000.0	+0010.1	+1583.8	+0000.0
0000787	3	-0000.1	+0551.6	+0550.7	+0548.9	+0545.8	+0059.0	-0374.6	+0074.9	+0000.0	+0009.8	+1583.7	+0000.0
0000787	3	-0000.0	+0551.5	+0550.6	+0549.0	+0545.8	+0059.4	-0374.7	+0074.8	+0000.0	+0009.7	+1583.8	+0000.0
0000787	3	-0000.1	+0551.5	+0550.6	+0548.9	+0545.8	+0059.3	-0374.7	+0074.8	+0000.0	+0009.8	+1583.8	+0000.0
0000787	3	-0000.1	+0551.5	+0550.6	+0548.8	+0545.7	+0059.0	-0375.0	+0074.7	+0000.0	+0009.8	+1583.7	+0000.0
0000787	3	-0000.1	+0551.5	+0550.6	+0548.8	+0545.7	+0059.0	-0374.7	+0074.6	+0000.0	+0009.6	+1583.7	+0000.0
0000787	3	-0000.1	+0551.5	+0550.6	+0548.8	+0545.8	+0059.4	-0374.9	+0074.6	+0000.0	+0009.6	+1583.7	+0000.0
0000788	3	-0000.1	+0551.4	+0550.5	+0548.8	+0545.8	+0059.8	-0374.7	+0074.5	+0000.0	+0009.7	+1583.6	+0000.0
0000788	3	-0000.1	+0551.5	+0550.5	+0548.8	+0545.7	+0058.8	-0374.8	+0074.4	+0000.0	+0009.6	+1583.6	+0000.0
0000788	3	-0000.1	+0551.4	+0550.5	+0548.8	+0545.7	+0058.8	-0374.9	+0074.4	+0000.0	+0009.6	+1583.6	+0000.0
0000788	3	-0000.1	+0551.4	+0550.5	+0548.7	+0545.7	+0059.1	-0374.9	+0074.3	+0000.0	+0009.4	+1583.6	+0000.0
0000788	3	-0000.1	+0551.4	+0550.5	+0548.7	+0545.7	+0058.5	-0374.7	+0074.2	+0000.0	+0009.3	+1583.6	+0000.0
0000788	3	-0000.1	+0551.4	+0550.4	+0548.7	+0545.7	+0058.3	-0375.1	+0074.1	+0000.0	+0009.3	+1583.6	+0000.0
0000788	3	-0000.1	+0551.3	+0550.4	+0548.7	+0545.7	+0058.7	-0375.1	+0074.1	+0000.0	+0009.3	+1583.6	+0000.0
0000788	3	-0000.1	+0551.3	+0550.4	+0548.7	+0545.6	+0059.1	-0374.8	+0074.0	+0000.0	+0009.2	+1583.6	+0000.0
0000788	3	-0000.1	+0551.3	+0550.4	+0548.7	+0545.6	+0058.6	-0374.8	+0073.9	+0000.0	+0009.3	+1583.6	+0000.0
0000788	3	-0000.1	+0551.3	+0550.3	+0548.7	+0545.6	+0059.0	-0374.9	+0073.9	+0000.0	+0009.4	+1583.6	+0000.0
0000788	3	-0000.1	+0551.3	+0550.3	+0548.7	+0545.6	+0058.3	-0375.2	+0073.9	+0000.0	+0009.2	+1583.7	+0000.0
0000788	3	-0000.1	+0551.3	+0550.3	+0548.6	+0545.6	+0058.8	-0375.1	+0073.9	+0000.0	+0009.1	+1583.7	+0000.0
0000788	3	-0000.1	+0551.2	+0550.3	+0548.6	+0545.6	+0058.6	-0375.2	+0074.1	+0000.0	+0009.3	+1583.7	+0000.0
0000788	3	-0000.1	+0551.2	+0550.3	+0548.6	+0545.6	+0058.8	-0375.1	+0074.3	+0000.0	+0009.2	+1583.8	+0000.0
0000788	3	-0000.1	+0551.2	+0550.2	+0548.6	+0545.5	+0058.9	-0375.0	+0074.0	+0000.0	+0009.3	+1583.7	+0000.0
0000788	3	-0000.0	+0551.2	+0550.2	+0548.6	+0545.5	+0058.7	-0375.2	+0073.7	+0000.0	+0009.0	+1583.9	+0000.0
0000788	3	-0000.0	+0551.1	+0550.2	+0548.6	+0545.4	+0058.6	-0375.0	+0074.0	+0000.0	+0009.1	+1583.9	+0000.0

History of Rx Power Aug 30 - Nov 30 1978

K-8



K-9 RCS Pressure from strip chart, used as pressure correction to peak rate calculations done in 1980

2142

78					2142
12/20	8:05	~~(Floating 2120-2185)~~	9:05	~~Flue 2115-2185~~	
21	2:59	2142	3:59	2142	
22	8:10	2130-2150	8:10	2160-2180	
22	23:26	2120-2155	(23) 00:26	2120-2165	
23	20:48	2130-2160	21:48	2130-2160	
24	17:36	(Flue 2125-2185)	18:36	(2115-2185)	
25	1:20	2130-2140	2:20	2150-2185	
25	7:52	2130-2185	8:52	2130-2180	
26	2:49	2120-2190	3:49	2120-2190	
26	9:16	2145-2200	10:16	2140-2190	
27	8:10	missing	9:10	missing	
30	6:15	2120-2150	7:15	2120-2160	
31	5:17	2120-2145	6:17	2120-2145	
31	12:25	2120-2150	13:25	2120-2150	
(79) 1/2	1:03	2120-2155	2:03	2125-2155	
4	3:02	2140	4:02	2145-2165	
5	2:54	2130-2150	3:54	2130-2160	
5	17:23	2120-2180	18 23	2120 2180	
6	2:47	2120-80	3:47	2120-80	
6	10:29	2120-80	11:29	2130-2155	
6	19:20	2125-80	20:20	2110-2200	
7	3:41	2120-2180	4:41	2130 2170	
8	3:21	2120-2155	4:21	2130-2160	
10	1:48	2125-2155	2:48	2120-2165	
11	21:53	2130-2155	22:53	2130-2155	
13	9:37	2130-2155	10:37	2130-2155	
15	0:24	2145	1:24	2145	

all 2100+ PSI

(79)	1/30	22:06	missing	23:06	missing
	2/2	0:55	20-40	1:55	20-40
	2	14:31	20-40	15:31	20-40
	3	5:17	20-40	6:17	20-40
	3	10:32	10-50	11:32	20-35
	3	23:49	20-60	0:49	40-50
	4	14:45	20-30	15:45	20-45
	5	3:12	20-70	4:12	20-55
	5	8:35	20-40	9:35	15-40
	5	18:37	20-40	19:37	05-80
	6	0:25	2100-2180	1:25	2100-2180
	7	1:50	10-30	2:50	10-30
	7	13:57	20-30	14:57	20-30
	8	1:00	30-60	2:00	25-35
	8	20:50	2115	21:50	2115-2130
	9	2:20	20-40	3:20	20-40
	10	8:41	20-40	9:41	15-30
	11	2:41	25-40	3:41	25-40
	11	18:08	2135	19:08	2135
	12	21:20	15-25	22:20	2125
	13	12:36	2100-2135	13:36	2115-2135
	13	18:42	2120-2140	19:42	2127
	14	5:30	2128	0:30	2128
	14	20:46	20-40	21:46	20-30
	15	20:26	2125	21:26	15-40
	16	2:53	15-40	3:53	50-70
	16	12:03	2100-2110	13:03	2130
	17	4:11	2120	5:11	2120

2/19	0:01	2125	1:01	15-30
(79) ~~2/19~~	~~[illegible]~~	~~2119-2126~~	~~1:[illegible]~~	~~15-35~~
19	1:36	2115-2125	2:36	15-40
19	2:28	2120	3:28	2120
21	8:36	20-50	9:36	20-35
23	11:07	2120	12:07	2120
25	20:02	10-25	21:02	2100-2130
26	0:38	2128	1:38	25-35
26	18:39	2080-2130	19:39	2122
27	21:56	10-20	22:56	10-20
28	19:04	2125	20:04	10-20
3/1	0:41		1:41	
4	1:41		2:42	
6	3:21		4:21	
8	3:06		4:06	
12	1:32		2:32	
13	2:00		3:00	
14	12:05		13:05	
15	4:50		5:50	
16	20:09		21:09	
17	2:48		3:48	
21	1:14		2:14	
25	5:25		6:25	
28	1:34		2:34	
28	19:09		20:09	

10
23
26
27
88

3/1/79	0:41	2125	1:41	35-60
2	1:46	missing	2:46	missing
2	19:35	2140	20:35	2140
3	2:38	~~missing~~ 2140	3:38	~~missing~~ 2195
4	1:42	2140	2:42	2140
5	3:20	2140	4:20	2140
6	3:21	20-50	4:21	40-50
8	3:06	2140	4:06	2140
9	3:23	2140	4.23	2140
10	3:51	40-50	4:51	2140
12	1:32	2145	2:32	2145
13	2:0	2140	3:0	2140
13	11:05	30-50	12:05	30-50
14	12:05	2145	13:05	2145
15	4:50	2145	5:50	2145
16	20:09	2130	21:09	2130
17	2:48	2150	3:48	2150
19	0:58	40-50	1:58	40-50
21	1:14	2140	2:14	35-45
22	3:00	2150	4:00	2150
24	5:40	2140	6:40	2140
25	5:25	2135	6:25	2135
28	1:34		2:34	

150 gal

20

62.3   40° var   20±   3   .05   .05   5%

8   .1%

10^8   1%

Trailer 202 John Saunders

60-61 84082

Morrill 8229

Bin 28 Pt # 23 MVT

K-10

I E Bulletin No 80-XX

REACTOR COOLANT SYSTEM LEAK RATE TESTING IN PWRS.

A number of concerns regarding the adequacy of the primary system leak rate determinations in PWRS were identified during a recent investigation. These include inaccuracy in the test results, errors in the computer program used for the leak rate calculations and personnel actions affecting the test results.

A. Variation in the Test Results

A plot of the leak rate test results had a scatter that exceeded the allowable unidentified leak rate of one gpm. Several causes of potentially large variation were identified, including:

1. The normal inaccuracy in the instrumentation.

2. Variation in the temperature distribution in the primary system.

3. Variation in the input parameters during the time that the data is being taken.

The test procedure is always conducted over a period of one hour, with the result that a discrepancy of 60 gallons in the water inventory can cause an apparent limiting leak rate. The makeup tank level normally oscillates over a level change of about 1½ inches with a frequency on the order of one to two minutes. The beginning and end input data sets consist of three measurements, taken at one minute intervals and averaged. This results in a variation of over an inch in the makeup tank level measurement. Since an inch change in this tank is equivalent to over 40 gallons at reactor temperature, this error alone approaches the one gpm leak rate limit. A 0.5°F error in the difference between the beginning and end averaged RCS temperature will also result in a leak rate error of about 1 gpm. This value appears to be comparable to the expected error which is subject to all three of the effects listed above at both the beginning and end of the one hour measurement.

B. <u>Errors in the Computer Program</u>

A number of significant errors were identified in the computer program used to perform the leak rate calculations as follows:

1. The densities used to determine gallons of gross leakage and gallons of identified leakage are not consistant. The gross leakage from the RCS is determined by summing the RCS mass changes in pounds (makeup tank included) and multiplying by a gallons-per-pound factor which is based on the average RCS temperature (.16787 gallons/# at 582°F, see item 5 below.) The identified leakage, however, is derived directly from the leakage collection tank level change, converted to gallons. The calibration for this level measurement is based on a cold water density of 62.3~~099~~ #/ft^3 (.1200~~8~~7 gallons/# at 70°F ~~ambient temperature~~). The unidentified leakage is defined as gross leakage less identified leakage. This inconsistancy led to a positive error in the unidentified leak rate of about 40% of the identified leak ra

2. Water added by the operators to the makeup tank during the test (which must be manually entered into the computer), also was not corrected to reactor density, resulting in a negative error of similar magnitude.

3. The conversion of RCS average temperature to density is erroneous above 582°F. The tables in the program used to convert temperature to density terminate at 582°F. When RCS temperature exceeds this value, the density corresponding to 582°F is selected. The test data reviewed, frequently contained temperatures above 582°F resulting in errors as high as one gpm.

4. No correction was made for pressure changes in the RCS during the test. Pressure affects the coolant mass determination in several ways, the largest being the change in pressurizer mass due to the resulting change in pressurizer temperature. During some of the test periods reviewed, the RCS pressure was cycling over a range of 80 psi resulting in density changes of 0.63 pounds per cubic foot. With an 800 cubic foot pressurizer water volume, this omission resulted in an error of about 1.3 gpm.

5. The computer program uses a density derived from the average RCS temperature, for conversion of RCS mass change to gallons of leakage. However, the SAR derivation of the allowable unidentified leakage uses a cold leg density of 46.4 $\#/ft^3$.

6. The RCS volume used in the program does not correspond to the SAR values.

7. The table in the program used to convert the reactor coolant leakage collection tank levels to gallons of water does not correspond to similar tables in the leakage surveillance procedure used for hand calculations.

C. Personnel Actions Affecting the Leak Rate Test Results.

Several personnel actions which changed the outcome of the leak rate test results were also identified:

1. As a result of the problems identified above, the scatter in the leak rate test results exceeded the allowable unidentified leak rate. Consequently, many of the leak rate tests showed unidentified leakage in excess of the allowable leak rate, regardless of the actual leakage. A common personnel practice was to ignore such high leak rates and to continue running leak rate tests until a result below the limit was achieved. Personnel considered the acceptance criteria to have been met if any of these tests met the limit prior to the end of the 72 hour surveillance period. The plant technical specifications require reduction of the leakage to within allowable limits within four hours or shutdown to hot shutdown within the next six hours.

2. On various occasions personnel added water to the makeup tank during the test, without entering the addition into the computer calculation of the leak rates. These additions were identified by log entries and confirmed by examination of the makeup tank level recorder charts.

3. Personnel increased the makeup tank hydrogen cover gas pressure during tests causing an increase in the indicated makeup tank level. While the level indication is nominally unaffected by changes in the cover gas pressure, the stated increase was confirmed by examination of the makeup tank level recorder chart. The cause of the indicated level change is believed to be a manometer effect from condensation in the normally dry reference leg.

ACTIONS TO BE TAKEN BY LICENSEES OF ALL PWR FACILITIES WITH OPERATING LICENSES

A. Error analysis

Please provide an error analysis of the primary system leak rate calculation based on standard variation. Use the time period normally used to conduct the test. Include in the analysis, the estimated variation in each of the parameters that are used as input data to the calculation. The estimated variation should include:

1. Instrument variation between beginning and final data sets (repeatability). Compare these values to the ranges of the respective instruments.
2. The effect of hysteresis on level measurements.
3. The effect of real variation in the measured parameters during the time period over which a data set is being taken.
4. The effect of temperature distribution changes on the measured average temperatures in the RCS.

5. The effect of any potentially significant changes to the primary system that are not accounted for in the leak rate calculations. In particular, include the effect of temperature variation in the pressurizer, the makeup tank, and the primary leakage collection tank if these are not accounted for by the calculation.

Please provide, as part of the submittal, the details of the above analysis, including the estimated variations listed above.

B. Review of Computer Calculation

Please review the computer program used to calculate the RCS leak rate test results. Determine if any of the errors listed in the description of the computer problems above exist in your program. Include a description of this computer program as part of the submittal. Include as part of this description:

1. The basic equations used to calculate the various leak rates

2. Various constants used in the calculation and their deriviation. In particular, include all constants used to convert level and temperature changes in the RCS, pressurizer, makeup tank and RCS leakage collection tank, to volume and/or mass changes.

3. The equations or tables used to derive water density/specific volume from temperatures and (if applicable) pressure.

4. The data collection scheme, including the number of times each parameter is collected, the times of collection relative to the start of the test, and the method of averaging data.

5. List any errors identified in the computer program.

C. Personnel Actions

Please provide information relative to your facilities in the following areas:

1. Any significant difficulties that you are experiencing in achieving test result accuracies that are commensurate with the allowable limits.

2. Any special treatment of the leak rate test results, such as, plotting, trending or error analysis used to assure that leakages are within limits.

3. Your policy on the course of action to be followed when a leak rate test indicates leakage in excess of the allowable limits.

4. Administrative controls to prevent the addition of water to the RCS without entry into the leak rate calculation.

5. The sensitivity of the makeup tank and primary leakage collection tank level measurement to pressure changes. Indicate if actions to change the pressure in these tanks is permitted during a leak rate test.

For all power reactor facilities with a construction permit, this Bulletin is for information only and no written response is required.

Approved by GAO B180225 (R0072); clearance expires 7-31-80. Approval is given under a blanket clearance specifically for identified generic problems.

K-11

DRAFT

RCSLK8

REACTOR COOLANT SYSTEM LEAK RATE DETERMINATION FOR PWRs

USER'S GUIDE

D. C. Kirkpatrick & R. W. Woodruff

March 24, 1983

TABLE OF CONTENTS

INTRODUCTION

RCSLK8 was developed to provide the inspector with the capability to independently analyze the leak tightness of reactor cooling systems for PWRs. Using operating data, RCSLK8 determines the water inventories in the reactor cooling system and in leak collection tanks. By taking two sets of data separated by a time interval and applying RCSLK8, the inspector can obtain the gross leak rate for the reactor cooling system and the rate at which leakage is collected.

Collected or identified leakage comes from components such as valves and seals. Uncollected or unidentified leakage may come from components or from thru-wall flaws in reactor cooling piping. This leakage spills on containment building floors and, depending on the location of the leak and the rate, will reach the containment sump sooner or later. To determine the unidentified leak rate, RCSLK8 subtracts the identified leak rate from the gross leak rate.

Thru-wall flaws may gradually grow until the critical flaw size is exceeded. If that were to happen, it is conceivable that the flaw might suddenly extend resulting in rapid loss of coolant. To provide assurance that thru-wall flaws will be detected early, a limiting condition for operation (LCO) in PWR technical specifications addresses unidentified leakage from the reactor cooling system. If the source of leakage from the reactor cooling system is unknown, then it must be assumed that the source may be from a thru-wall flaw. The LCO for unidentified leak rate is one gpm for most PWRs. Identified leakage cannot be from thru-wall flaws, and the LCO for this leakage is more lenient.

RCSLK8 was developed for use with the Osborne 1 computer. The Osborne was selected because it has adequate internal memory and diskette storage for RCSLK8, is portable, and is likely to meet our needs for other independent measurement programs for some time to come.

