PNC TJ8222 97-002

３次元拡散計算コード「ＭＯＳＥＳ」の詳細メッシュ（Ｔｒｉ－Ｚ）計算機能の整備

報　告　書

平成９年３月

技術管理室
No.
9.9.19
動燃事業団 情報センター

株式会社　三菱総合研究所

複製又はこの資料の入手については，下記にお問い合わせ下さい。
〒319－11　茨城県那珂郡東海村大字村松４－３３
動力炉・核燃料開発事業団
東海事業所　技術開発推進部・技術管理室

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動力炉・核燃料開発事業団 (Power Reactor and Nuclear Fuel Development Corporation)

PNC TJ8222 97-002
１９９７年３月

３次元拡散計算コード「ＭＯＳＥＳ」の詳細メッシュ(Tri-Z)計算機能の整備

角田　弘和*
薮田　尚宏*
畠山　弘美*

要　旨

ＭＯＳＥＳコードの詳細計算機能(TriZ)をＵＮＩＸ計算機上で動かせるように整備した。併せて、これまでのソースプログラムを見直していくつかの不具合を解消した。

３次元詳細メッシュ(TriZ)ソルバーのメモリおよび外部ファイル制御部は、もともと大型計算機のハードウェア環境を前提としてプログラミングされているため、そのままではＵＮＩＸ計算機で動作しなかった。そこで、DOPC、REED/RITEのようなＩ／Ｏ制御部をＵＮＩＸ用に書き換えて計算が可能となるように整備した。また、これまでのプリント出力形式を改訂した。

この書き換えたＭＯＳＥＳコードはＳＵＮワークステーション以外の計算機環境でも計算が可能である。また、システム依存のタイマー、日付等の設定ルーチンについては、主要な計算機に合わせて変更できるように情報をまとめた。

典型的な大型炉を対象とした燃焼計算問題を取り上げて検証解析を行った。１／３体系の問題に対しては、粗メッシュ、修正粗メッシュおよび詳細メッシュ解法の３種の結果を比較し、概ね一致する結果が得られた。これにより、詳細メッシュ計算部が正しく機能していることを確認した。また、今後の利用に際しての参考のため、詳細メッシュ計算部は設定メモリ長に依存して計算時間が変動する例を示した。

本報告書は、（株）三菱総合研究所が動力炉・核燃料開発事業団との契約により実施した業務の成果である。
契　約　番　号：08C0048
事業団担当部室：東海事業所　技術開発推進部　炉心・燃料設計室
＊　株式会社　三菱総合研究所　総合安全研究センター

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1．はじめに

1．1　目的

現在、高速炉の炉心核設計解析のツールとしてＭＯＳＥＳコードを主に使用している。当コードは、３次元体系を扱い、粗メッシュ、修正粗メッシュおよび詳細メッシュ（Tri-Z）解法を備えている。最近では計算精度を高めるために詳細メッシュ解法の使用頻度が高まっているが、これに伴って一連の計算結果を得るための計算時間が増大し、解析業務効率が低下しつつある。当コードはもともと大型汎用計算機用に整備したものであり、最近のワークステーションなどのＵＮＩＸ系計算機には適合しない部分がある。ワークステーションでは、計算機内で実行待ちとなる確率が小さいため、計算に要する時間短縮を期待できる。従って、解析業務の効率化のためにはＭＯＳＥＳコードをワークステーションや他のＵＮＩＸ系計算機上でも実行できるように整備することが有効である。

そこで、ＭＯＳＥＳコードをワークステーション、ＣＲＡＹ等のＵＮＩＸ系プラットフォーム上で実行できるように整備し、解析効率の向上を図る。

1．2　範囲

以下の項目を実施した。

（1）３次元詳細メッシュ解法の改修

（2）マルチプラットフォームへの対応

（3）テスト計算

1．3　作業概要

（1）３次元詳細メッシュ解法の改修

詳細メッシュ解法（TriZ）では、粗メッシュおよび修正粗メッシュ解法に比べて最低でも６倍以上のメッシュ数を扱う。このような大量のデータを扱えるように、ＭＯＳＥＳコードの詳細メッシュ解法部は外部ファイルやメモリーを複雑に制御しながら計算を実行するソルバーを採用している。しかし、ソルバーのメモリおよび外部ファイル制御部は、もともと大型計算機のハードウェア環境を前提としてプログラミングされているため、そのままではＵＮＩＸ計算機で動作しない。そこで、ソルバーの主要な部分には手を加えず、制御部を書き換えてＵＮＩＸ環境でも詳細メッシュ計算が可能となるように整備した。