To apply RCSLK8 to a specific unit for the first time, it is first necessary to obtain certain information about the plant and enter this information in the computer's memory. Once that is done, RCSLK8 commands the computer to store the information indefinately on the RCSLK8 PROGRAM diskette. RCSLK8 can then be used to analyze the leak tightness of the unit's cooling system at any time. At the inspector's option, a report of the analysis will be displayed on the computer's monitor or will be printed with a compatible printer.

because of leaks and because water can be supplied to and withdrawn from these systems. Water can be supplied to the CVCS thru a totalizer or flow integrator. The total volume supplied in any period of time is determined by reading the totalizer at the beginning and end of the period and taking the difference. Water may also be withdrawn from the system for sampling purposes. This volume can be measured directly.

Leakage from certain RCS components is collected in either the pressurizer relief tank or the reactor drain tank. However, at some plants, water from sources other than the RCS and CVCS may be piped to the reactor drain tank. These lines must be valved off during a leak rate test.

Water levels in the pressuizer relief and reactor drain tanks are also determined by measuring delta-Ps between upper and lower taps. The level instruments for these tanks are not temperature compensated. Generally, these tanks are cylindrical with convex heads. Often, the tanks are oriented so that their axes are horizontal.

Level instrumentation may be calibrated by pneumatically applying a range of delta-Ps across the level instrument and reading its response. The applied delta-P is converted to head of water by dividing the delta-P by the density of water at the normal operating temperature of the tank. This temperature is called the calibration temperature. Either the volume or the mass of water corresponding to this head is calculated and the calibration curve is plotted. This curve is usually a plot of water mass or volume versus indicated level in inches or percent of full range. Uncompensated level instrumentation and a correct mass calibration curve give accurate results for the mass of water in the tank at any temperature. Uncompensated level instrumentation and a correct volume calibration curve give accurate results for the volume of water in the tank only when the water is at the calibration temperature. The reverse is true for compensated level instrumentation.

For a vertical tank, the calibration curve is linear for the cylindrical portion of the tank, and usually, the cyclindrical portion of the tank is long relative to the height of the heads. For a horizontal tank, the calibration curve is, in principle, nonlinear. In reality, however, the central part of the curve is essentially linear. For some tanks, the normal operating range falls within the linear part of the calibration curve, and for others it does not. If not, the mass of water in the tank must be calculated from tank dimensions, water level, and water density.

be used to convert from mass leak rate to volume leak rate; however, since the point of leakage is not known, the density is not known. Further, limiting conditions for operation do not specify the value of density that should be used in converting mass leak rate to volume leak rate. RCSLK8 asks the user to arbitrarily select the conditions which determine the density. RCSLK8 then calculates the gross leak rate. The result of the gross leak rate calculation is shown under TEST RESULTS which includes a footnote giving the value of water density that was used in converting from mass to volume.

The input required for calculating the gross leak rate is given under TEST DATA and under DURATION. Test data that are needed are pressurizer pressure and level, T ave, volume control tank level, the volumes of water charged and drained.

In addition to these data, the values of certain plant specific parameters are needed before the gross leak rate can be calculated. These parameters are:

(a) Water volume of the reactor vessel, pumps, steam generators, and connecting piping, including the piping to the pressurizer;

(b) Slopes of the linear portion of the calibration curves for the pressurizer and the volume control tank; and

(c) Upper and lower level limits for the linear portions of the calibration curves.

In addition, the inspector will need to know whether the level instrumentation for the pressurizer is temperature compensated, the tank to which the pressurizer relieves, the units of measurement for the level instrumentation, and whether the normal operating range for the volume control tank falls within the linear portion of its calibration curve. If the normal operating range does not and if the tank is cylindrical and horizontal, then the inside dimensions of the tank and the density of water at the calibration temperature will be needed. The water volume can then be calculated using the method described in Appendix D.

Identified Leak Rate

To determine the identified leak rate for the RCS and CVCS during the test, the amount of water collected in the pressurizer relief tank and the reactor drain tank must be calculated. Prior to the test, the inspector must make certain that no drains other than RCS and CVCS drains are connected to the reactor drain tank. If leakage is collected from other systems, then the identified leak rate will be to large and the unidentified leak rate will be too small.

If the inspector calculates the unidentified leak rate using the same test data that the licensee has used and if the results differ by more than 0.2 gpm, the inspector should try to determine the cause of the discrepancy. Assistance can be obtained from Inspection and Enforcement. After the cause for the discrepancy is determined, corrective action should be taken.

CREATION AND FUNCTION OF RCSLK8 SOFTWARE

RCSLK8 is stored on two 5 1/4 inch diskettes. One diskette, labled RCSLK8 PROGRAM, stores all the subroutines necessary to run RCSLK8. The other diskette, labled RCSLK8 USER'S GUIDE, stores this document.

RCSLK8 PROGRAM contains AUTOST.COM, other CP/M subroutines needed to run RCSLK8, CRUN2.COM, H.INT, RCSLK8.INT, and files of PWR parameters created by running RCSLK8. As supplied to the regions with this issue of the User's Guide, the parameter files written on the RCSLK8 PROGRAM diskette are: 255, 266, 282, 295, 301, 304, 305, 306, 312, 315, 316, 317, 318, 320, 344, 346, and 348. These file names are the last three digits of the docket numbers of certain PWRs. User's can create additional parameter files and correct existing parameter files by running the RCSLK8 PROGRAM diskette.

When the machine is turned on, the program stored in ROM takes control of the machine and displays a message or prompt on the monitor which asks the inspector to insert a program diskette in the A drive and press the RESET key. When the user responds to this prompt using the RCSLK8 PROGRAM diskette, CP/M subroutines stored on the diskette take control of the machine and invoke AUTOST.COM. AUTOST.COM (autostart command) automatically displays the NRC label, identifies the diskette as an independent measurements program, and directs the machine to use CRUN2.COM to run H.INT. H.INT in turn directs the machine to run RCSLK8.INT.

RCSLK8.BAS was written in CBASIC and is reproduced in Appendix A. RCSLK8.INT was compiled from RCSLK8.BAS by using CBAS2.COM from the CBASIC diskette. Compiling RCSLK8.BAS translated it from CBASIC language to intermediate language. RCSLK8.INT requires approximately half the storage space required by RCSLK8.BAS, and it runs faster. Likewise, H.INT was compiled from H.BAS which is reproduced in Appendix C.

The C/M subroutines necessary to run RCSLK8 were transferred from the CP/M diskette by running SETUP.COM, a CP/M subroutine.

AUTOST.COM for RCSLK8 was created by first using PIP.COM from CP/M to copy AUTOST.COM from the CP/M diskette to the RCSLK8 PROGRAM diskette. Then DDT.COM from CP/M UTILITY was used to modify AUTOST.COM for use with Independent Measurements programs. The original version of AUTOST.COM is given on pages 247 thru 250 of "Osborne 1 User's Reference Guide" dated 2/22/82. The modified version is given in Appendix B.

(a) Nominal operating level and
(b) Pressurizer volumes above and below the nominal operating level.

For each tank including the pressurizer, the computer will ask for:

(a) Units for level measurement,
(b) Slope of the linear portion of the calibration curve for volume or mass versus level, and
(c) Upper and lower level limits of the linear portion of the calibration curve.

For all tanks except the temperature-compensated pressurizer, the computer will ask for the slope in pounds of water per unit level change. If the licensee's calibration curve is in volume of water per unit level change, the inspector will need to convert from volume to mass of water. That should be done by obtaining from the licensee the density of water assumed for the calibration and using that value to convert the slope from volume per unit level change to mass per unit level change.

If the user wishes to enter the dimensions of any horizontal tank, the computer will ask for:

(a) Radius and length of the cylindrical part of the tank,
(b) Radius of the heads of the tank, and
(c) Density of water at the calibration temperature.

The computer will then calculate the mass of water between the upper and lower limits of the straight line portion of the calibration curve in two different ways. First, it will do the calculation using the calibration curve, and second, it will do the calculation using the tank dimensions and the water density at the calibration temperature (geometric method). The computer will take the ratio of the first result to the second, label the ratio as the normalization factor, display the normalization factor and store it for future use. Whenever, the user directs the computer to calculate a water inventory in a tank by using the geometric method, the computer will multiply the result by the normalization factor.

After keying each information item into the computer in response to its requests, the user must strike the RETURN key in order to continue. Once the RETURN key is struck, the entry cannot be corrected until after the plant parameter entry session is completed. When the user returns to the options menu, corrections can be made with ease by invoking the correction subroutine. Before doing this, the user may want to list the plant parameters as entered. All values of parameters that are now stored on the RCSLK8 PROGRAM diskette are shown in Appendix F.

stores the normalization factor. The computer then asks if there are other corrections for that group. If so, the parameter menu is displayed again. If not, the user is asked if there are corrections for other groups. If so, the group menu is displayed again. If not, the computer, asks whether to continue or terminate the session.

Listing Plant Parameters

By selecting from the options menu the option for listing the values of plant parameters, the user can obtain a list for any unit for which a file has been created. The list can either be printed or displayed on the monitor. If it is displayed on the monitor, the computer will list the parameters on the screen until it is filled and then stop until the user directs the computer to resume listing. When the list is completed, the computer will ask whether to continue or terminate the session.

Identifying Plants with Parameters on File

When the options menu is displayed, the user can direct the computer to search its files for all units for which parameter files have been created. The computer will respond by searching for docket numbers from 50-029 to 50-599. Because this takes a few minutes, each docket number is displayed as the computer searches for it. In this way the user knows that computer is functioning. If a printer is used, each time a file is found the docket number, plant name, and unit number will be printed. If a printer is not used, this information will be displayed on the screen. If plant name and unit number are not displayed, then a file for that unit does not exist. A list of files now available on the RCSLK8 PROGRAM diskette is given in Appendix E.

Calculating Leak Rates

After a parameter file has been created for a specific unit, the leak tightness of the RCS and CVCS can be analyzed by calculating the gross, identified, and unidentified leak rates. When the data analysis subroutine of RCSLK8 is initiated, the computer first asks for the test date and the start time for the test. This information is obtained for archival purposes for a printed report. The user should note that test data are not saved on the diskette.

The computer then asks for the duration of the test in hours. Because the accuracy of the test is directly proportional to the test duration, the minium duration should be four hours.

After the duration is entered, the computer asks for the volumes

14,000 psia.

The water inventory in temperature-compensated pressurizers is found by calculating the mass of water and the mass of steam in the pressurizer. The mass of water is found by assuming that it is saturated. The computer finds the saturation temperature of the water by running the subroutine, Saturation Temperature, shown on pages A-25 and 26 of Appendix A. This is an iterative subroutine which duplicates the values given in Table 2 of the steam tables for pressures from 14.7 psia to 3208.2 psia. The density of saturated water is found by substituting pressurizer pressure and the saturation temperature in the subcooled water subroutine. The density of saturated steam is found from subroutine, Density of Saturated Steam, on page A-27 of the appendix. This is a curve fit to the steam tables with an accuracy of 1.0% or better in the range from 1400 to 2700 psia.

The inventories for other tanks are calculated from either the calibration curves or from the tank dimensions and the appropriate density. The rest of the analysis is performed as described in the section titled Water Inventories and System Leak Rates.

After the analysis is completed, a report of the results is displayed on the monitor or is printed with the printer.

PROCEDURE

Running RCSLK8

1. To prepare to run RCSLK8, place the Osborne 1 in the upright position, and open the cover adjacent to the handle. Remove the cord and connect the computer to an electrical outlet.

2. Place the case on its side with the ribbed side down and open the ventilation cover on the top side.

3. Unlatch the bottom of the case to release the keyboard. Place the lower edge of the computer on the upper edge of the keyboard.

4. If the Itoh printer will be used, connect the printer cable to the IEEE 488 port on the front of the computer. Connect the other end of the cable to the connector on the back of the printer.

5. Connect the printer to an electrical outlet.

6. Open the doors on both disk drives to make certain that neither drive contains a diskette.

7. Turn on power to the computer and to the printer.

8. Position the selector lever on the top of the printer to FRICTION.

9. Press the SEL (select) button on the front of the printer if the SEL light is not illuminated.

10. Place a piece of typing paper in the printer.

11. Move the selector lever to PIN-FEED. Align the left edge of the paper so that it is 3/8 inch to the left of the index on the roller shaft. Move the selector lever to FRICTION. Align the top edge of the paper with the rollers.

12. To run RCSLK8, follow the instructions displayed on the monitor. Latch the drive door before pressing the RETURN key.

13. Replace paper in the printer as necessary. If the computer does not function, make certain that there is paper in the printer and that the SEL light is on.

14. After the session is terminated and AFTER THE INDICATOR LIGHT OF THE "A" DRIVE IS OFF, open the drive door and remove the disk. If the indicator light is not off, information stored