また、今回の改訂を機に印刷出力に係わる改訂を行った。

（２） マルチプラットフォームへの対応

上記（１）は、ＳＵＮワークステーションを対象として整備するが、他に事業団が有しているＣＲＡＹおよびＶＰＰ計算機でも計算が可能となるよう整備した。なお、ＶＰＰ等大型汎用機用には、今回改訂した部分を包含したソースプログラムを用意した。

（３） テスト計算

上記（１）および（２）の整備が正しく行われていることを確認するために、典型的な燃焼計算問題を取り上げて検証解析を行った。

なお、本報告書の付録にはＭＯＳＥＳコードのＩ／Ｏ関連改訂部、テスト計算結果およびプログラム情報を添付した。

2.　3次元詳細メッシュ解法の改修

詳細メッシュ解法（TriZ）のＩ／Ｏ関連制御部を書き換えて、これまで不可能であったＵＮＩＸ環境でも詳細メッシュ計算が可能となるように整備した。

2．1　詳細メッシュ計算部のＩ／Ｏ

詳細メッシュ（TriZ）計算部は、取り扱う問題のサイズや計算を実行する計算機システムのメモリーサイズに係わらず計算を可能とするように、反復計算で使用するデータをメモリー上やダイレクトアクセス（ＤＡ）ファイル上に蓄えて使用している。

TriZ 計算部で用意しているＤＡファイルは次の５つがある。ただし、問題のサイズ（メッシュ数、バルクメモリの空き領域の大きさなど）によっては必ずしも全てを使用するわけではない。

- ICNSTS (91)：方程式の結合係数
- IFLUX　(92)：中性子束
- ITCH1　(95)：中性子束ワーク
- ITCH2　(96)：中性子束ワーク
- ITCH6　(98)：方程式の係数

ここで、（）内はＭＯＳＥＳで使用している機番である。
各ファイルのレコード構成を以下に示す。

ファイル	機番	レコード長	レコード数
ICNSTS	91	[3+W(1+2H)](J+1) + RJ	ILK
IFLUX	92	WJI	LK
ITCH1	95	WJI	LK
ITCH2	96	WJI	LK
ITCH6	98	(R+W)JI+(2+H)JI+(1+H)(J+L)+H	LK
			(Plane Stored Mode)
		(3+W+H)JIL+(1+H)(J+I)L+JI+HL	K
			(Mesh Stored Mode)
		{[3+W(1+2H)](J+I)+RJ}I	LK
			(MultilevelData Transfer Mode)

ここで、

J ： Row 内のメッシュ数
I ： Plane 中の Row 数
L ： Plane 数
K ： 群数
W ： 倍精度係数（=2）
R ： 対象次元（=4: 3 次元）
H ： 形状（=0: 6 角以外）
M ： ゾーン数

である。９８番のファイルは、空きメモリ領域の大きさに応じて３つのモードの中からコードが自動的に選定する。

さらに、空きメモリが十分にある場合には、外部ファイルではなく空きメモリ上にあたかもファイルがあるかのようにメモリ間のデータ授受を行う。当然ながらこの場合はＩ／Ｏに要する計算時間は短くて済み、エラップス時間が短くてすむ。この例は４章に示す。

２．２　ＵＮＩＸ環境における不具合

ＵＮＩＸ環境の例としてＳＵＮワークステーション（ＳＳ２０、SUN－ＯＳ、Ｆ７７）でコンパイル・リンクを行い、実行した。その結果、メモリーアクセスが異常となり計算ができなかった。これは、詳細メッシュ計算でのみ生じるため、上記のソルバー部の制御に問題があると推定された。ソースレベルで検討したところ、Ｉ／Ｏ制御のための配列設定に非標準の設定が行われていることが判明した。

２．３　改修内容

（１）Ｉ／Ｏ制御部

ソルバーのメモリおよび外部ファイル制御部は、もともとＩＢＭ系大型汎用計算機のハードウェア環境を前提としてプログラミングされているため、そのままではＵＮＩＸ計算機で動作しない。そこで、制御部のみを書き換えてＵＮＩＸ環境でも詳細メッシュ計算が可能となるように整備する方針をとった。

具体的には以下のルーチンを中心にワークステーションや他のＵＮＩＸ系計算機で作動するように改修した。

・DPOC　　：外部ファイル等の初期化
・REED/RITE ：外部ファイル（ＳＡ／ＤＡ）およびメモリー領域へのＩ／Ｏ
・DASU　　：ＤＡファイルのセットアップ
・その他のＩ／Ｏ関連部

各ルーチンの改修内容の概要を表２．１から表２．３に示す。これらの改修により、ＭＯＳＥＳコードは正しく作動するようになった。

（２）その他の改修

上記詳細メッシュ計算に係わる部分のほか、これを機に印刷出力部の改訂を行った。主な変更点とその例を示す。

①断面積（図２．１）

断面積のタイプを含め出力データを整理した。

②集合体グループ関連（図２．２）

フォームを整理し見やすくした。

③装荷燃料（図２．３）

同上。

④収束計算（図２．４）

同上。grep 用に@@を追加した。

⑤中性子束（図２．５）

フォームを整理し見やすくした。

⑥出力分布（図２．６）

同上。

⑦燃料インベントリ（図２．７）

同上。

⑧取り出し燃料関連（図２．８）

同上。

表2．1　REED／RITE改修内容

RITE／ROXX／REED
機能 1)RITE はファイル出力（SA、DA形式）および別メモリー領域へのデータ書き出しを行う。 2)REED は RITE のエントリー名で、ファイル入力（SA、DA形式）および別メモリー領域からのデータ読み込みを行う。 3)ROXX は IBM 系計算機においてI／Oする配列の先頭アドレスをセットする機能があった。今回はその機能がUNIX系計算機で使えないので変更した。
変更箇所とその理由 1)COMMON 変更 ・comdop.inc のインクルード ・メモリー間データ移動のために/pnc/をセットし、移動前後のアドレスを明示して使用。 2)ROXX 引数削除 3)メモリー間データ転送部の変更 4)DA形式I／Oにおける配列位置およびレコード制御の追加

表2．2　ＤＯＰＣ改修内容

ＤＯＰＣ／ＲＯＸＹ
機能 1)DOPC はファイルＩ／Ｏ（ＳＡ、ＤＡ形式）および別メモリー領域への移動の初期化を行う。 2)ROXY は IBM 系計算機においてＩ／Ｏする配列の先頭アドレスをセットする機能があった。今回はその機能がＵＮＩＸ系計算機で使えないので変更した。
変更箇所とその理由 1)COMMON 変更 ・comdop.inc のインクルード 2)ROXY 引数削除 3)ＤＡファイルについては実際のＩ／Ｏを行うためのレコード長でOPEN。 4)ＤＡ形式Ｉ／Ｏにおけるレコード長を保存。

表2．3　ＤＡＳＵ改修内容

ＤＡＳＵ
機能 1)ＤＡファイルの設定。
変更箇所とその理由 1)COMMON 変更 ・comdop.inc のインクルード 2)物理レコードの最大値を 130KB に設定。 3)ROXX、ROXY の代わりに空きメモリ領域の先頭アドレスを設定。

```
fbrco 1st cycle boc calculation (1-3rd core model) 96/10/17                    Mon Apr  7 09:26:36 1997  page   1
step no.1-1 cell.(cr na-follower)                                                          cpu time (sec)     0.0


     cross section file informations
      following cross section set was read

         set=    1   title=IN  CORE           (1)
                  type= -2  nn= 27  ng=  7
         xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
         xs id =  29  30
         set=    2   title=OUT CORE           (2)
                  type= -2  nn= 27  ng=  7
         xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
         xs id =  29  30
         set=    3   title=AX  BLANK(UPPER)   (3)
                  type= -2  nn= 27  ng=  7
         xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
         xs id =  29  30
         set=    4   title=AX  BLANK(LOWER)   (4)
                  type= -2  nn= 27  ng=  7
         xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
         xs id =  29  30
         set=    5   title=NA  FOLLOWER   1   (5)
                  type= -2  nn=  6  ng=  7
         xs id =  21  22  23  24  25  26
         set=    6   title=NA  FOLLOWER   2   (6)
                  type= -2  nn=  6  ng=  7
         xs id =  21  22  23  24  25  26
         set=    7   title=GEM                    (7)
                  type= -2  nn=  6  ng=  7
         xs id =  21  22  23  24  25  26
         set=    8   title=UP-PLENUM(CORE        (8)
                  type= -2  nn=  6  ng=  7
         xs id =  21  22  23  24  25  26
         set=    9   title=LO-PLENUM(CORE        (9)
                  type= -2  nn=  6  ng=  7
         xs id =  21  22  23  24  25  26
         set=   10   title=UP  SHIELD (CORE-B4C)(10)
                  type= -2  nn=  9  ng=  7
         xs id =  17  18  19  21  22  23  24  25  26

   ------ suppressed ----------

at Rload; no.  1 nload=  1 kload=  1 ires=  0 kflg=  0
```