RCSLK8.BAS

```
\                        ***********
\                        * OPTIONS *
\                        ***********

\                      ** MESSAGES **

CONSOLE   :  FOR I = 1 TO 20   :  PRINT   :  NEXT I

PRINT "                          RCSLK8"
PRINT
PRINT "     REACTOR COOLANT SYSTEM LEAK RATE DETERMINATION"
PRINT "                         FOR PWRs"
PRINT
PRINT "                      FEBRUARY 15, 1983"

FOR I = 1 TO  8 : PRINT : NEXT I
GOSUB 901   REM: Stop
FOR I = 1 TO 24 : PRINT : NEXT I

PRINT "       ****************************************"
PRINT "       *                                      *"
PRINT "       *           For help, call:            *"
PRINT "       *                                      *"
PRINT "       *   Roger Woodruff     (301) 492-4507  *"
PRINT "       *   Don Kirkpatrick    (301) 492-4510  *"
PRINT "       *                                      *"
PRINT "       *     After working hours, call on     *"
PRINT "       *           (301)  492-7000            *"
PRINT "       *                                      *"
PRINT "       ****************************************"

FOR I = 1 TO  6  :  PRINT   :  NEXT I
GOSUB 901   REM: Stop
FOR I = 1 TO 15  :  PRINT   :  NEXT I

PRINT TAB(24);"NOTE"  :  PRINT
PRINT "  1.  To delete input characters, simultaneously"
PRINT "      press CTRL and H."  :  PRINT
PRINT "  2.  To halt execution, simultaneously press"
PRINT "      CTRL and S.  To restart, repeat."  :  PRINT
PRINT "  3.  To escape from the program, simultaneously"
PRINT "      press CTRL and C."

FOR I = 1 TO  6 :  PRINT   :  NEXT I
GOSUB 901   REM: Stop
FOR I = 1 TO 24 :  PRINT   :  NEXT I
```

```
   \                        **************
10 \                        * PLANT LIST *
   \                        **************

   A%=10  :  B%=20

   PRINT TAB(21);"Searching"  :  PRINT
   IF PRINT.FLAG$="Y" THEN LPRINTER  : PRINT : PRINT : PRINT  \
      : PRINT TAB(27);"PLANTS WITH PARAMETERS FILED" : PRINT  \
      : PRINT
   FOR D% = 29 TO 599
    D$=STR$(D%)  :  I$="A:"+D$  :  CONSOLE
    PRINT TAB(23);"50-";  :  PRINT USING "###";D%
    IF END #1 THEN 12
    OPEN I$ RECL 30 AS 1
    READ #1,1; PLANT$  :  READ #1,2; UNIT$  :  READ #1,45; DOCKET$
    IF PRINT.FLAG$="Y" THEN LPRINTER  :  A%=27  :  B%=37
    PRINT TAB(A%);"50-";DOCKET$;TAB(B%);PLANT$;" ";UNIT$ : CONSOLE
    CLOSE 1
12 NEXT D%
   GOTO 995   REM: Continuation or Termination
```

```
    PRINT "piping to the pressurizer and the inlet side of"
    INPUT "the letdown heat exchanger:";VP.VOL   :  RETURN

70  \                    ** PRESSURIZER **

    TANK$ = "Pressurizer"
    GOSUB 260  : PZR.UNITS$ = UNITS$    :  PRINT #1, 5; PZR.UNITS$
    GOSUB  75                           :  PRINT #1, 6; COMP$

    IF COMP$="Yes" THEN GOSUB 80  :  GOSUB 90   :  GOSUB 91     \
       : GOTO 71 ELSE GOTO 72

71  PRINT #1, 7; PZR.LVL.NOM   :  PRINT #1, 8; PZR.BTM.VOL
    PRINT #1, 9; PZR.TOP.VOL

72  GOSUB 270  :  PZR.SLOPE=SLOPE       :  PRINT #1,10; PZR.SLOPE
    GOSUB 280  :  PZR.UP.LMT=UP.LMT     :  PRINT #1,11; PZR.UP.LMT
    GOSUB 290  :  PZR.LO.LMT=LO.LMT     :  PRINT #1,12; PZR.LO.LMT
    GOSUB 100  :  GOTO 110

    \               * Temperature Compensation *

75  PRINT "Pressurizer level instrumentation may be:"  :  PRINT
    PRINT "  (A) Temperature Compensated or"
    PRINT "  (B) Uncompensated."  :  PRINT
    INPUT "Which is it (A/B)?";Y$

    PRINT  :  PRINT  :  PRINT

    IF Y$="A" THEN COMP$="Yes" : GOTO 77 ELSE GOTO 76
76  IF Y$="B" THEN COMP$="No" ELSE GOTO 75
77  RETURN

    \                    * Nominal Level *

80  PRINT "For the Pressurizer, type the nominal operating"
    IF PZR.UNITS$="inches" THEN GOTO 82 ELSE GOTO 81
81  IF PZR.UNITS$="%" THEN GOTO 83 ELSE GOTO 85
82  INPUT "level in inches:";PZR.LVL.NOM   :  GOTO 84
83  INPUT "level in %:";PZR.LVL.NOM

84  PRINT  :  PRINT  :  PRINT  :  RETURN

85  PRINT  : PRINT "ERROR: Pressurizer units have not been entered."
    PRINT  :  PRINT  :  PRINT  :  GOTO 60
```

```
117 IF X$="B" THEN LD.TANK$="Makeup Tank" ELSE GOTO 116
118 RETURN

    \                        ** DRAIN TANK **

120 TANK$ = "Drain Tank"
    GOSUB 260  :  DT.UNITS$ = UNITS$   :  PRINT #1,24; DT.UNITS$
    GOSUB 270  :  DT.SLOPE=SLOPE       :  PRINT #1,25; DT.SLOPE
    GOSUB 280  :  DT.UP.LMT=UP.LMT     :  PRINT #1,26; DT.UP.LMT
    GOSUB 290  :  DT.LO.LMT=LO.LMT     :  PRINT #1,27; DT.LO.LMT
    GOSUB 300  :  DT.GEO$=GEO$         :  PRINT #1,28; DT.GEO$

    IF DT.GEO$="Yes" THEN GOSUB 310    :  GOSUB 311  :  GOSUB 312 \
                                       :  GOSUB 313  :  GOTO  124 \
       ELSE GOTO 130

124 DT.CYL.RAD=CYL.RAD    :  PRINT #1,29; DT.CYL.RAD
    DT.CYL.LEN=CYL.LEN    :  PRINT #1,30; DT.CYL.LEN
    DT.CVX.RAD=CVX.RAD    :  PRINT #1,31; DT.CVX.RAD
    DT.DENSITY=DENSITY    :  PRINT #1,32; DT.DENSITY
    DT.NORMFAC=NORMFAC    :  PRINT #1,33; DT.NORMFAC

    \               ** RELIEF OR QUENCH TANK **

130             TANK$ =RQ.TANK$        :  PRINT #1,34; RQ.TANK$

    IF RQ.TANK$="Drain Tank" THEN GOTO 135

    GOSUB 260  :  RQT.UNITS$ = UNITS$  :  PRINT #1,35; RQT.UNITS$
    GOSUB 270  :  RQT.SLOPE=SLOPE      :  PRINT #1,36; RQT.SLOPE
    GOSUB 280  :  RQT.UP.LMT=UP.LMT    :  PRINT #1,37; RQT.UP.LMT
    GOSUB 290  :  RQT.LO.LMT=LO.LMT    :  PRINT #1,38; RQT.LO.LMT
    GOSUB 300  :  RQT.GEO$=GEO$        :  PRINT #1,39; RQT.GEO$

    IF RQT.GEO$="Yes" THEN GOSUB 310   :  GOSUB 311  :  GOSUB 312  \
                                       :  GOSUB 313  :  GOTO  134  \
       ELSE GOTO 135

134 RQT.CYL.RAD=CYL.RAD   :  PRINT #1,40; RQT.CYL.RAD
    RQT.CYL.LEN=CYL.LEN   :  PRINT #1,41; RQT.CYL.LEN
    RQT.CVX.RAD=CVX.RAD   :  PRINT #1,42; RQT.CVX.RAD
    RQT.DENSITY=DENSITY   :  PRINT #1,43; RQT.DENSITY
    RQT.NORMFAC=NORMFAC   :  PRINT #1,44; RQT.NORMFAC

135 PRINT #1,45; DOCKET$

    CLOSE 1  :  GOTO 995   REM: Continuation or Termination
```

```
311 PRINT "For the ";TANK$;", type the length (feet)"
    INPUT "of the cylindrical part of the tank:";CYL.LEN
    GOSUB 314  :  PRINT  :  PRINT  :  PRINT  :  RETURN

312 PRINT "For the ";TANK$;", type the radius (feet)"
    INPUT "of the convex head:";CVX.RAD
    GOSUB 314  :  PRINT  :  PRINT  :  PRINT  :  RETURN


    \            * Water Density for Calibration *

313 PRINT "For the ";TANK$;", type the density (pounds per"
    PRINT "cubic foot) of water assumed for the tank cali-"
    INPUT "bration:";DENSITY
    GOSUB 314  :  PRINT  :  PRINT  :  PRINT  :  RETURN

314 IF CYL.RAD=0 OR CYL.LEN=0 OR CVX.RAD=0 OR DENSITY=0 THEN  \
       NORMFAC=0  :  RETURN ELSE GOTO 315


    \                  * Normalization Factor *

315 IF UNITS$ = "inches" THEN UP.LMT.FRAC=UP.LMT/(12*2*CYL.RAD)  \
                             ELSE UP.LMT.FRAC=UP.LMT/100

    IF UNITS$ = "inches" THEN LO.LMT.FRAC=LO.LMT/(12*2*CYL.RAD)  \
                             ELSE LO.LMT.FRAC=LO.LMT/100

    LVL.FRAC.I = LO.LMT.FRAC  :  LVL.FRAC.F = UP.LMT.FRAC
    GOSUB 871

    INV.CHG.GEO = INV.CHG
    INV.CHG.CAL = SLOPE*(UP.LMT-LO.LMT)
    NORMFAC = INV.CHG.CAL/INV.CHG.GEO
    PRINT TAB(10);TANK$ : PRINT TAB(12);"Normalization Factor is"
    PRINT TAB(14);    :  PRINT USING "#.####";NORMFAC
    PRINT  :  PRINT  :  PRINT
    INPUT "                To continue, press RETURN."; LINE X$
    RETURN
```

```
    GOSUB 900   REM: Conditional Stop

    \             ** VOLUME CONTROL OR MAKEUP TANK **

    PRINT TAB(A%);LD.TANK$;":"  :  UNITS$=LDT.UNITS$
    SLOPE=LDT.SLOPE  :  UP.LMT=LDT.UP.LMT  :  LO.LMT=LDT.LO.LMT
    GEO$=LDT.GEO$  :  CYL.RAD=LDT.CYL.RAD  :  CYL.LEN=LDT.CYL.LEN
    CVX.RAD=LDT.CVX.RAD  :  DENSITY=LDT.DENSITY
    NORMFAC=LDT.NORMFAC  :  GOSUB 490
    GOSUB 900   REM: Conditional Stop

    \                  ** DRAIN TANK **

    PRINT TAB(A%);"Drain Tank:";  :  UNITS$=DT.UNITS$
    SLOPE=DT.SLOPE  :  UP.LMT=DT.UP.LMT  :  LO.LMT=DT.LO.LMT
    GEO$=DT.GEO$  :  CYL.RAD=DT.CYL.RAD  :  CYL.LEN=DT.CYL.LEN
    CVX.RAD=DT.CVX.RAD  :  DENSITY=DT.DENSITY
    NORMFAC=DT.NORMFAC  :  GOSUB 490

    IF RQ.TANK$="Drain Tank" THEN GOTO 480
    GOSUB 900   REM: Conditional Stop

    \              ** RELIEF OR QUENCH TANK **

    PRINT TAB(A%);RQ.TANK$;":"  :  UNITS$=RQT.UNITS$
    SLOPE=RQT.SLOPE  :  UP.LMT=RQT.UP.LMT  :  LO.LMT=RQT.LO.LMT
    GEO$=RQT.GEO$  :  CYL.RAD=RQT.CYL.RAD  :  CYL.LEN=RQT.CYL.LEN
    CVX.RAD=RQT.CVX.RAD  :  DENSITY=RQT.DENSITY
    NORMFAC=RQT.NORMFAC  :  GOSUB 490
    GOSUB 900   REM: Conditional Stop

480 CLOSE 2  :  CONSOLE
    GOTO 995   REM: Continuation or Termination

    \                ** TANK SUBROUTINE **

490 PRINT TAB(B%);"Level Units";TAB(D%);UNITS$
    PRINT TAB(B%);"Calibration Curve"
    PRINT TAB(C%);"Slope";TAB(E%);SLOPE;"pounds per ";LEFT$(UNITS$,4)
    PRINT TAB(C%);"Upper Level Limit";TAB(E%);UP.LMT;UNITS$
    PRINT TAB(C%);"Lower level limit";TAB(E%);LO.LMT;UNITS$
    IF GEO$="Yes" THEN GOTO 491 ELSE GOTO 492
491 PRINT TAB(C%);"Water Density";TAB(E%);DENSITY;
    PRINT "pounds per cubic foot"
492 PRINT TAB(B%);"Geometric Method Available";TAB(D%);GEO$
    IF GEO$<>"Yes" THEN PRINT : RETURN ELSE GOTO 493
493 PRINT TAB(B%);"Dimensions"
    PRINT TAB(C%);"Cylinder Radius";TAB(E%);CYL.RAD;"feet"
```

```
    \                          ***************
500 \                          * CORRECTIONS *
    \                          ***************

    OPEN "A:"+DOCKET$ RECL 30 AS 2
    IF END #2 THEN 3


501 \                       ** GROUP ACCESS **

    PRINT "For access, parameter groups are:"  :  PRINT
    PRINT "  (A) Unit Identification,"
    PRINT "  (B) Vessel and Piping,"
    PRINT "  (C) Pressurizer,"
    PRINT "  (D) Volume Control or Makeup Tank,"
    PRINT "  (E) Drain tank, or"
    PRINT "  (F) Relief or Quench Tank."  :  PRINT
    INPUT "Which group do you want (A/B/C/D/E/F)?";X$

    PRINT  :  PRINT  :  PRINT

    IF X$="A" THEN GOTO 510
    IF X$="B" THEN GOTO 520
    IF X$="C" THEN GOTO 530
    IF X$="D" THEN GOTO 540
    IF X$="E" THEN GOTO 550
    IF X$="F" THEN GOTO 560 ELSE GOTO 501


    \                   ** PARAMETER  ACCESS **

510 \                   * Unit Identification *

    ID% = 1

    PRINT "The parameters in this group are:"  :  PRINT
    PRINT "  (A) Plant Name,"  :  PRINT "  (B) Unit Number,"
    PRINT "  (C) Nuclear Steam System Supplier, and"
    PRINT "  (D) Docket Number."  :  PRINT
    INPUT "Which do you need to correct (A/B/C/D)?";X$

    PRINT  :  PRINT  :  PRINT

    IF X$="A" THEN GOSUB 51 : PRINT #2, 1; PLANT$  : GOTO 597
    IF X$="B" THEN GOSUB 52 : PRINT #2, 2; UNIT$   : GOTO 597
    IF X$="C" THEN GOSUB 53 : PRINT #2, 3; NSSS$   : GOTO 597
    IF X$="D" THEN GOSUB 2.5: PRINT #2,45; DOCKET$ : PRINT      \
       : PRINT TAB(5);"NOTE:  The corrected file may need to" \
       : PRINT TAB(17);"be renamed." : PRINT : PRINT : PRINT   \
       : GOTO 597 ELSE GOTO 510
```

```
    : PRINT #2,8;0 : PRINT #2,9;0 : GOTO 597
  IF X$="B" AND Y$="B" AND COMP$="Yes" THEN  GOTO 597
  IF X$="C" THEN GOSUB  80 : PRINT #2, 7; PZR.LVL.NOM : GOTO 597
  IF X$="D" THEN GOSUB  90 : PRINT #2, 8; PZR.BTM.VOL : GOTO 597
  IF X$="E" THEN GOSUB  91 : PRINT #2, 9; PZR.TOP.VOL : GOTO 597
  IF X$="F" THEN GOSUB 270 : PZR.SLOPE=SLOPE     \
    : PRINT #2,10 ; PZR.SLOPE : GOTO 597
  IF X$="G" THEN GOSUB 280 : PZR.UP.LMT=UP.LMT \
    : PRINT #2,11 ; PZR.UP.LMT : GOTO 597
  IF X$="H" THEN GOSUB 290 : PZR.LO.LMT=LO.LMT \
    : PRINT #2,12 ; PZR.LO.LMT : GOTO 597
  IF X$="I" THEN GOSUB 100 : PRINT #2,34; RQ.TANK$ ELSE GOTO 530
  IF RQ.TANK$="Drain Tank" THEN GOTO 597
  IF RQ.TANK$="Relief Tank" OR RQ.TANK$="Quench Tank" THEN    \
    TANK$=RQ.TANK$ : GOSUB 260 : PRINT #2,35; UNITS$          \
    : GOSUB 270 : PRINT #2,36; SLOPE : GOSUB 280              \
    : PRINT #2,37; UP.LMT : GOSUB 290 : PRINT #2,38; LO.LMT   \
    : GOTO 597 ELSE GOTO 532

532 PRINT : PRINT "CODE ERROR: Tank for relieving Pressurizer not"
    PRINT "properly specified." : STOP


540 \            * Volume Control or Makeup Tank *

    ID% = 4  :  READ #2,13; TANK$  :  READ #2,14; UNITS$

    PRINT "The Volume Control or Makeup Tank parameters are:"
    PRINT  :  PRINT "  (A) Tank Name," : PRINT "  (B) Level Units,"
    PRINT "  (C) Slope of the Calibration Curve,"
    PRINT "  (D) Its Upper Level Limit,"
    PRINT "  (E) Its Lower Level Limit,"
    PRINT "  (F) Geometric Method," : PRINT "  (G) Cylinder Radius,"
    PRINT "  (H) Cylinder Length," : PRINT "  (I) Head Radius, and"
    PRINT "  (J) Water Density."  :  PRINT

    PRINT TAB(3);"NOTE:  First correct (A) then (B) and"
    PRINT TAB(10);"then any other parameter(s) for"
    PRINT TAB(10);"this tank."   :   PRINT

    PRINT "Which do you wish to access (A/B/C/D/E/F/G/H/"
    INPUT "I/J)?";X$

    PRINT  :  PRINT  :  PRINT

    IF X$="A" THEN GOSUB 116 : PRINT #2,13; TANK$    : GOTO 597

    TANK$=LD.TANK$

    READ #2,15; SLOPE   : READ #2,16; UP.LMT  : READ #2,17; LO.LMT
    READ #2,18; GEO$    : READ #2,19; CYL.RAD : READ #2,20; CYL.LEN
    READ #2,21; CVX.RAD : READ #2,22; DENSITY
```

```
    IF X$="I" THEN GOSUB 313 : PRINT #2,32; DENSITY  : GOSUB 552  \
       : GOTO  597  ELSE GOTO 550

552 PRINT #2,33; NORMFAC  :  PRINT  :  PRINT  :  PRINT  :  RETURN

560 \                    * Relief or Quench Tank *

    ID% = 6  :  READ #2,34; TANK$  :  READ #2,35; UNITS$

    PRINT "The Relief or Quench Tank parameters are:"
    PRINT "  (A) Tank Name," : PRINT "  (B) Level Units,"
    PRINT "  (C) Slope of the Calibration Curve,"
    PRINT "  (D) Its Upper Level Limit,"
    PRINT "  (E) Its Lower Level Limit,"
    PRINT "  (F) Geometric Method," : PRINT "  (G) Cylinder Radius,"
    PRINT "  (H) Cylinder Length," : PRINT "  (I) Head Radius, and"
    PRINT "  (J) Water Density."  :      PRINT

    PRINT TAB(3);"NOTE:  First correct (A) then (B) and"
    PRINT TAB(10);"then any other parameter(s) for"
    PRINT TAB(10);"this tank."   :   PRINT

    PRINT "Which do you wish to access (A/B/C/D/E/F/G/H/"
    INPUT "I/J)?";X$

    PRINT  :  PRINT  :  PRINT

    IF X$="A" THEN GOSUB 100 : PRINT #2,34; TANK$ : GOTO 597

    IF TANK$="Drain Tank" THEN GOTO 597

    READ #2,36; SLOPE    : READ #2,37; UP.LMT   : READ #2,38; LO.LMT
    READ #2,39; GEO$     : READ #2,40; CYL.RAD  : READ #2,41; CYL.LEN
    READ #2,42; CVX.RAD  : READ #2,43; DENSITY


    IF X$="B" THEN GOSUB 260 : PRINT #2,35; UNITS$    : GOTO  597
    IF X$="C" THEN GOSUB 270 : PRINT #2,36; SLOPE     : GOTO  597
    IF X$="D" THEN GOSUB 280 : PRINT #2,37; UP.LMT    : GOTO  597
    IF X$="E" THEN GOSUB 290 : PRINT #2,38; LO.LMT    : GOTO  597
    IF X$="F" THEN GOSUB 591 : GOTO 597
    IF X$="G" THEN GOSUB 310 : PRINT #2,40; CYL.RAD   : GOSUB 562  \
       : GOTO 597
    IF X$="H" THEN GOSUB 311 : PRINT #2,41; CYL.LEN   : GOSUB 562  \
       : GOTO 597
    IF X$="I" THEN GOSUB 312 : PRINT #2,42; CVX.RAD   : GOSUB 562  \
       : GOTO 597
    IF X$="J" THEN GOSUB 313 : PRINT #2,43; DENSITY   : GOSUB 562  \
       : GOTO  597  ELSE GOTO 560

562 PRINT #2,44; NORMFAC  :  PRINT  :  PRINT  :  PRINT  :  RETURN
```

```
    \                        ******************
600 \                        * DATA  ANALYSIS *
    \                        ******************

    \                          ** DATA INPUT **

    OPEN "A:"+DOCKET$ RECL 30 AS 2
    IF END #2 THEN 3
    GOSUB 890

    INPUT "Type test date in quotes:";DATE$
    INPUT "Type test start time in quotes:";TIME$
    INPUT "Type test duration in hours:";DURATION
    PRINT  :  PRINT  :  PRINT
    PRINT "Type the quantity of water in gallons--" : PRINT
    INPUT "                         Charged: ";GAL.CHARGED
    INPUT "                     and Drained: ";GAL.DRAINED
    PRINT  :  PRINT  :  PRINT

    LDT.METHOD$="Cal"  :  DT.METHOD$="Cal"  :  RQT.METHOD$="Cal"
    LDT.NOTE$="(1)" : DT.NOTE$="(1)" : RQT.NOTE$="(1)"
    IF LDT.GEO$="Yes" OR DT.GEO$="Yes" OR RQT.GEO$="Yes" THEN  \
       GOTO 605 ELSE GOTO 6'0

605 PRINT "For the following tank(s), select either the"
    PRINT "Calibration (C) or the Geometric (G) Method for"
    PRINT "calculating water inventories."  :  PRINT
    IF LDT.GEO$="Yes" THEN PRINT "  ";LD.TANK$;" "; ELSE GOTO 606
    INPUT "(C/G)?";X$
    IF X$="C" THEN LDT.METHOD$="Cal" ELSE LDT.NOTE$="(2)"
    IF X$="G" THEN LDT.METHOD$="Geo"
    IF X$<>"C" AND X$<>"G" THEN GOTO 605
606 IF DT.GEO$="Yes" THEN PRINT "  Drain Tank "; ELSE GOTO 607
    INPUT "(C/G)?";X$
    IF X$="C" THEN DT.METHOD$="Cal" ELSE DT.NOTE$="(2)"
    IF X$="G" THEN DT.METHOD$="Geo"
    IF X$<>"C" AND X$<>"G" THEN GOTO 606
607 IF RQT.GEO$="Yes" THEN PRINT "  ";RQ.TANK$;" "; ELSE GOTO 610
    INPUT "(C/G)?";X$
    IF X$="C" THEN RQT.METHOD$="Cal" ELSE RQT.NOTE$="(2)"
    IF X$="G" THEN RQT.METHOD$="Geo"
    IF X$<>"C" AND X$<>"G" THEN GOTO 607

610 PRINT  :  PRINT  :  PRINT  :  A% = 12
    PRINT "Type values for the following system variables:" : PRINT
    IF COMP$="Yes" THEN GOTO 611 ELSE GOTO 612
611 PRINT "  Pressure, psia";"  ( 1400 < Range < 2700 )"
    GOTO 613
612 PRINT "  Pressure, psia";"  ( Hot Leg P sat < Range < 3200 )"
613 PRINT
    PRINT TAB(A%);  :  INPUT "Initial Value: ";PRES.I
    PRINT TAB(A%);  :  INPUT "Final  Value : ";PRES.F
```

```
    PRINT "establish the density of the leakage.  The choices"
    PRINT "are:"  :  PRINT
    PRINT "  (A) Standard Conditions,"
    PRINT "  (B) Average Reactor Cooling System Conditions,"
    PRINT "  (C) Other."  :  PRINT
    INPUT "Which would you like (A/B/C)? ";X$

    IF X$="A" THEN LEAK.COND$="Standard" : LEAK.TEMP=70 :  \
       LEAK.PRES=14.7 : GOTO 630
    IF X$="B" THEN LEAK.COND$="Ave RCS"  :    \
       LEAK.TEMP=(T.AVE.I+T.AVE.F)/2  :       \
       LEAK.PRES=(PRES.I+PRES.F)/2  :  GOTO 630
    IF X$="C" THEN LEAK.COND$="Other" : PRINT : PRINT : PRINT   \
       : GOTO 624 ELSE GOTO 623
624 INPUT "Type the selected temperature in degrees F: ";LEAK TEMP
    INPUT "Type the selected pressure in psia: ";LEAK.PRES


630 \                    ** CALCULATIONS **

    \References:
    \  (1) "ASME Steam Tables," Fourth Edition.
    \  (2) "Horizontal Tanks," Note to J. Chung from R. Woodruff,
    \        May 22, 1981.

    IF COMP$="No" THEN GOTO 640 ELSE GOTO 641


640 \               * Uncompensated Pressurizer *

    PZR.INV.I = PZR.SLOPE * PZR.LVL.I
    PZR.INV.F = PZR.SLOPE * PZR.LVL.F

    GOTO 642


641 \               * Compensated Pressurizer *

    PRES =  PRES.I    : GOSUB 840   REM: Saturation Temperature
    TEMP = TEMP.SAT : GOSUB 850   REM: Density of water
    GOSUB 860                     REM: Density of Saturated Steam

    PZR.INV.I = DENSITY.WTR * PZR.BTM.VOL + DENSITY.STM  \
       * PZR.TOP.VOL + (DENSITY.WTR - DENSITY.STM)  \
       * (PZR.LVL.I - PZR.LVL.NOM) * PZR.SLOPE

    PRES = PRES.F     :  GOSUB 840
    TEMP = TEMP.SAT   :  GOSUB 850
    GOSUB 860
```

```
\                    * Water Charged and Drained *

MASS.CHARGED = 8.3238 * GAL.CHARGED : REM: Mass in Pounds
MASS.DRAINED = 8.3238 * GAL.DRAINED


\                         * Leakage Density *

PRES = LEAK.PRES   :  TEMP = LEAK.TEMP
GOSUB 850          :  REM Density of Water
LEAK.DENSITY = DENSITY.WTR


\                           * Leak Rates *

RCS.INV.CHG = VP.INV.CHG + PZR.INV.CHG + LDT.INV.CHG     \
   - MASS.CHARGED + MASS.DRAINED

GROSS.LEAK.RATE = -RCS.INV.CHG/LEAK.DENSITY*7.481/DURATION/60

IDENT.LEAK.RATE = (RQT.INV.CHG + DT.INV.CHG)/LEAK.DENSITY    \
   *7.481/DURATION/60

UNIDENT.LEAK.RATE = GROSS.LEAK.RATE - IDENT.LEAK.RATE


690 \                        ** DATA OUTPUT **

IF PRINT.FLAG$="Y" THEN LPRINTER
PRINT  :  PRINT  :  PRINT TAB(39);"NRC"  :  PRINT
PRINT TAB(24);"INDEPENDENT MEASUREMENTS PROGRAM"
PRINT
PRINT TAB(24);"REACTOR COOLING SYSTEM LEAK RATES"
PRINT  :  PRINT
PRINT TAB(11);"STATION: ";PLANT$;TAB(44);"TEST DATE : ";
PRINT DATE$
PRINT TAB(11);"UNIT    : ";UNIT$;TAB(44);"START TIME: ";
PRINT TIME$
PRINT TAB(11);"DOCKET : 50-";DOCKET$;TAB(44);
PRINT "DURATION  :";DURATION;"hours"  :  PRINT  :  PRINT
GOSUB 900   REM: Conditional Stop

PRINT TAB(36);"TEST DATA" :  PRINT

PRINT TAB(48);"Initial";TAB(63);"Final"
PRINT TAB(16);"System Parameters:"  :  PRINT
PRINT TAB(17);"Pressure  psia";TAB(48);PRES.I;TAB(62);PRES.F
PRINT TAB(17);"T Ave, degrees F";TAB(48);T.AVE.I;TAB(62);
PRINT T.AVE.F  :  PRINT
PRINT TAB(16);"Water Levels:"  :  PRINT
PRINT TAB(17);"Pressurizer, ";PZR.UNITS$;TAB(48);
PRINT PZR.LVL.I;TAB(62);PZR.LVL.F
```

```
     PRINT USING "##.##";GROSS.LEAK.RATE;
     PRINT TAB(30);"Identified";Tab(46);
     PRINT USING "##.##";IDENT.LEAK.RATE
     PRINT TAB(30);"Unidentified";Tab(46);
     PRINT USING "##.##";UNIDENT.LEAK.RATE
     PRINT  :  PRINT

     PRINT TAB(11);"(1)  Determined from tank calibration curve."
     PRINT TAB(11);"(2)  Determined from tank dimensions."
     PRINT TAB(11);"(3)  The density used for converting inventory ";
     PRINT "change to leak"  :  PRINT TAB(16);"rate was ";
     PRINT USING "##.##";LEAK.DENSITY;
     PRINT " pounds/cubic foot based on";
     IF LEAK.COND$="Standard" THEN PRINT " standard"
     IF LEAK.COND$="Ave RCS" THEN PRINT " average RCS"
     IF LEAK.COND$="Standard" OR LEAK.COND$="Ave RCS" THEN PRINT  \
        TAB(16);"conditions."
     IF LEAK.COND$="Other" THEN PRINT LEAK.TEMP;"degrees F and"
     IF LEAK.COND$="Other" THEN PRINT TAB(16);"and";LEAK.PRES;"psia."
     GOSUB 900   REM: Conditional Stop

699  CONSOLE  :  CLOSE 2  :  GOTO 995

     \              ** ANALYTICAL SUBROUTINES **

840  \               * Saturation Temperature *

     \Note: This calculation is based on Page 17, Section 5,
     \  Reduced saturation pressure, of Reference (1).  It
     \  duplicates saturation temperature as given in Table 2 of
     \  Reference (1) for pressures from 14.696 psia to 3208.2 psia.

     BETA  = PRES*9.80665*0.45359237/22120000/0.0254/0.0254

     PRINT  : PRINT  :  PRINT
     PRINT "         Calculating Saturation Temperature"
     PRINT "         for ";PRES;"psia"

     THETA = 0.5  :  THETA1 = 0.25

841  SK1 =-7.691234564      :  SK2 =-2.608023696E+1
     SK3 =-1.681706546E+2   :  SK4 = 6.423285504E+1
     SK5 =-1.189646225E+2   :  SK6 = 4.16711732
     SK7 = 2.09750676E+1    :  SK8 = 1E9
     SK9 = 6

     T1 = 1-THETA  :  T2 = T1*T1  :  T3 = T1*T2  :  T4 = T1*T3
     T5 = T1*T4

     BETA1 = EXP(1/THETA*(SK1*T1+SK2*T2+SK3*T3+SK4*T4+SK5*T5)   \
       /(1+SK6*T1+SK7*T2)-T1/(SK8*T2+SK9))
```

```
     BETA  = PRES*9.80665*0.45359237/22120000/0.0254/0.0254
     BETA2 = BETA*BETA   :  BETA3 = BETA*BETA2

     Y = 1-SA1*THETA2-SA2/THETA6

     Z = Y+SQR(SA3*Y*Y-2*SA4*THETA+2*SA5*BETA)

     CHI1 = A11*SA5/EXP(LOG(Z)*5/17) + (A12+A13*THETA+A14*THETA2  \
        + A15*EXP(LOG(ABS(SA6-THETA))*10)+A16/(SA7+THETA19))      \
        - 1/(SA8+THETA11)*(A17+2*A18*BETA+3*A19*BETA2)        \
        - A20*THETA18*(SA9+THETA2)*(-3/EXP(LOG(SA10+BETA)*4)+SA11) \
        + 3*A21*(SA12-THETA)*BETA2 + 4*A22/THETA20*BETA3

     SPECIFIC.VOL=CHI1*3.17*0.0160184634

     DENSITY.WTR = 1/SPECIFIC.VOL   :  RETURN     REM: lb/ft3

860 \               * Density of Saturated Steam *

     \Note: The following equation is a curve fit to the density of
     \  saturated steam as given on pages 90 and 91 of Reference (1).
     \  It is accurate to 1.0% or better in the range from 1400 to
     \  2700 psia.

     PRINT  :  PRINT  :  PRINT
     PRINT "        Calculating the Density of Saturated"
     PRINT "        Steam at ";PRES;"psia"

     P = PRES-2000
     DENSITY.STM = 5.3104+3.8887E-3*P+1.2782E-6*P*P+6.24E-10*P*P*P

     RETURN


     \                       * Tank Inventory *

865 \                          Calibration Method

     INV.CHG = SLOPE * (LVL.F - LVL.I)  :  RETURN

870 \                          Geometric Method

     IF CVX.RAD<CYL.RAD THEN CONSOLE : PRINT : PRINT : PRINT  \
        : PRINT "ERROR: Radius of Convex Head is less than"   \
        : PRINT "Radius of Tank." : GOTO 995

     IF UNITS$="inches" THEN LVL.FRAC.I=LVL.I/12/2/CYL.RAD  \
                        ELSE LVL.FRAC.I=LVL.I/100
     IF UNITS$="inches" THEN LVL.FRAC.F=LVL.F/12/2/CYL.RAD  \
                        ELSE LVL.FRAC.F=LVL.F/100
```

```
       \          **************************
890    \          * PLANT PARAMETERS FILE *
       \          **************************

   READ #2, 1; PLANT$         :  READ #2, 2; UNIT$
   READ #2, 3; NSSS$          :  READ #2, 4; VP.VOL
   READ #2, 5; PZR.UNITS$     :  READ #2, 6; COMP$
   READ #2, 7; PZR.LVL.NOM    :  READ #2, 8; PZR.BTM.VOL
   READ #2, 9; PZR.TOP.VOL    :  READ #2,10; FZR.SLOPE
   READ #2,11; PZR.UP.LMT     :  READ #2,12; PZR.LO.LMT
   READ #2,13; LD.TANK$       :  READ #2,14; LDT.UNITS$
   READ #2,15; LDT.SLOPE      :  READ #2,16; LDT.UP.LMT
   READ #2,17; LDT.LO.LMT     :  READ #2,18; LDT.GEO$
   READ #2,19; LDT.CYL.RAD    :  READ #2,20; LDT.CYL.LEN
   READ #2,21; LDT.CVX.RAD    :  READ #2,22; LDT.DENSITY
   READ #2,23; LDT.NORMFAC    :  READ #2,24; DT.UNITS$
   READ #2,25; DT.SLOPE       :  READ #2,26; DT.UP.LMT
   READ #2,27; DT.LO.LMT      :  READ #2,28; DT.GEO$
   READ #2,29; DT.CYL.RAD     :  READ #2,30; DT.CYL.LEN
   READ #2,31; DT.CVX.RAD     :  READ #2,32; DT.DENSITY
   READ #2,33; DT.NORMFAC     :  READ #2,34; RQ.TANK$
   READ #2,35; RQT.UNITS$     :  READ #2,36; RQT.SLOPE
   READ #2,37; RQT.UP.LMT     :  READ #2,38; RQT.LO.LMT
   READ #2,39; RQT.GEO$       :  READ #2,40; RQT.CYL.RAD
   READ #2,41; RQT.CYL.LEN    :  READ #2,42; RQT.CVX.RAD
   READ #2,43; RQT.DENSITY    :  READ #2,44; RQT.NORMFAC
   READ #2,45; DOCKET$        :  RETURN
```

```
    \                ********************************
995 \                * CONTINUATION OR TERMINATION *
    \                ********************************

    CONSOLE  :  PRINT  :  PRINT  :  PRINT
    INPUT "Do you wish to terminate this session (Y/N)?";X$
    IF X$<>"Y" AND X$<>"N" THEN GOTO 995
    IF X$ = "N" THEN GOTO 1 ELSE GOTO 999
999 PRINT  :  PRINT  :  PRINT  :  STOP
    END
```

AUTOST.COM

```
0100 2A 01 00 2E 00 7C D6 16 *....|..
0108 67 22 65 01 11 20 03 01 g"e.. ..
0110 FF 07 1A D6 41 12 13 0B ....A...
0118 78 B7 C2 12 01 11 73 01 x.....s.
0120 CD 60 01 11 00 F0 21 20 .`....!
0128 03 01 00 07 ED B0 11 75 .......u
0130 01 CD 60 01 11 67 01 01 ..`
0138 0A 00 2A 65 01 2E 07 CD ..*.....
0140 55 01 2A 65 01 2E 88 3E U.*e...>
0148 08 77 2A 65 01 2E 89 7C .w*e...|
0150 77 2A 65 01 E9 1A 77 23 w*e...w#
0158 13 0B 78 B1 C2 55 01 C9 ..x..U..
0160 0E 09 C3 05 00 00 34 04 ......4.
0168 43 52 55 4E 32 20 48 00 CRUN2 H.
0170 00 00 00 1A 24 1B 3D 30 ....$.=0
0178 21 20 20 20 20 20 20 20 !
0180 20 20 20 20 20 20 20 20
0188 20 20 20 20 20 20 20 20
0190 20 20 20 20 20 20 20 20
0198 20 20 20 20 20 20 20 20
01A0 20 20 20 20 20 20 20 20
01A8 20 20 20 20 0D 0A 20 20     ..
01B0 20 20 20 20 20 20 20 20
01B8 20 20 20 49 4E 44 45 50    INDEP
01C0 45 4E 44 45 4E 54 20 4D ENDENT M
01C8 45 41 53 55 52 45 4D 45 EASUREME
01D0 4E 54 53 20 20 20 20 20 NTS
01D8 20 20 20 20 20 20 20 20
01E0 20 0D 0A 20 20 20 20 20  ..
01E8 20 20 20 20 20 20 20 20
01F0 20 20 20 20 20 20 20 20
01F8 50 52 4F 47 52 41 4D 20 PROGRAM
0200 20 20 20 20 20 20 20 20
0208 20 20 20 20 20 20 20 20
0210 20 20 20 20 20 20 0D 0A       ..
0218 20 20 20 20 20 20 20 20
0220 20 20 20 20 20 20 20 20
0228 20 20 20 20 20 20 20 20
0230 20 20 20 20 20 20 20 20
0238 20 20 20 20 20 20 20 20
0240 20 20 20 20 20 20 20 20
0248 20 20 20 0D 0A 20 20 20    ..
0250 20 20 20 20 20 55 2E 53      U.S
0258 2E 20 4E 75 63 6C 65 61 . Nuclea
0260 72 20 52 65 67 75 6C 61 r Regula
0268 74 6F 72 79 20 43 6F 6D tory Com
0270 6D 69 73 73 69 6F 6E 20 mission
0278 20 20 20 20 20 20 20 20
0280 0D 0A 20 20 20 20 20 20 ..
0288 20 20 20 20 20 20 20 20
0290 57 61 73 68 69 6E 67 74 Washingt
0298 6F 6E 2C 20 44 43 20 20 on, DC
```

```
0450 61 61 61 61 61 61 61 61 aaaaaaaa
0458 61 61 61 61 61 61 61 61 aaaaaaaa
0460 61 61 61 61 61 61 61 61 aaaaaaaa
0468 61 61 61 61 61 61 61 61 aaaaaaaa
0470 61 61 61 61 61 61 61 61 aaaaaaaa
0478 61 61 61 61 61 61 61 61 aaaaaaaa
0480 61 61 61 61 61 61 61 61 aaaaaaaa
0488 61 61 61 61 61 61 61 61 aaaaaaaa
0490 61 61 61 61 61 61 61 61 aaaaaaaa
0498 61 61 61 61 61 61 61 61 aaaaaaaa
04A0 61 61 61 61 61 61 61 61 aaaaaaaa
04A8 61 61 61 61 61 61 61 61 aaaaaaaa
04B0 61 61 61 61 61 61 61 61 aaaaaaaa
04B8 61 61 61 61 61 61 61 61 aaaaaaaa
04C0 61 61 61 61 61 61 61 61 aaaaaaaa
04C8 61 61 61 61 61 61 61 61 aaaaaaaa
04D0 61 61 61 61 61 61 61 61 aaaaaaaa
04D8 61 61 61 61 61 61 61 61 aaaaaaaa
04E0 61 61 61 61 61 61 61 61 aaaaaaaa
04E8 61 61 61 61 61 61 61 61 aaaaaaaa
04F0 61 61 61 61 61 61 61 61 aaaaaaaa
04F8 61 61 61 61 61 61 61 61 aaaaaaaa
0500 61 61 61 61 61 61 61 61 aaaaaaaa
0508 61 61 61 61 61 61 61 61 aaaaaaaa
0510 61 61 61 61 61 61 61 61 aaaaaaaa
0518 61 61 61 61 61 61 61 61 aaaaaaaa
0520 59 59 59 59 59 59 59 59 YYYYYYYY
0528 59 59 59 59 59 59 59 59 YYYYYYYY
0530 59 59 59 59 59 59 59 59 YYYYYYYY
0538 59 59 59 59 59 59 59 59 YYYYYYYY
0540 59 59 59 59 59 59 59 59 YYYYYYYY
0548 59 59 59 59 59 59 59 59 YYYYYYYY
0550 59 59 59 61 61 61 61 61 YYYaaaaa
0558 61 61 61 61 61 61 61 61 aaaaaaaa
0560 61 61 61 61 61 61 61 61 aaaaaaaa
0568 61 61 61 61 61 61 61 61 aaaaaaaa
0570 61 61 61 61 61 61 61 61 aaaaaaaa
0578 41 61 42 61 43 61 44 61 AaBaCaDa
0580 45 61 46 61 47 61 48 61 EaFaGaHa
0588 49 61 4A 61 4B 61 4C 61 IaJaKaLa
0590 4D 61 4E 61 4F 61 50 61 MaNaOaPa
0598 51 61 52 61 53 61 54 61 QaRaSaTa
05A0 57 61 61 61 61 61 61 61 Waaaaaaa
05A8 61 61 61 61 61 61 61 61 aaaaaaaa
05B0 61 61 61 61 61 61 61 61 aaaaaaaa
05B8 61 61 61 61 61 61 61 61 aaaaaaaa
05C0 61 61 61 61 61 61 61 61 aaaaaaaa
05C8 61 61 61 61 61 61 61 61 aaaaaaaa
05D0 61 61 57 61 61 61 61 61 aaWaaaaa
05D8 61 61 61 61 61 61 61 61 aaaaaaaa
05E0 61 61 61 61 61 61 61 61 aaaaaaaa
05E8 61 61 61 61 61 61 61 61 aaaaaaaa
```

```
07A0 57 61 61 61 61 61 61 61 Waaaaaaa
07A8 61 61 61 61 61 57 61 61 aaaaaWaa
07B0 56 49 57 61 61 61 57 61 VIWaaaWa
07B8 61 61 56 49 61 61 61 57 aaVIaaaW
07C0 61 61 61 61 59 61 61 61 aaaaYaaa
07C8 61 61 61 61 61 61 61 61 aaaaaaaa
07D0 61 61 57 61 61 61 61 61 aaWaaaaa
07D8 61 61 61 61 61 61 61 61 aaaaaaaa
07E0 61 61 61 61 61 61 61 61 aaaaaaaa
07E8 61 61 61 61 61 61 61 61 aaaaaaaa
07F0 61 61 61 61 61 61 61 61 aaaaaaaa
07F8 61 61 61 61 61 61 61 61 aaaaaaaa
0800 61 61 61 61 61 61 61 61 aaaaaaaa
0808 61 61 61 61 61 61 61 61 aaaaaaaa
0810 61 61 61 61 61 61 61 61 aaaaaaaa
0818 61 61 61 61 61 61 61 61 aaaaaaaa
0820 57 61 61 61 61 61 61 61 Waaaaaaa
0828 61 61 61 61 61 57 61 61 aaaaaWaa
0830 61 56 57 61 61 61 57 61 aVWaaaWa
0838 61 61 61 56 49 61 61 57 aaaVIaaW
0840 59 59 59 59 57 61 61 61 YYYYWaaa
0848 61 61 61 61 61 61 61 61 aaaaaaaa
0850 61 61 57 61 61 61 61 61 aaWaaaaa
0858 61 61 61 61 61 61 61 61 aaaaaaaa
0860 61 61 61 61 61 61 61 61 aaaaaaaa
0868 61 61 61 61 61 61 61 61 aaaaaaaa
0870 61 61 61 61 61 61 61 61 aaaaaaaa
0878 61 61 61 61 61 61 61 61 aaaaaaaa
0880 61 61 61 61 61 61 61 61 aaaaaaaa
0888 61 61 61 61 61 61 61 61 aaaaaaaa
0890 61 61 61 61 61 61 61 61 aaaaaaaa
0898 61 61 61 61 61 61 61 61 aaaaaaaa
08A0 57 61 61 61 61 61 61 61 Waaaaaaa
08A8 61 61 61 61 61 61 61 61 aaaaaaaa
08B0 61 61 61 61 61 61 61 61 aaaaaaaa
08B8 61 61 61 61 61 61 61 61 aaaaaaaa
08C0 61 61 61 61 61 61 61 61 aaaaaaaa
08C8 61 61 61 61 61 61 61 61 aaaaaaaa
08D0 61 61 57 61 61 61 61 61 aaWaaaaa
08D8 61 61 61 61 61 61 61 61 aaaaaaaa
08E0 61 61 61 61 61 61 61 61 aaaaaaaa
08E8 61 61 61 61 61 61 61 61 aaaaaaaa
08F0 61 61 61 61 61 61 61 61 aaaaaaaa
08F8 61 61 61 61 61 61 61 61 aaaaaaaa
0900 61 61 61 61 61 61 61 61 aaaaaaaa
0908 61 61 61 61 61 61 61 61 aaaaaaaa
0910 61 61 61 61 61 61 61 61 aaaaaaaa
0918 61 61 61 61 61 61 61 61 aaaaaaaa
0920 57 59 59 59 59 59 59 59 WYYYYYYY
0928 59 59 59 59 59 59 59 59 YYYYYYYY
0930 59 59 59 59 59 59 59 59 YYYYYYYY
0938 59 59 59 59 59 59 59 59 YYYYYYYY
0940 59 59 59 59 59 59 59 59 YYYYYYYY
0948 59 59 59 59 59 59 59 59 YYYYYYYY
```