図２．１　断面積関連出力例

fbrco 1st cycle boc calculation (1-3rd core model) 96/10/17
step no.1-1 cell.(cr na-follower)

Mon Apr 7 09:26:53 1997 page 5
cpu time (sec) 14.6

a s s e m b l y g r o u p t a b l e

a s s e m b l y g r o u p t a b l e

no.	n a m e		flag	mix.	edit.	attr.	plot.	name	assem
1	incore	init	1	1	1	1	1	ic1	67
2	oucore	init	1	2	1	2	2	oc1	32
3	gem	na	1	3	1	4	0	gem	22
4	radial	shisus	1	4	1	4	0	rss	108
5	radial	shib4c	1	4	1	4	0	rsh	102
6	course	rod	2	5	1	4	-1	ccr	6
7	fine	rod	2	5	1	4	-1	fcr	2
8	backup	rod	2	5	1	4	-1	bcr	2
	t o t a l								341

mixture group table

no.	n a m e		assem
1	incore	init	67
2	oucore	init	32
3	gem	na	22
4	radial	shib4c	210
5	backup	rod	10
	t o t a l		341

r e g i o n t a b l e

r e g i o n t a b l e

no.	n a m e		x-sect.	mixture	edit.op.	attr.	plot.rgn	atr.name	volume
1	incore	init	1	1	1	1	1	\ic1	1.435906E+06
2	oucore	init	2	2	1	1	1	\oi1	6.926985E+05
3	axbla	upper	3	3	1	2	1	\abu	7.450122E+05
4	axbla	lower	4	3	1	2	1	\abl	7.450119E+05
5	na	foll1	5	4	0	5	0	\nac	6.736494E+05
6	na	foll2	6	4	0	5	0	\nab	3.658314E+05
7	gem	na	7	5	0	5	0	\gem	1.204863E+06
8	upplenumcore		8	6	0	3	0	\upc	4.092332E+05
9	loplenumcore		9	6	0	3	0	\lpc	2.235036E+06
10	upb4c	shield	10	7	0	3	0	\usc	1.426166E+06
11	upgem	shield	11	7	0	3	0	\ugs	3.190743E+05
12	lower	shield	12	7	0	3	0	\lsc	4.818938E+05
13	radial	susshie	13	8	0	5	0	\rsh	9.094266E+06
14	radial	b4cshie	14	8	0	5	0	\rsb	8.589029E+06
15	gem	upplenum	15	5	0	5	0	\gep	2.404963E+05
	t o t a l								2.865817E+07

mixture region table

no.	n a m e		volume
1	incore	init	1.435906E+06
2	oucore	init	6.926985E+05
3	axbla	lower	1.490024E+06
4	na	foll2	1.039481E+06
5	gem	upplenum	1.445359E+06
6	loplenumcore		2.644269E+06
7	lower	shield	2.227134E+06
8	radial	b4cshie	1.768330E+07
	t o t a l		2.865817E+07

図２．２　集合体グループ関連出力例

fbrco 1st cycle boc calculation (1-3rd core model) 96/10/17 Mon Apr 7 09:26:53 1997 page 14
step no.1-1 cell.(cr na-follower) cpu time (sec) 15.1