APPENDIX C

H.BAS

```
\                  **** H.BAS ****

    \H.INT is executed by AUTOST.COM.

%CHAIN 500,21700,0,1700
    CHAIN "RCSLK8"
    END
```

PARTIAL TANK VOLUMES

PARTIAL TANK VOLUMES

As suggested by J. W. Chung, the volume of water, V, in a partially-filled, horizontal tank with convex heads can be calculated by integrating Sdh where S is the surface area and dh is the thickness of a horizontal, incremental slab of water located at height h above the bottom of the tank.

The surface of the slab has the shape and dimensions shown in Figure 1. The area of the surface can be calculated by dividing it into a rectangle and two circular segments. The area of the rectangle is 2cL and the combined area of the two circular segments is bbB - ac where angle B is expressed in radians and is equal to arctan(c/a). Term bbB is twice the area of the smallest circular sector containing one of the segments, and term ac is twice the area of the largest isosceles triangle contained in the sector.

The volume of the incremental slab is

$$dV = [\ 2cL + bb*\arctan(c/a) - ac\ ]\ dh$$

Before this expression can be integrated, a, b, and c must be expressed in terms of h and the tank dimensions, R, H, and L, where R and H are the radii of the cylindrical part of the tank and the heads and L is the length of the cyclindrical part of the tank. The relationships between R, H, L, and h and the dimensions of the incremental slab surface are shown in Figure 2.

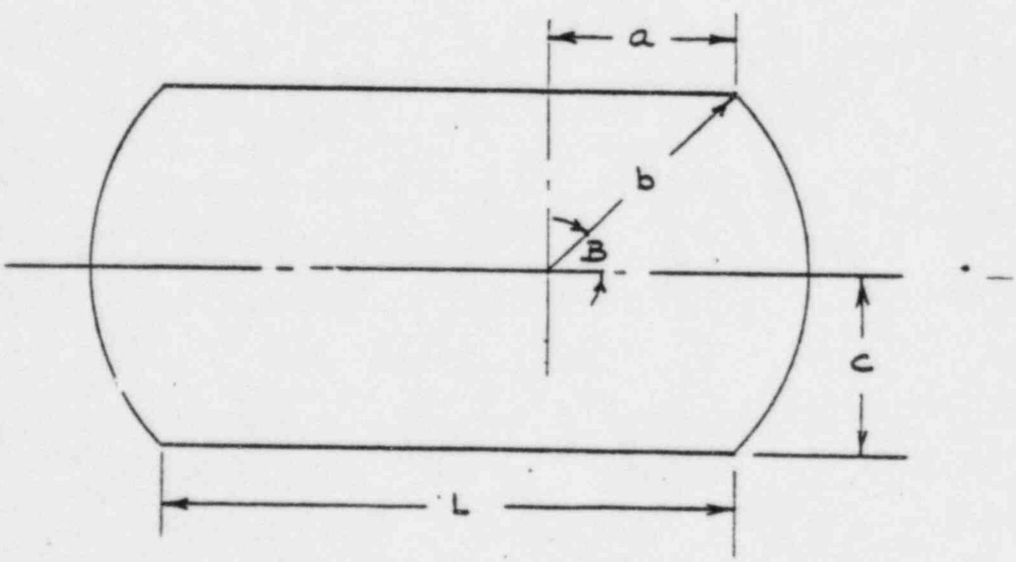


Figure 1: Slab Surface

This expression for dV is the basis for the numerical integration in the Tank Inventory Subroutine using the geometric method which is given on pages A-27 and 28 of Appendix A. In the subroutine, the height increment is set at 1% or less of the tank diameter and the surface area is the mean of the upper and lower surfaces of the slab. Slab volumes are calculated and summed from the initial surface level to the final surface level.

CURRENT PLANT LIST

PLANTS WITH PARAMETERS FILED

50-255	Palisades 1
50-266	Point Beach 1
50-282	Prairie Island 1
50-295	Zion 1
50-301	Point Beach 2
50-304	Zion 2
50-305	Kewaunee 1
50-306	Prairie Island 2
50-312	Rancho Seco 1
50-315	D. C. Cook 1
50-316	D. C. Cook 2
50-317	Calvert Cliffs 1
50-318	Calvert Cliffs 2
50-320	Three Mile Island 2
50-344	Trojan 1
50-346	Davis Besse 1
50-348	Farley 1

CURRENT PARAMETER LISTS

PARAMETER LIST

Unit Identification:	
Plant Name	Calvert Cliffs
Unit Number	1
Docket Number	50-317
Nuclear Steam System Supplier	Combustion Engineering
Vessel and Piping:	
Volume	9601 cubic feet
Pressurizer:	
Level Units	inches
Temperature Compensated	No
Calibration Curve	
Slope	139.82 pounds per inch
Upper Level Limit	375 inches
Lower level Limit	32 inches
Relief	Quench Tank
Volume Control Tank:	
Level Units	inches
Calibration Curve	
Slope	230.389 pounds per inch
Upper Level Limit	168 inches
Lower level limit	0 inches
Geometric Method Available	No
Drain Tank:	
Level Units	inches
Calibration Curve	
Slope	174.513 pounds per inch
Upper Level Limit	40 inches
Lower level limit	15 inches
Water Density	62.27 pounds per cubic foot
Geometric Method Available	Yes
Dimensions	
Cylinder Radius	2.2422 feet
Cylinder Length	7.2292 feet
Head Radius	4.4844 feet
Normalization Factor	0.9755
Quench Tank:	
Level Units	inches
Calibration Curve	
Slope	291.513 pounds per inch
Upper Level Limit	40 inches
Lower level limit	15 inches
Water Density	62.27 pounds per cubic foot
Geometric Method Available	Yes
Dimensions	
Cylinder Radius	2.474 feet
Cylinder Length	10.494 feet
Head Radius	4.4459 feet
Normalization Factor	1.0254

PARAMETER LIST

Unit Identification:	
Plant Name	D. C. Cook
Unit Number	1
Docket Number	50-315
Nuclear Steam System Supplier	Westinghouse
Vessel and Piping:	
Volume	10812 cubic feet
Pressurizer:	
Level Units	%
Temperature Compensated	No
Calibration Curve	
Slope	579.367 pounds per %
Upper Level Limit	100 %
Lower level Limit	0 %
Relief	Relief Tank
Volume Control Tank:	
Level Units	%
Calibration Curve	
Slope	161.619 pounds per %
Upper Level Limit	100 %
Lower level limit	0 %
Geometric Method Available	No
Drain Tank:	
Level Units	%
Calibration Curve	
Slope	30.144 pounds per %
Upper Level Limit	75 %
Lower level limit	25 %
Geometric Method Available	No
Relief Tank:	
Level Units	%
Calibration Curve	
Slope	1209.88 pounds per %
Upper Level Limit	80 %
Lower level limit	20 %
Geometric Method Available	No

PARAMETER LIST

Unit Identification:	
Plant Name	Davis Besse
Unit Number	1
Docket Number	50-346
Nuclear Steam System Supplier	Babcock & Wilcox
Vessel and Piping:	
Volume	10040 cubic feet
Pressurizer:	
Level Units	inches
Temperature Compensated	Yes
Nominal Level	200 inches
Volume Below Nominal Level	681.87 cubic feet
Volume Above Nominal Level	0 cubic feet
Calibration Curve	
Slope	3.1865 cubic feet per inch
Upper Level Limit	456 inches
Lower level Limit	48 inches
Relief	Relief Tank
Makeup Tank:	
Level Units	inches
Calibration Curve	
Slope	258.221 pounds per inch
Upper Level Limit	100 inches
Lower level limit	0 inches
Geometric Method Available	No
Drain Tank:	
Level Units	inches
Calibration Curve	
Slope	62.473 pounds per inch
Upper Level Limit	80 inches
Lower level limit	15 inches
Geometric Method Available	No
Relief Tank:	
Level Units	inches
Calibration Curve	
Slope	368.034 pounds per inch
Upper Level Limit	120 inches
Lower level limit	48 inches
Geometric Method Available	No

PARAMETER LIST

Unit Identification:	
Plant Name	Kewaunee
Unit Number	1
Docket Number	50-305
Nuclear Steam System Supplier	Westinghouse
Vessel and Piping:	
Volume	5591 cubic feet
Pressurizer:	
Level Units	%
Temperature Compensated	No
Calibration Curve	
Slope	327.8 pounds per %
Upper Level Limit	100 %
Lower level Limit	0 %
Relief	Relief Tank
Volume Control Tank:	
Level Units	%
Calibration Curve	
Slope	105.6 pounds per %
Upper Level Limit	100 %
Lower level limit	0 %
Geometric Method Available	No
Drain Tank:	
Level Units	%
Calibration Curve	
Slope	29.33 pounds per %
Upper Level Limit	80 %
Lower level limit	20 %
Geometric Method Available	No
Relief Tank:	
Level Units	%
Calibration Curve	
Slope	557.74 pounds per %
Upper Level Limit	74 %
Lower level limit	72 %
Geometric Method Available	No

PARAMETER LIST

Unit Identification:	
Plant Name	Point Beach
Unit Number	1
Docket Number	50-266
Nuclear Steam System Supplier	Westinghouse
Vessel and Piping:	
Volume	5440 cubic feet
Pressurizer:	
Level Units	%
Temperature Compensated	Yes
Nominal Level	50 %
Volume Below Nominal Level	500 cubic feet
Volume Above Nominal Level	0 cubic feet
Calibration Curve	
Slope	8.56 cubic feet per %
Upper Level Limit	61 %
Lower level Limit	38 %
Relief	Relief Tank
Volume Control Tank:	
Level Units	%
Calibration Curve	
Slope	107.25 pounds per %
Upper Level Limit	78 %
Lower level limit	8 %
Geometric Method Available	No
Drain Tank:	
Level Units	%
Calibration Curve	
Slope	33.27 pounds per %
Upper Level Limit	50 %
Lower level limit	7 %
Geometric Method Available	No
Relief Tank:	
Level Units	%
Calibration Curve	
Slope	519.89 pounds per %
Upper Level Limit	76 %
Lower level limit	66 %
Geometric Method Available	No

PARAMETER LIST

Unit Identification:	
Plant Name	Prairie Island
Unit Number	1
Docket Number	50-282
Nuclear Steam System Supplier	Westinghouse
Vessel and Piping:	
Volume	5591 cubic feet
Pressurizer:	
Level Units	%
Temperature Compensated	Yes
Nominal Level	35 %
Volume Below Nominal Level	372.944 cubic feet
Volume Above Nominal Level	0 cubic feet
Calibration Curve	
Slope	8.637 cubic feet per %
Upper Level Limit	100 %
Lower level Limit	0 %
Relief	Relief Tank
Volume Control Tank:	
Level Units	%
Calibration Curve	
Slope	104.954 pounds per %
Upper Level Limit	100 %
Lower level limit	0 %
Geometric Method Available	No
Drain Tank:	
Level Units	%
Calibration Curve	
Slope	28.599 pounds per %
Upper Level Limit	80 %
Lower level limit	20 %
Geometric Method Available	No
Relief Tank:	
Level Units	%
Calibration Curve	
Slope	527.548 pounds per %
Upper Level Limit	80 %
Lower level limit	20 %
Geometric Method Available	No

PARAMETER LIST

Unit Identification:	
Plant Name	Rancho Seco
Unit Number	1
Docket Number	50-312
Nuclear Steam System Supplier	Babcock & Wilcox
Vessel and Piping:	
Volume	10578.2 cubic feet
Pressurizer:	
Level Units	inches
Temperature Compensated	Yes
Nominal Level	200 inches
Volume Below Nominal Level	872.6 cubic feet
Volume Above Nominal Level	0 cubic feet
Calibration Curve	
Slope	3.16678 cubic feet per inch
Upper Level Limit	320 inches
Lower level Limit	0 inches
Relief	Drain Tank
Makeup Tank:	
Level Units	inches
Calibration Curve	
Slope	256 pounds per inch
Upper Level Limit	100 inches
Lower level limit	0 inches
Geometric Method Available	No
Drain Tank:	
Level Units	inches
Calibration Curve	
Slope	280 pounds per inch
Upper Level Limit	120 inches
Lower level limit	48 inches
Geometric Method Available	No

PARAMETER LIST

Unit Identification:	
Plant Name	Trojan
Unit Number	1
Docket Number	50-344
Nuclear Steam System Supplier	Westinghouse
Vessel and Piping:	
Volume	10811 cubic feet
Pressurizer:	
Level Units	%
Temperature Compensated	No
Calibration Curve	
Slope	1215 pounds per %
Upper Level Limit	100 %
Lower level Limit	0 %
Relief	Relief Tank
Volume Control Tank:	
Level Units	%
Calibration Curve	
Slope	158.9 pounds per %
Upper Level Limit	100 %
Lower level limit	40 %
Geometric Method Available	No
Drain Tank:	
Level Units	%
Calibration Curve	
Slope	33.7 pounds per %
Upper Level Limit	70 %
Lower level limit	20 %
Water Density	62.27 pounds per cubic foot
Geometric Method Available	Yes
Dimensions	
Cylinder Radius	1.4821 feet
Cylinder Length	6.2756 feet
Head Radius	2.1695 feet
Normalization Factor	0.9234
Relief Tank:	
Level Units	%
Calibration Curve	
Slope	1176 pounds per %
Upper Level Limit	70 %
Lower level limit	30 %
Water Density	62.27 pounds per cubic foot
Geometric Method Available	Yes
Dimensions	
Cylinder Radius	4.75 feet
Cylinder Length	23.315 feet
Head Radius	6.5276 feet
Normalization Factor	0.8269

PARAMETER LIST

Unit Identification:	
Plant Name	Zion
Unit Number	2
Docket Number	50-304
Nuclear Steam System Supplier	Westinghouse
Vessel and Piping:	
Volume	10938 cubic feet
Pressurizer:	
Level Units	%
Temperature Compensated	No
Calibration Curve	
Slope	597.59 pounds per %
Upper Level Limit	100 %
Lower level Limit	0 %
Relief	Relief Tank
Volume Control Tank:	
Level Units	%
Calibration Curve	
Slope	159.95 pounds per %
Upper Level Limit	100 %
Lower level limit	0 %
Geometric Method Available	No
Drain Tank:	
Level Units	%
Calibration Curve	
Slope	29.75 pounds per %
Upper Level Limit	90 %
Lower level limit	10 %
Geometric Method Available	No
Relief Tank:	
Level Units	%
Calibration Curve	
Slope	1205.62 pounds per %
Upper Level Limit	80 %
Lower level limit	20 %
Geometric Method Available	No

EXAMPLES

NRC

INDEPENDENT MEASUREMENTS PROGRAM

REACTOR COOLING SYSTEM LEAK RATES

STATION: Calvert Cliffs
UNIT : 1
DOCKET : 50-317

TEST DATE : March 18, 1983
START TIME: Software Test
DURATION : 2 hours

TEST DATA

	Initial	Final
System Parameters:		
Pressure, psia	2140	2135
T Ave, degrees F	581	582
Water Levels:		
Pressurizer, inches	43	44
Quench Tank, inches	30	31
Volume Control Tank, inches	60	59
Drain Tank, inches	21	22

Water Charged = 10 gal   Water Drained = 2 gal

TEST RESULTS

Change in Water Inventory in pounds:

Vessel & Piping	-785
Pressurizer	140
Volume Control Tank (1)	-230
Less: Water Charged	83
Plus: Water Drained	17
Cooling System	-943

Quench Tank (1)	292
Drain Tank (1)	175
Collected Leakage	466

Leak Rates in gpm (3):

Gross	0.94
Identified	0.47
Unidentified	0.48

(1) Determined from tank calibration curve.
(2) Determined from tank dimensions.
(3) The density used for converting inventory change to leak rate was 62.31 pounds/cubic foot based on standard conditions.

NRC

INDEPENDENT MEASUREMENTS PROGRAM

REACTOR COOLING SYSTEM LEAK RATES

STATION: Farley
UNIT : 1
DOCKET : 50-348

TEST DATE : March 18, 1983
START TIME: Software Test
DURATION : 2 hours

TEST DATA

	Initial	Final
System Parameters:		
Pressure, psia	2138	2128
T Ave, degrees F	581	582
Water Levels:		
Pressurizer, %	44	43
Relief Tank, %	70	71
Volume Control Tank, %	60	59
Drain Tank, %	21	22

Water Charged = 10 gal   Water Drained = 2 gal

TEST RESULTS

Change in Water Inventory in pounds:

Vessel & Piping	-718	Relief Tank (1)	830
Pressurizer	-396	Drain Tank (1)	32
Volume Control Tank (1)	-115		
Less: Water Charged	83	Collected Leakage	862
Plus: Water Drained	17		
Cooling System	-1295		

Leak Rates in gpm (3):

Gross	1.30
Identified	0.86
Unidentified	0.43

(1) Determined from tank calibration curve.
(2) Determined from tank dimensions.
(3) The density used for converting inventory change to leak rate was 62.31 pounds/cubic foot based on standard conditions.

NRC

INDEPENDENT MEASUREMENTS PROGRAM

REACTOR COOLING SYSTEM LEAK RATES

STATION: Three Mile Island
UNIT : 2
DOCKET : 50-320

TEST DATE : March 18, 1983
START TIME: Software Test
DURATION : 4 hours

TEST DATA

	Initial	Final
System Parameters:		
Pressure, psia	2100	2000
T Ave, degrees F	570	580
Water Levels:		
Pressurizer, inches	230	220
Makeup Tank, inches	60	70
Drain Tank, inches	73	80

Water Charged = 100 gal   Water Drained = 0 gal

TEST RESULTS

Change in Water Inventory in pounds:

Vessel & Piping	-8669	Drain Tank (1)	4276
Pressurizer	-648		
Makeup Tank (1)	2570		
Less: Water Charged	832		
Plus: Water Drained	0		
Cooling System	-7579		

Leak Rates in gpm (3):

Gross	3.79
Identified	2.14
Unidentified	1.65

(1) Determined from tank calibration curve.
(2) Determined from tank dimensions.
(3) The density used for converting inventory change to leak rate was 62.31 pounds/cubic foot based on standard conditions.

K-12

Notes on Discussion w J Flegel.

3/31/80

Talked w Floyd:

said believes correction to RC leakage Test made after RCDT Pump out during test showed error in computer code. The only time the RCDT was ever pumped out during RCL test was 3/14/79 - temporary Procedure change was approved by PORC on 3/16/79 and used for the first time on 20-09 the same day.

Floyd said that controlled leakage included 2nd and 3rd seal leakage

second seal leakage measured by Computer ~~on [illegible] flow meters~~ ( )

3rd seal leakage was measured by "dipping bird" gauge located on RCDT panel behind racks. Typical leakages were in gallons per hour. These were not accounted for in computer listed "Identified" leakage (IL) and would only present a problem if the Computer printed IL exceeded the TS allowed 10 gpm

~~Flow [illegible] GPM = [illegible] times~~

Flow GPM = K × display

$K_{1A} = 16.1$

$K_{1B} = 14.3$

$K_{2A} = 14.4$

$K_{2B} = 13.6$

Talk w/ Jim Flagg

~~Temperature~~

Color Why the VS S

Occurrences

Temperature ± °F repeatability

Pzr level ± ? 1 - 2 & 4" acc

RCDT Voltage ± level ± press ±

MDT level ± 4" acc

4.162 1% full rang

get fixed on Canbial file CR

K-13

Hand Calculations
and Calculator notes

MEMORIES ~~Main~~ TMI-2 containment

$\Sigma \Delta M$

0 ~~Memories~~

data in

1	21 (LM2)	41 (ΣV_D Terms)
2	22 (LD1)	42 $-1\frac{1}{3}$
3 V_g matters	23 (LD2)	43 6485
4	24 ~~066~~	44 P_2 ΔM
5	25 Pi P → T	45 ~~1067~~ 1034
6	26	46 V_{Zi}
7	27	47 M_{Zi}
8	28	48 25.9
9	29	49 1.342886/60
10	30 2100 V_{CL}	50 V_D expl M_D
11	31 -5×10^{-7}	51 .00268696 A
12	32 (Ti − 580)	52 $\Sigma \Delta M$
13	33 3.9×10^{-5}	53 GLR
14 (T1)	34 (ΣV_{CL} Terms)	54
15 (T2)	35 2×10^{-7}	55
16 (P1)	36 .02240	56
17 (P2)	37 (Internal Pi)	57
18 (LZ1)	38 MM	58
19 (LZ2)	39 (Li − 77)	59
20 (LM1)	40 73.33333	

Data entry

LD → VD

M = mass (#) L = level (in)
ρ = density (#/ft^3) T = Temperature (°F)
V = Vol (ft^3) #/Hr $v = \frac{1}{\rho}$

$$GLR = \frac{(\Delta M_T + \Delta M_Z + \Delta M_M + \Delta M_O)}{60\,min/Hr}\left(\frac{7.4805\,gal/ft^3}{46.4\,\#/ft^3}\right)$$

Temperature change

$$\Delta M_T = \text{RCS Temp change} = (\rho_1 - \rho_2)\ 10678\,ft^3$$

(#/ft^3)

Pressurizer change

$$\Delta M_Z = \rho_{Z1} V_{Z1} - \rho_{Z2} V_{Z2}$$

$$V_{Z_i} = 800\,ft^3 + (L_{Z_i} - 200.)\ 3.208\,ft^3/in$$

Make Up Tank

$$\Delta M_M = (L_{M_1} - L_{M_2})\ 255\ \#/in$$

~~DKR~~
Operator additions

$$\Delta M_O = (\text{gallons added})\ 8.33\ \#/gal$$

$$ILR = \frac{(V_{O2}(gal) - V_{O1}(gal))\ \frac{62.3099}{46.4}}{60}$$

main

Main Program
Lable A

$ULR = GLR - ILR$

$$GLR = \frac{(\Delta M_1 + \Delta M_2 + \Delta M_H + \Delta M_D)\ \#/Hr\ N\,gal/\#}{60\ min/Hr}$$

$$N\,gal/\# = \frac{1/46.4\ \#/ft^3}{7.4805\ gal/ft^3} = .161218\ gal/\#$$

$$GLR = \Sigma \Delta M\ \frac{.161218}{60} = .00268696$$

$$ILR = (V_{RCDT_2} - V_{RCDT_1})_{gal} \frac{62.31}{46.4} \frac{1}{60}$$

$$= (V_{D2} - V_{D1})(.022381$$

$$V = \pi\left(4 - \frac{.347}{12}\right)^2 H = 49.54135 \cdot H \ ft^3$$

Unidentified Leak Rate (ULR) =

Gross Leak Rate (GLR) − Identified Leak Rate ILR

$$GLR = \frac{\Delta M_{RCS} + \Delta M_{PZR} + \Delta M_{HUT} + \Delta M_{OCP}}{\rho_{T_{AVT_2}} \, (\sout{62.4 \, lb/ft^3}) \, (7.4805 \, gal/ft^3)}$$

$$ILR = \frac{\Delta M_{RCDT} + \Delta M_{OCDT}}{\rho_{T_{AVT_2}} \, \sout{62.4 \, lb/ft^3} \, (7.4805 \, gal/ft^3)}$$

$$ULR = GLR - ILR$$

ΔM_{RCS} = Mass change due to RCS temperature change (lbs)

$$= \frac{V_{RCS_1}}{v_{RCS_1}} - \frac{V_{RCS_2}}{v_{RCS_2}}$$

Where: $V_{RCS} = 10{,}678 ft^3 + (582°F - T_{ave})(0.1 ft^3/°F)$

$v_{RCS_1} = f T$ and is calculated by equation 18, P21 from Keenan and Keyes - "Thermodynam Properties of Steam"

ΔM_{PZR} = Mass change in pressurizer (lbs)

$$= \frac{V_{PZR_1}}{v_{PZR_1}} - \frac{V_{PZR_2}}{v_{PZR_2}}$$

$V_{PZR} = 800 ft^3 + (L - 200 in) 3.208 ft^3/in$

$v_{PZR} = f T$ by equation 18 from K & K

and $T = f P =$

$$649.46 - (2200 - P_{PZR}).0655 - (2200 - P_{PZR})^2 (1.5 \times 10^{-5})$$

~~[illegible]~~

Use $\Delta M_{A} = (L_1 - L_2)\, 255\ \#/in$ — Based on Tank dimensions and 3.6#/100" calib procedure

ΔM_{MUT} = Mass Change in Make Up Tank (lb

$$= \frac{V_{MUT_1}}{v_{MUT_1}} - \frac{V_{MUT_2}}{v_{MUT_2}}$$

not good because ΔP measurement is mass measurement

$$V_{MUT} = 508 + (L - 65_{in})\, 4.128446\ ft^3/in$$

v_{MUT} = ~~fT~~ by eq 18 from K&K

ΔM_{OCP} = Operator Changes to Primary (incl. MUT) (lbs)

$$= (\text{Gallons in})(7.48\ gal/ft^3)(62.4\ \#/ft^3)$$

ΔM_{RCDT} = Mass Change in RC Drain Tank

$$\Delta M_{RCDT} = \frac{V_{RCDT_1}}{v_{RCDT_1}} - \frac{V_{RCDT_2}}{v_{RCDT_2}}$$

$$V_{RCDT} = 6485 + 73.3353(L-77) - 1(L-77)^2$$

v_{RCDT} = ST by eq 18 from K & K

ΔM_{OCDT} = Operator Changes to RC Drain Tan

35.0
32.4
2 2.1

3068.87366
30168.87366
1C2661173971

Memories

0	582	} ΔM RCS calc
1	10678	
2	-0.1	
3 — 13	ν_g subroutine	
14	-2000	} Comp Liq Corr, SBR
15	4.6×10^{-7}	
16	3.7×10^{-4}	
17	2200 psi	
18	65	
19	4.128446	
20	508	
21	6485	} RCDT Volume
22	77	
23	73.33333	
24	-1.0	
25 - 29	P → T subroutine	~~How is~~ P in 25 ~~entered~~ =
~~28~~	~~200~~	} ~~[illegible]~~
~~29~~	~~3.208~~	
(30)	~~800~~	71.4805
31	V ~~[illegible]~~ RCDT (L - 77)	
32	V RCDT	Σ terms (6411 + 73.33(L-77) - (L·77)
33	~~[illegible]~~ Tank i	
34	~~[illegible]~~ $\nu_{RCS\,i}$	
35	~~[illegible]~~ M_{RCS_1}	
36	~~[illegible]~~ M_{RCS_2}	
37	~~[illegible]~~ $V_{PZR\,i}$	
38	~~[illegible]~~ $V_{MUT\,i}$	
39	~~[illegible]~~	

~~RCL 33~~

40 ~~[scribbled out]~~

41 200

42 3,208 } ΔM_{PZR}

43 800

44 P_1

45 P_2

46 M_{RCS} 1

47 $\Sigma \Delta M$

48 M_{PZR} 1

49 Tau 1

50 Tau 2

51 M_{HUT} 1

52 ~~gal/#~~ #/gal at 72°F) = 8.3238 #/gal

53 Gross LR gal/min

54 (gal/# at Tau)

55 M_{RCDT} 1

56 ΔM_{RCDT}

57 ILR gal/min

48
27
10
85

P-T SBR ~~209 - 12~~ 213

~ SBR ~~118 - 11~~ 12[illegible]-212

M[illegible]RCOTi SBR ~~81 - 19~~ 84

MRCSi SBR ~~[illegible]70 - 81~~

MPZRi SBR 240 - 266

MHOT SBR 270 - 296

Main Program 301

31
32
33
34
35 117 2
36 116 92
37
38
39

113
114

65
43

$T_{PZR} = f(P_{PZR}) =$

$649.46 - (2200 - P_{PZR})(.0655) - (2200 - P_{PZR})^2 / 1.5\times10^{-}$

~~[illegible]~~ $V_{RCS} = 10,678 -$

$V_{RCS} = 10678 - (582 - T)(0.1\ ft^3/{}^{o}F)$

SBR [illegible] M PZR i

1 R/S Enter L PZR i
2 PRT
34 RCL [illegible] 41 (200)
5 = (L − 200)
6 ×
78 RCL [illegible] 42 ($3.208 ft^3$/in)
9 = (L − 200)(3.208)
10 +
1112 RCL [illegible] 43 $800 ft^3$
13 = ($V_{PZR\,i}$ = 800 + (L − 200) 3.208)
1415 STO [illegible] 37

~~RCL 23 P_{RCS} … RCL … 2200 … (2200 − P_{RCS})~~

161718 SBR 213 [illegible] P → T Prints T | needs P in 25 |
192021 SBR 124 [illegible] ω_f from T
22 1/x $\rho_{PZR\,i}$
23 ×
2425 RCL 37 $V_{PZR\,i}$
26 = $M_{PZR\,i}$
27 [illegible] 2nd INV SBR

	SBR ~~[illegible]~~ MRCSi	
1 20	R/S	(Enter TCAi
2	PRT	
3	+	
4	R/S	(enter THAi)
5	PRT	
6	+	
7	R/S	(enter TcBi)
8	PRT	
9	+	
10	R/S	(enter THBi)
11	PRT	
12	=	
13	÷	
14	4	
15	=	(Tavg)
16 17	STO 33	Tav
18	PRT	
19 20 21	SBR ~~18~~ 124	(N4 sat)
22 23	STO 34	
24	~~SBR (Ch cor)~~	
25 26	SUM 34	
27 28	RCL 34	(N4)
29	PRT	(N5)
30 31	RCL 33	(Tav)
32	+/-	(-Tav)
33	+	
34 35	RCL 00	(582)
36	×	
37 38	RCL 02	(±0.1)
39	=	-(582 - Tav)(0.1)
		ovey

RCL 25 (P)
−
RCL 14 (2000
=
×
RCL 15 (4.6×10
=
+
RCL 16 (3.7×10
=
+/-

Test
STO 2000 in 25
SBR 20
R/S
enter 578
579
581
582
PRT 580
~~[illegible]~~ in 4 CL

40 +

41 42 RCL 01 (10678)

43 = $V_{RCS\,i} = (10678 - (582 - T_{av})(0.1)$

44 ÷

45 46 RCL 34 $v_{RCS\,i}$

47 = $M_{RCS\,i}$

48 2nd INV SBR

SBR MMUTi

1 R/S (enter LMUTi)
2 —
3 4 RCL 18 (65)
5 = (LMUTi - 65)
6 X
7 8 RCL 19 4.128446 ft³/in
9 = (LMUTi - 65) 4.128446
10 +
11-12 RCL 20 (508)
13 = VMUTi = 508 + (L - 65) 4.128446
14 15 STO 38 VMUTi
16 R/S (enter TMUTi)
17 18 19 SBR 124 (vMUTi)
20 1/x ρMUTi
21 22-23 X RCL 38 VMUTi
24 = MMUTi
25 and INV SBR

SBR Mrcoti 84 Done

R/S enter Lrcoti

calc Vrcoti in 32

1 R/S enter Trcoti

2 PRT

3 SBR 118 Vrcoti

4 1/x Prcoti

5 X

6 RCL 32 Vrcoti

7 = Mrcoti

8 2nd INV SBR

11

Main Program

580.4 – 582	44.66 582.0
44.66 44.56	44.56 580.8
	.10 1.2

$44.66 + (T - 580.4)\left(\frac{-.1}{1.2}\right) = 44.66 - (T - 580.8).0833333$

$= (10678\,ft^3)[44.66 - (T - 580.8)(.0833333)]\ \#/ft^3$

$\Delta M_{RCS} = (DNI - DHF)10678$

$= 10678\ \{[44.66 - (T_1 - 580.8)(.0833333)] - [44.66 - (T_2 - 580.8)(.083333)]\}$

$\Delta M_{PZR} = (L_{PZR_1} - L_{PZR_2})\ 120.8$

$\Delta M_{HOT} = (L_{HOT_1} - L_{HOT_2})\ 255.0$

$GLR = (\Delta M_{RCS} + \Delta M_{PZR} + \Delta M_{HOT})\ \frac{gal/\#}{60}$

$Gal/\# = [.16740 + (T_{av} - 580.4)(.0002923)]$

583.0	.16816
580.4	.16740
2.6	.00076
	2.6

07 ρ_{T_1}
~~06 ...~~

Enter data

T_1	01
T_2	02
✓ L_{Z1}	03
L_{Z2}	04
L_{MUT1}	05
L_{MUT2}	06

10	.08333333
11	.00029230 77
12	580.8
13	44.66
14	10628
15	120.8
16	255

Calc ΔMRCS ~~STO~~ ~~..~~ 20

Calc ΔMz SUM ~~..~~ 20

Calc ΔMMUT SUM ~~..~~ 20
PRT

Calc gal/#

÷ 60 = G Leak Rate
PRT and STO

17	~~...~~ 580.4
18	.16740
19	
20	
21	ΔMRCS

2nd LBL A   for GHR Calc   R/S Enter Date
PRT
ADV

R/S	enter T_1
STO 01	
PRT	
R/S	enter T_2
STO 02	
PRT	
R/S	enter L_{Z1}
STO 03	
PRT	
R/S	enter L_{Z2}
STO 04	
PRT	
R/S	enter L_{MUT1}
STO 05	
PRT	
R/S	enter L_{MUT2}
STO 06	
PRT	
RCL 01	T_1
−	
RCL 12	580.8
=	$T_1 - 580.8$
X	
RCL 10	.08333
=	$(T_1 - 580.8).0833$ —
+/−	− 〃