loading fuels information mixture groups

1. no. name 1. incore init 2. oucore init

2. no. of fuels 67 fuels 32 fuels

3. inventory

	--- c o r e --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)	--- c o r e --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)
1 pu238	14.19	0.27	0.00	0.00	9.94	0.40	0.00	0.00
2 pu239	484.90	9.30	0.00	0.00	339.82	13.60	0.00	0.00
3 pu240	208.65	4.00	0.00	0.00	146.22	5.85	0.00	0.00
4 pu241	76.78	1.47	0.00	0.00	53.81	2.15	0.00	0.00
5 pu242	39.23	0.75	0.00	0.00	27.49	1.10	0.00	0.00
6 u235	13.14	0.25	11.79	0.30	5.74	0.23	5.63	0.30
7 u236	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8 u238	4368.44	83.75	3919.34	99.70	1908.87	76.37	1871.92	99.70
9 am241	10.85	0.21	0.00	0.00	7.60	0.30	0.00	0.00
10 am242m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11 am243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12 np237	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13 cm242	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14 cm243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 cm244	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16 cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
u total	4381.59	84.00	3931.13	100.00	1914.62	76.60	1877.55	100.00
pu total	834.59	16.00	0.00	0.00	584.88	23.40	0.00	0.00
pu fiss.	561.68	10.77	0.00	0.00	393.63	15.75	0.00	0.00
(u + pu)	5216.18	100.00	3931.13	100.00	2499.50	100.00	1877.55	100.00
20 o	693.24	11.73	528.92	11.86	332.03	11.73	252.62	11.86
uo2 total	4964.53	84.01	4460.05	100.00	2169.35	76.61	2130.17	100.00
puo2 total	944.89	15.99	0.00	0.00	662.18	23.39	0.00	0.00
mo2 total	5909.42	100.00	4460.05	100.00	2831.53	100.00	2130.17	100.00
27 u235-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
28 u238-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
29 pu239-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
30 pu241-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
fp total	0.00	-----	0.00	-----	0.00	-----	0.00	-----

図２．３　装荷燃料関連出力例

fbrco 1st cycle boc calculation (1-3rd core model) 96/10/17 Mon Apr 7 09:27:05 1997 page 17
step no.1-1 cell.(cr na-follower) cpu time (sec) 25.7

normal flux calculation

== coarse mesh corrected line relaxation will be done on three dimensional == 4 inner iteration(s)