+
RCL ~~13~~ 13 44.66
= ρ_{T_1}
STO 07 ρ_{T_1}
RCL 02 T_2
−
RCL 12 580.8
= $T_2 - 580.8$
X
RCL 10 .0833
= $(T_2 - 580.8).0833$
+/− − 〃
+
RCL ~~13~~ 13 44.66
= ρ_{T_2}
+/- $-\rho_{T_2}$
+
RCL 07 ρ_{T_2}
= $\rho_{T_1} - \rho_{T_2}$
X
RCL 14 10678 ~~[illegible]~~ Vol RCS
= Δ MRCS
~~STO 20~~ Δ MRCS Σ register
~~[illegible]~~ PRT
RCL 03 LZ1
−
RCL 04 LZ2

= $L_{Z1} - L_{Z2}$

X

~~120.8~~ RCL 15   120.8 #/min (PZR)

= ΔM_{PZR}

~~STO 22~~

SUM 20 $\Sigma \Delta M$

PRT

RCL 05 L_{MOT1}

−

RCL 06 L_{MOT2}

= $L_{MOT1} - L_{MOT2}$

X

RCL 16   255 #/min (MOT)

= ΔM_{MOT}

SUM 20 $\Sigma \Delta M = \Delta M_{RCS}$

PRT

RCL 01 T_1

+

RCL 02 T_2

= $T_1 + T_2$

÷

2

= $(T_1 + T_2)/2 - T_{AV}$

~~STO 08~~

~~RCL [illegible] T_1~~

−

RCL 17   580.4

= T_{av} − 580.4

X

RCL 11 .0002923 —

= $(T_1 - 580.4)$.0002923

+

RCL 18 .16760

= gal/#

PRT gal/#

X

RCL 20 $\Sigma \Delta M$

= ~~[illegible]~~ Total gross leakage

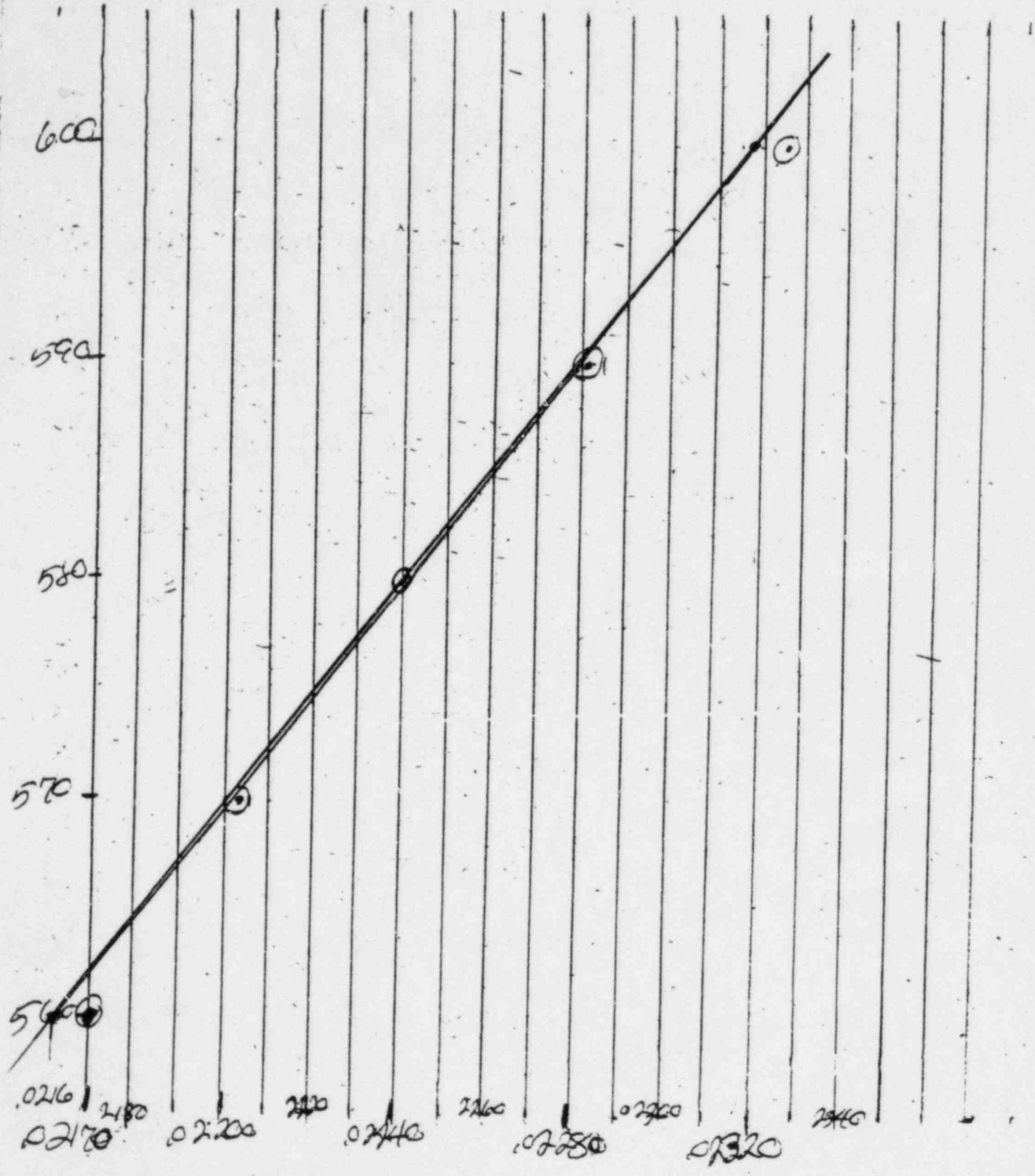
÷

6

0

= GLR gpm

Enter P Start
STO 25
~~R/S Enter T~~
SBR 20 Enter T R/S 4 times
~~R/S~~ Return



600
590
580
570
560
.0216
.02170
.02200
.02240
.02280
.02320

2nd LBL A
R/S enter Date i
STO 00
R/S enter Time
STO 01
R/S enter hi
STO 02
R/S enter OTPi
STO 03
R/S enter ~~[illegible]~~ TTPi
STO 04
~~R/S~~ enter Date i+1
STO 05
R/S enter Time i+1
STO 06
R/S enter hi+1
STO 07
R/S enter OTPi+1
STO 08
R/S enter TTPi+1
STO 09
RCL 00 Date i
PRT Date i
~~[illegible]~~ RCL 05 Date i+1
059 STO 00 Date i

RCL 07		Li+1
—		
RCL 02		Li
=		ΔL
PRT		ΔL
STO 10		ΔL
RCL 08		OTP i+1
71 +		
RCL 04		TTPi
=		Pi
PRT		Pi
STO 11		Pi
RCL 10		ΔL ft
×		
RCL 20		209.45456 gal/ft
=		
+		
RCL 11		Pi
×		
RCL 21		244.3636533
=		
90 STO 12		Gross UID Leakage
RCL 06		Ti+1
÷		
1		
0		
0		

=

2nd Int

STO 13 Int of Ti+1

RCL 06 Ti+1

÷

1

0

0

=

−

RCL 13 Int Ti+1

=

X

1

0

0

+

6

0

X

RCL 13

+

2

4

X

6

0

=

STO 14
RCL 01 Ti
÷
1
0
0
=
2nd Int
STO 13 Int of Ti
RCL 01 Ti
÷
1
0
0
−
RCL 13
=
X
1
0
0
+
60
X
RCL 13
=
+/-

+
RCL 14 Ti+1 min
= ΔTi
1/x
X
RCL 12 GUL
=
PRT GUL GPM
RCL 06 Ti+1
STO 01 Ti
RCL 07 Li+1
STO 02 Li
RCL 08 OTPi+1
STO 03 OTPi
RCL 09 TTPi+1
STO 04 TTPi
~~2ND ADV~~
2nd ADV
GTO B

Nominal Value of Parameter N/A	Parameter	Symbol N/A	Repeatability % of Range	Range N/A	Instrument Variation	Actual Variation during measurement	No of measurements	Variation in Average	Partial Equation	Partial Effect Δ gallons	Partial Effect Δ gpm	Partial Effect from Calculator Program Hallelujah [illegible]	
580	Hot leg A temp 1	THA 1	±.2	520 - 620°F	±.2°F	±.2°F	3	±.163	PRT = (PTH(.0776 #/°F)(7.4805 gal/ft³)N) / ((4) 46.4 #/ft³ (60 min/Hr))	5.27	.0879	.0883	T
(avg of all)	Hot leg B temp 1	THB 1	±.2	520 - 620	±.2°F	±.2°F	3	±.163		"	"	(.09)	T
	Cold leg A temp 1	TCA 1	±.2	520 - 620	±.2°F	±.2°F	3	±.163		"	"		T
T1A	Cold leg B temp 1	TCB 1	±.2	520 - 620	±.2°F	±.2°F	3	±.163	PRT =	"	"		T
580	Hot leg A temp 2	THA 2	±.2	520 - 620	±.2°F	±.2°F	3	±.163	(10346 ft³)(.0776 #/°F ft³)(7.4805 gal/ft³)	"	"		T
(avg of all)	Hot leg B temp 2	THB 2	±.2	520 - 620	±.2°F	±.2°F	3	±.163	(464 #/ft³)(60 min/hr)	"	"		T
	Cold leg A temp 2	TCA 1	±.2	520 - 620	±.2°F	±.2°F	3	±.163	PRT = (PTH(10346 ft³)(.0776 #/°F ft³)(N [illegible])) / ((4) 60 min/Hr)	"	"		T
T2A	Cold leg B temp 2	TCB 1	±.2	520 - 620	±.2°F	±.2°F	3	±.163		"	"		T
2155	RCS Pressure 1	P1	±.2	1700 - 2500	±2 PSI (1.6)	±20 PSI	1	±20	RP = (10346 ft³)(.00 #/ft³ psi)(.1612 gal/#)(PTH psi/Hr)	12.9024	.2150	.2146	N
2155	RCS Pressure 2	P2	±.2	1700 - 2500	±2 PSI (1.6)	±20 PSI	1	±20	(800 ft³)(.00793 #/ft³ psi)(.1612 gal/#)(P [illegible])	33.3333 / 20.4531	.3339 / .3409	(.05)	N
200	PzR Level 1	Lz1	±.2	0 - 400	±1 (.8)	±2.5"	3	±1.55	PRL2 = (PTH(3.208 ft³/in)(37.69 #/ft³)(0.1612 gal/#)) / (60 min/Hr)	30.210	.5035	.5044	T
200	PzR Level 2	Lz2	±.2	0 - 400	±1" (.8)	±2.5"	3	±1.55		"	"	(.42) [illegible]	T
70	MUT Level 1	LM1	±1	0 - 100	±1" (1)	±1.5"	3	±1.04	PR = (PTH(1.57 #/in)(7.4805 gal/ft³)) / ((46.4 #/ft³)(60 Min/Hr))	43.0855	.7181	.7182	T
70	MUT Level 2	LM2	±1	0 - 100	±1" (1)	±1.5"	3	±1.04		"	"	(.72)	T
77	RCDT Level 1	LD1	±1	0 - 92	±1" (1)	0	3	±0.58	PRD = (PTH(62.31 #/ft³)(1.333 gal/in)) / ((46.4 #/ft³) 60 min/Hr)	57.1175	.9520	.9594	T
77	RCDT Level 2	LD2	±1	0 - 92	±1" (1)	0	3	±0.58		"	"	(.96)	T
SKIP 0.	Operator Change	Mo	—	No Limit	±1 gal	±5 gal	1	±5	Ro = (P [illegible](8.3454 #/gal)(.1612 gal/#)) / (60 min/Hr)	6.7264	.1121	.1121	T
												(.11)	
									R|15 >	112.8	1.8756	1.8837	
											1.88	1.88	

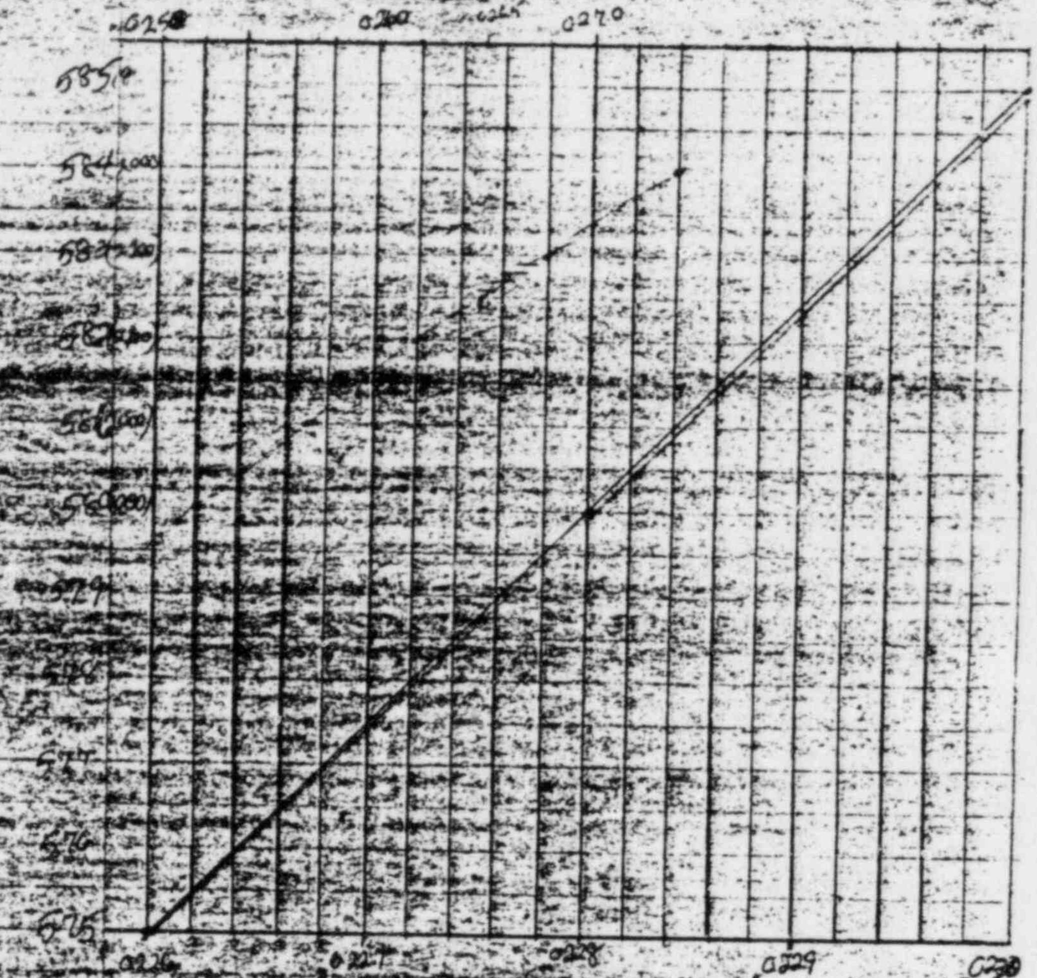


Table 1 (44.5478 − 43.4782) 1/10°F = .09695 2674 #/°F
Table 2 44.228
= .078773
= .0775 #/ft³/°F

Level ER = MΔT + MΔPZR + MΔHUT

= [(T₁ − T₂) .0775 #/ft³/°F (10,678) ft³

+ (L₁ − L₂) 3208 ft³/in × 37.70739 #/ft³

+ (L_HT1 − L_HT2) 255 #/in] 1/62.42197 × 7.48805

Date	Unidentified Leakage	Date	Unidentified Leakage		Date	Unidentified Leakage
~~1/4/80~~	~~0.85~~	2/16	0.05		3/11	0.55
5	0.48	17	0.08		12	0.43
6	0.48	18	0.12		13	0.43
7	0.74	19	0.25		14	0.48
8	1.13 (1.12)	20	0.36		15	0.67
9	1.40	21	0.50		16	0.85
10	1.72	22	0.57		17	0.91
11	2.03	23	0.62		18	1.11
1/12	~~2.15~~ 2.27	24	0.70		19	1.20
2/2		25	~~0.73~~	0.70	20	1.33
3		26	~~0.76~~	0.75	21	1.45
4		27	~~0.84~~	0.75	22	1.53
5		28	~~0.88~~	0.75	23	1.56
6		3/1	~~0.93~~	0.77	24	1.56
7		2	~~0.99~~	0.77	25	1.55
8		3	1.04	0.78	26	1.54
9		4	1.10	0.79	~~27~~	
10		5		0.85	~~28~~	
11		6	0.95	~~0.90~~		
12		7	1.04	~~0.93~~		
13	0.0	8	1.10	~~0.97~~		
14	0.0	9		0.99		
15	0.0	10		0.78		

WET A' Write Data Entry Routine 16-63 14-23

Store Date Time (T_1 T_2) (P_1 P_2) L_{Z1}, L_{Z2} L_{H1} L_{H2} L_{D1} L_{D2} etc

ET C' Table ΔT_z routine 171-201 3-13

~~T in ... ΔT_z out~~

ET D' Table P-T routine 202-230 25-29

P stored in 25 T out

WET B' Write v_{cE} routine 453 steps 8 ... 65-108

T_z in P_z stored in 37, V_{cE} out

WET B Write ΔM_T routine 265-295 2 mem

Uses stored Data ΔM_T out

WET C Write ΔM_z routine 320-368 2 mem

Uses stored Data ΔM_z out

WET D Write ΔM_H routine (V_{cE}(L_1-L_2) Const 370-384

Uses stored input Data, ΔM_H out

WET E Write ΔM_D routine (V_{cE}(L_1-L_2) Const

Uses stored input Data, ΔD Leak rate out 385-406

WET A-Write Main routine 410-

Entered by Pressing A. Enter Data Per A'

PR int IC data entries	10
v_{z1}, v_{z2} v_1 v_2	2
ΔM_T ΔM_z ΔM_H ΔM_D	4

WET CE' Write $L_{zi\,in}$ → $V_{zi\,out}$ 300-319

WET E' L_D Level → V_D routine 31 steps 6 Min

L_{D1} in V_D out 233-262

11 12 13 14 15 16 17 18 19 20
A B C D E A' B' C' D' E'

A' 1-63 -
B' 65-108
C' 111-201
D' 202-230
E' 233-262
B 265-295
C 300-368 (SBRCE 300-319)
D 370-384
E 385-406
A 410-459

Date Time
Data - T_1 T_2 P_1 P_2 L_{Z1} L_{Z2} L_{H1} L_{H2} L_{D1} L_{D2}
OC cyl
Vch
V
P → T
L_D - V_D
ΔM_T
ΔM_Z
ΔM_H
ΔM_D
Main

Prints
space → All data ~~##~~
Date, Time 11 parameters
sp →
Masses
sp
Mass Total
sp.
OLR
ILR
ULR

2nd LBL A
SR B_n A'_B   Enter Data Printed

~~2nd LBL A~~
SBR B ΔM_T Printed
STO 52 ΔM_T
SBR C ΔM_Z Printed
SUM 52 $\Delta M_T + \Delta M_Z$
SBR D ΔM_M Printed
SUM 52 $\Delta M_T + \Delta M_Z + \Delta M_M$
RCL 24   OCC   Water entered by operator
X
8
.
3
3
=
~~PRT~~ ΔM_0
    ΔM_0
SUM 52 $\Sigma \Delta M_{RCS}$
~~[struck]~~ RCL 52 $\Sigma \Delta M_{RCS}$
~~PRT~~ ADV
PRT $\Sigma \Delta M_{RCS}$
X RCL 51   G.L.R.   conversion to GPM .00268644
=
~~[struck]~~ STO 53   G.L.R.
PRT   G.L.R.
SBR E   I.L.R.   Printed
+/-
~~[struck]~~ +
RCL 53

$\left(\frac{1}{46.4 lb/ft^3}\right)(7.48 \text{ gal}...)$
$6C$

1040 [illegible] LRM

Data entry

(1)

2 Lable A'
3-4 Advance Twice
5 Enter Date
6 Print
7 advance
47 Enter
Print
and STO
~~48 Advance~~
49 WV SBR

T12	P12	L12	LH12	LD12
14-15	16-17	1819	2021	22-23

=   U.L.R.

PRT

~~ADV~~

ADV

GTOA

(2)

```
[illegible] RCL [illegible] 16      Pi
in  STO 37                          Pi in SBRC'   [illegible]
    RCL [illegible]                 Ti
    SBR B'
                                    43 steps  8 Storage
    2nd LBL B'                      Curve fit to ASME Tables
    [illegible] —
    [illegible] 5 8 0   (C'1)  [illegible]
    =
    STO 32   (C'2)  (Ti - 580)
    X
    RCL 33   (C'3)  (3.4 x 10^-5)
    =
    STO 34   (C'4)  (3.4x10^-5)(Ti - 580), Σ v_f terms
    RCL 32   (C'2)  (Ti - 580)
    x^2
    X
    RCL 35   (C'5)  (2.06 x 10^-7)
    =               (T - 580)^2 (2.06 x 10^-7)
    SUM 34          (Σ v_f Terms)
    RCL 36   (C'6)  (.02240)
    SUM 34          Σ v_f Terms
    RCL 37   (C'7)  Internal Pi
    —
    RCL 30   (C'8)  2100
    =               (Pi - 2100)
    X
    RCL 31   (C'9)  (5 x 10^-7)
    =
    SUM 34   (C'4)  Σ v_f Terms
    RCL 34
    INV SBR  1/x
    INV SBR
```

I-

For error analysis
PZR fluctuating 60-80 PSI

Mike Benson

Pcorr = .00005 ~~[crossed out]~~

Press corr = $-\dfrac{.00005}{100}(P-2100) = -5\times10^{-7}(P-2100)$

$.02240 + (T-580)\dfrac{.00256}{40.} + (T-580)^2\, 2.25\times10^{-7}$ (3.9×10^{-5})

$\sigma_f = .02240 + 3.9\times10^{-5}(T-580) + 2.00\times10^{-7}(T-580)^2$
$(-5\times10^{-7})(P-2100)$

.02317
.02161
.00156 / 40

$(T-580)^2 f = .00009$

$f = \dfrac{.00008}{400} = \dfrac{8}{4}\times10^{-7} = 2.00\times10^{-7}$

39
4 | 1.56
12
36
36

128
64

.256

2.25
4.9
.8
16

2×10^{-7}

600 .02377
.02326
.00051

590 .0230625
.02281
.0002525

.02203
.0217825
570 .0002475

.02170
.02121
49

	2000	2100	2200
600	.02332	.02326 .02320	.02320
590	.02286	.02281 .25 .02281	.02275
580	.02245	.02240 .02240	.02235
570	.02204	.02203 + .25 .02203	.02199
560	.02173	.02170 .02170	.02166

5 Needs Li
2nd LBL 2nd E'

Lo → Vo

(5)

RCL

30 steps
6 memories

34 are Previous Program

~~RCL RTS enter~~

5 —
7 RCL 38 77
8 = (Li? − 77)
10 STO 39 (Li − 77)
11 X
13 RCL 40 73.33333
14 = (Li − 77)(73.33333)
16 STO 41 " Σ terms
18 RCL 39 (Li − 77)
19 x^2
20 X
22 RCL 42 (−.1)
23 = $-(Li - 77)^2$
25 SUM 41 Σ terms
27 RCL 43 6485
29 SUM 41 (Li − 77) 73.33333 + (Li − 77)(−.1)
RCL 41 + 6485
30 INV SBR

35 steps 2

(7)

(Vierman)

$$\Delta M_T = 10678(\rho_1 - \rho_2)$$

1, 2 2nd LBL B
3, 4 RCL 17 (ρ_2)
5, 6 STO 37 (C'7)
7, 8 RCL 15 (T_2)
9, 10, 11 SBR 2nd B' (ρ_2)
12, 13 STO 44 (B_1) ρ_2
14, 15 RCL 16 (ρ_1)
16, 17 STO 37 (C'7)
18, 19 RCL 14 (T_1)
20, 21, 22 SBR 2nd B' (ρ_1)
23 −
24, 25 RCL 44 B_1 ρ_2
26 = $\rho_1 - \rho_2$
27 X
28, 29 RCL 45 = B_2 10678
30 = $\Delta M_{RCS} = \Delta M_T$
31, 32 ~~STO [illegible]~~
33, 34 PRT
35 INV SBR

— ΔM_z Lable C 300

$\Delta M_z = V_1 z \rho_{z_1} - V_2 z \rho_{z_2}$

$V_{z_i} = 800 + (L_i - 200)\, 3.208$ (SBR CE

$\rho_{z_i} = = 1/v_{s_{z_i}}$

2nd LBL C

RCL 19	L_{z_2}	clc V_{z_2}
SBR CE	V_{z_2}	STO
STO 46	V_{z_2}	clc ρ_{z_2}
RCL 17	P_2	X
STO 25	Internal P_i	V_{z_2}
SBR 2nd D'	T_{z_2}	STO
SBR 2nd C'	$v_{s_{z_2}}$	
1/x	ρ_{z_2}	
X		
RCL 46	V_{z_2}	
=	$V_{z_2} \rho_{z_2}$	
STO 47	$V_{z_2} \rho_{z_2} = M_{z_2}$	
RCL 18	L_{z_1}	
SBR CE	V_{z_1}	
STO 46	V_{z_1}	
RCL 16	P_1	
STO 25		
SBR 2nd D'	T_{z_1}	
SBR 2nd C'	$v_{s_{z_1}}$	
1/x	ρ_{z_1}	
X		
RCL 46	V_{z_1}	
=	$V_{z_1} \rho_{z_1} = M_{z_1}$	

~~tth~~

RCL 47 — $M_{2,2}$

= — $\Delta M_{\dot{z}}$

PRT

IHV SBR

8a

Lzi → V_{zi}

2nd LBL CE

—

2

0

0

= X

3

.

2

0

8

+

8

0

0

=

1/x

INV SBR

$\Delta M_m = (L_{M_1} - L_{M_2})\, 255$

2nd LBL D	
RCL 20	L_{M_1}
−	
RCL 21	L_{M_2}
=	$L_{M_1} - L_{M_2}$
X	
RCL ~~[illegible]~~ 48	255 #/in
=	ΔM_m
PRT	
INV SBR	

(13)

* see p 5.2-22 of SAR

∅ I.D. leak rate ILR

~~I.D.L.R.~~ $ILR = (V_2 - V_1)_{gal}\ {}^{62.31}lb / 46.4^{*} / 60$

$ILR = (V_2 - V_1)\frac{62.31}{46.4/60} = 1.342886/60$

2nd LBL E
RCL 22 L_{D1}
SB R 2nd E' V_{D1}
STO 50
RCL 23 L_{D2}
SBR 2nd E' V_{D2}
−
RCL 50 V_{D1}
= ΔV_{gal}
X
RCL 49 $62.31 / 46.4/60 = 1.342886/60 = .022381$
=
PRT
INV SBR

$V_i = 6485 + (L_i - 77)73.333 - (L_i - 77)^2(1)$

$\frac{Q_{Ro}}{Q_{LD}}$ $(V_2 - V_1)$ ft³/hr 62.31 #/ft³ .1612 gal/#

at min/hr

$Q_{Ro} = dV$ ft³/hr $(62.3$ #/ft³$) = dV\, \rho_D\, [6485 + (L_{D2} - 77)73.333 - (L_{D2} - 77)^2(1) - 6485 - (L_{D1} - 77)73.333 + (L_{D1} - 77)^2(1)]$ — small compared to other term assume 0

293

at [illegible]

$= \rho_D (L_{D2} - L_{D1}) 73.333 = Q_{LD}$ in/hr 62.31 #/ft³ 73.333 ft³/in

$Q_{Ro} = Q_{LD}^{in} (62.31$ #/ft³$)(73.333$ ft³/in$)(.1612$ gal/#$)$ / 60 min/hr

$Q_{Ro} = dG\ 8.3454$ $\quad Q_{Ro} = Q_{B}$ gal $(8.3454$ #/gal$)(.1612$ gal/#$)$ / 60 min/hr

[illegible]

$$\frac{\rho_{R}}{\rho_{Lr}} = \frac{(257 \#/Hr)(7.4805 \, gal/ft^3)}{(46.4 \#/ft^3)(60 \, Min/Hr)}$$

254.4950
8 40

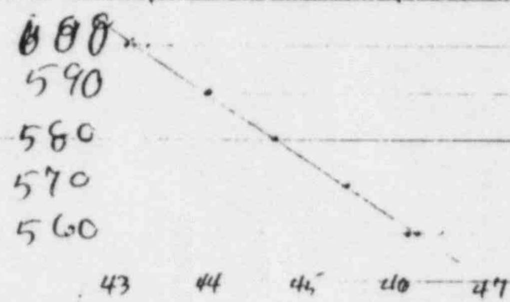
$5V_{sat}$

$$\frac{R}{P_T} = 10346 \, \Delta P = 10346\left(\frac{1}{V_{Ch_L}} - \frac{1}{V_{Ch_i}}\right)$$

$$\Delta R_T = \frac{1}{.02240 + (T_L - 580)3.9\times10^{-5} + (T_L - 580)^2 2\times10^{-7}} \quad \frac{1}{.02240 + (T_L - 580)3.9\times10^{-5} + (T_L - 580)^2 2\times10^{-7}}$$

75
30

	2100	2150	2200		
600	42.992	43.048	43.103	.111	56
590	43.840	43.898	43.956	.116	58
580	44.643	44.693	44.743	.100	60
570	45.393	45.434	45.475	.82	41
560	46.083	46.126	46.168	.85	43



43.15

46.25

$$\frac{3.10}{40} = .0776 \#/ft^3$$

44.642857
44.565265
.077592

$$R K_T = \frac{R T_{Lhr} \, .0776 \#/ft^3 \; 7.4805 \, gal/ft^3}{(46.4 \#/ft^3)(60 \, Min/Hr) \, 4}$$

(2)

Computer errors:
By order of significance

1. Failure to convert RCDT (also 7 each side) Volume change to Reactor Temperature Conditions

2. Failure to convert water additions to MUT to reactor temperature conditions

3. Truncation of Primary average temperature above 582°F to 582°F.

4. Failure to account for variations in Pressurizer pressure.

5. Incorrect primary system volume

6. Incorrect ~~value for~~ density of Primary water used ~~for~~ used in definition of gallon.

7. Incorrect dM/dp used for MUT mass change

8 Reactor Coolant Drain Tank Level

My Program ~~Their Program~~

Unidentified Leakage = Gross Leakage − Identified Leakage

Gross LR = $\Delta M_T + \Delta M_{PZR} + \Delta M_{HOT}$

$V_{Di} = .0454(L_i - 77) + 3.1113 - (L_i - 77)$ ...

Identified Leakage = $(V_2 - V_1)\,\rho_D / 46.4 / 60$ $= (V_{D2} - V_{D1})\,\dfrac{62.31}{(40.4)(60)}$

$\Delta M_T = 10346(\rho_1 - \rho_2) =$ $\rho_i = \dfrac{1}{V_{CLi}}$ compressed liquid

$\Delta M_{PZR} = V_1\rho_1 - V_2\rho_2 = \{[800 + (L_1 - 200)3.208]\rho_{Z1}\} - \{[800 + (L_2 - 200)3.208]\rho_{Z2}\}$

$\rho_{Zi} = \dfrac{1}{V_{3i}}$

~~$V_{3i} = 3.1975 + (-0.3151548(374.11 - t)^{1/3} + (-1.203374)$ ...~~

$\Delta M_{HOT} = 257(L_{M1} - L_{M2})$

~~CLARA~~

ULR = GLR − ILR

$$V_{3i} = \frac{3.1975 - 0.3151548(374.11 - t_{Zi})^{1/3} - 1.203374 \times 10^{-3}(374.11 - t_{Zi}) + 7.48908 \times 10^{-13}(374.11 - t_{Zi})^4}{1 + 0.1342489(374.11 - t_{Zi})^{1/3} - 3.946263 \times 10^{-3}(374.11 - t_{Zi})} \, (K)$$

conversion to english units: $K = .01602$

$$t = \left\{\left[649.46 - (2200 - P_i)(.0655) - (2200 - P_i)^2\, 1.5 \times 10^{-5}\right] - 32\right\}\frac{5}{9}$$

$$V_{CLi} = .02240 + (T_i - 580)(3.9 \times 10^{-5}) + (T_i - 580)^2(2 \times 10^{-7}) - (P_i - 2100)(5 \times 10^{-7})$$

$dM_z = V_{z1}\rho_{z1} - V_{z2}\rho_{z2} = (800 + (L_1 - 200)3.208)\rho_{z1} - (800 + (L_2 - 200)3.208)\rho_{z2}$

assume ρ_{z2} const since ρ is handled separately.

$dM_z = ~~800\rho_z~~ + L_1(3.208)\rho_z ~~-(200)3.208\rho_z~~ - ~~800\rho_z~~ - L_2\,3.208\,\rho_z ~~+(200)3.208\,\rho_z~~$

$= (L_{z1} - L_{z2})\,3.208\,\rho_z = \rho_{Lz1}\ 3.208\,ft^3/in\ (\rho_z\ at\ 2155\ psi) = \rho_{Lz}\ in/Hr\ (3.208\,ft^3/in)\,37.69\,\#/ft^3$

$dR_z = \dfrac{dM\,\#/Hr}{46.4\,\#/ft^3}\ \dfrac{7.4805\,gal/ft^3}{60\,min/Hr} = \dfrac{\rho_{Lz}(3.208\,ft^3/in)(37.69\,\#/ft^3)(.1612\,gal/\#)}{(60\,min/Hr)}$

$\dfrac{\rho_R}{\rho_P} = \left(\dfrac{\rho M_z}{\rho P} + \dfrac{\rho M_T}{\rho P}\right)\dfrac{.1612\,gal/\#}{60\,min/Hr}$

$\rho(2100)(580°F) = 44.643\,\#/ft^3$
$\rho(2200)(580°F) = 44.743$
$.1\#/100\,psi$
$.001\,\#/psi$

$\dfrac{\rho M_T}{\rho P} =$

$= \dfrac{1}{V_{CL_1}} - \dfrac{1}{V_{CL_2}}$

$\rho_R = (10346\,ft^3)(.001\,\#/ft^3\,psi)\,\rho_P\,(.1612\,gal/\#)/60\,\frac{min}{Hr}$

$+ (800\,ft^3)(.00793\,\#/ft^3\,psi)\,\rho_P\,(0.1612\,gal/\#)/60\,\frac{min}{Hr}$. $\rho_R = \rho_P\left[(10346\,ft^3)(.001\,\#/ft^3\,psi) + (800\,ft^3)(.00\#)\right]$

$\rho_R = \rho_P\,\frac{psi}{Hr}\left[(10346\,ft^3)(.001\,\#/ft^3\,psi) + (800\,ft^3)(.00793\,\#/ft^3\,psi)\right]0.1612\,gal/\#\,/\,60\,\frac{min}{Hr}$

$dM_z = V_{z1}\rho_{z1} - V_{z2}\rho_{z2} = (800 + (L_1 - 200)3.208)\rho_{z1} - (800 + (L_2 - 200)3.208)\rho_{z2} = 800\,d\rho_z$ (assume $L_1 - 200 = 0$, assume $L_2 - 200 = 0$)

$\rho_{2100} = 38.189$
$\rho_{2200} = 37.396$

$\dfrac{d\rho_z}{dP} = \dfrac{.793\,\#/ft^3}{100}\,psi$

K-14

Brief Notes on discussion with B. Smith

Interview with Bernie Smith.

Hartman CRO Smith's shift K-14

Inventory Test

Have checked all files have never exceeded 1 gpm every three days.

looking 1 gpm 80K dep.

parameters changing

if came out > 1 gpm

would re run.

yes did crumple up computer results

Tim: could attention to 4.0.3

Interprets that you have 72 hours to find find acceptable leak rate

Temp c

Press c change in turbine

1 change worth 100 gal water

could get 45 gal leak rate

guy could make up wasn't real.

Adding H_2 normal evolution would change

Compresses water in MUT.

In order to lo. RCDT level falsification must ~~add~~ manually input RCDT level

Bernie

Hartman always felt he was under pressure