iteration	flux change	cpu time	delt-k	delt-fu	iep	beta	mu-1	mu-2	mu-3	k-effective	n	k	g
1	1.23390E+00	6.460	3.15932E-01	1.23390E+00	1	1.9837	67.9307	-2.0000	0.0000	0.759918	91	23	3 @
2	5.53449E-01	6.860	2.17633E-01	5.53449E-01	1	1.9679	3.2994	0.0000	-0.0021	0.971306	66	30	3 @
3	-4.17134E-01	6.870	5.01949E-03	4.17134E-01	1	1.9529	68.7978	0.0004	4.2390	0.976206	1	50	7 @
4	-3.23249E-01	6.910	1.64452E-02	3.23249E-01	1	1.9388	76.0085	0.0035	-2.5786	0.960412	1	11	7 @
5	-2.60678E-01	6.910	8.47886E-03	2.60678E-01	1	1.9257	25.7111	0.0013	1.2739	0.952337	1	11	6 @
6	-2.01314E-01	6.870	3.80816E-03	2.01314E-01	1	1.9138	151.1273	0.0018	0.8911	0.955978	1	11	7 @
7	-1.73636E-01	6.890	1.02469E-02	1.73636E-01	1	1.9030	78.5339	0.0262	0.8276	0.965875	111	11	7 @
8	-1.52442E-01	6.890	1.09961E-02	1.52442E-01	1	1.8934	69.4686	0.0043	0.7737	0.976614	111	11	7 @
9	-1.31285E-01	6.900	8.89932E-03	1.31285E-01	1	1.8848	99.4132	0.0065	0.7536	0.985383	111	11	7 @
10	-1.11218E-01	6.890	6.60977E-03	1.11218E-01	1	1.8774	74.8572	0.0072	0.7832	0.991940	111	11	7 @
11	-9.31505E-02	6.840	5.10641E-03	9.31505E-02	1	1.8708	77.8514	0.0069	0.8448	0.997031	111	11	7 @
12	-7.75272E-02	6.890	4.18072E-03	7.75272E-02	1	1.8652	45.1758	0.0298	0.8738	1.001217	111	11	7 @
13	-6.44097E-02	6.880	3.53730E-03	6.44097E-02	1	1.8604	10.1446	0.0368	0.8711	1.004771	111	11	7 @
14	-5.36492E-02	6.910	3.00980E-03	5.36492E-02	1	1.8562	7.6196	0.0675	0.8610	1.007804	111	11	7 @
15	-4.49734E-02	6.900	2.53940E-03	4.49734E-02	1	1.8527	4.6300	0.1598	0.8553	1.010370	111	11	7 @
16	-3.80412E-02	6.850	2.12111E-03	3.80412E-02	1	1.8497	2.4604	0.1274	0.8567	1.012518	111	11	7 @
17	-3.25138E-02	6.920	1.76387E-03	3.25138E-02	1	1.8471	1.6828	0.1343	0.8634	1.014307	111	11	7 @
18	-2.80899E-02	6.910	1.47107E-03	2.80899E-02	1	1.8450	3.8075	0.2811	0.8725	1.015801	111	11	7 @
19	-2.45201E-02	6.840	1.23685E-03	2.45201E-02	1	1.8432	1.5075	0.3050	0.8814	1.017059	111	11	7 @
20	-2.16042E-02	6.890	1.05015E-03	2.16042E-02	1	1.8416	-0.9823	-0.4191	0.8890	1.018128	111	11	7 @
21	-1.91902E-02	6.910	8.99611E-04	1.91902E-02	1	1.8403	0.4891	1.0425	0.8951	1.019045	111	11	7 @
22	-1.71621E-02	6.910	7.76144E-04	1.71621E-02	1	1.8393	0.4339	0.8559	0.9002	1.019837	111	11	7 @
23	-1.54349E-02	6.880	6.73556E-04	1.54349E-02	1	1.8384	0.4800	0.8234	0.9049	1.020524	111	11	7 @
24	-1.39452E-02	6.920	5.87673E-04	1.39452E-02	1	1.8376	0.4001	1.2974	0.9096	1.021124	111	11	7 @
25	-1.26464E-02	6.870	5.15519E-04	1.26464E-02	1	1.8370	0.6450	0.8779	0.9139	1.021651	111	11	7 @
26	-1.15034E-02	6.880	4.54744E-04	1.15034E-02	1	1.8364	0.9512	1.2934	0.9181	1.022116	111	11	7 @
27	-1.04901E-02	6.890	4.03329E-04	1.04901E-02	1	1.7166	0.9489	0.5843	0.9219	1.022528	111	11	7 @
------ suppressed ----------													
159	1.02043E-04	6.720	1.85523E-06	1.02043E-04	0	1.0966	-0.2960	-0.7216	0.9766	1.028061	1	31	7 @
160	9.94205E-05	6.730	1.80015E-06	9.94205E-05	0	1.0828	-0.8067	-1.1785	0.9725	1.028063	1	31	7 @
161	9.59635E-05	6.740	1.74182E-06	9.59635E-05	0	1.0828	-1.3198	-0.6997	0.9612	1.028065	1	31	7 @
162	9.31025E-05	6.730	1.69129E-06	9.31025E-05	0	1.0828	-1.3558	-1.3534	0.9804	1.028067	1	32	7 @
163	9.05991E-05	6.730	1.63573E-06	9.05991E-05	0	1.0828	-1.1556	-0.9968	0.9658	1.028069	1	31	7 @
163	9.05991E-05	1127.500	1.63573E-06	9.05991E-05	0	1.0828	-1.1556	-0.9968	0.9658	1.028069			

end of eigenvalue calculation k-effective 1.028069 iteration cpu time 1101.82 second(s) @@

図2．4　収束計算関連出力例

fbrco 1st cycle boc calculation (1-3rd core model) 96/10/17
step no.1-1 cell.(cr na-follower)

Mon Apr 7 09:45:58 1997 page 21
cpu time (sec) 1138.3

mixture region normal flux distribution (n/sec.cm**2)

no.	n a m e	volume	group 1	group 2	group 3	group 4	group 5	group 6
1	incore init	1.435906E+06	4.695116E+13	2.187230E+14	1.547770E+15	9.686900E+14	2.580126E+14	3.990635E+13
2	oucore init	6.926985E+05	3.673052E+13	1.685986E+14	1.050854E+15	5.885304E+14	1.451046E+14	2.763866E+13
3	axbla lower	1.490024E+06	4.065338E+12	2.173537E+13	2.629474E+14	2.597262E+14	9.912207E+13	3.766696E+13
4	na fo112	1.039481E+06	8.048125E+12	4.261346E+13	3.493386E+14	2.545717E+14	9.530493E+13	3.224124E+13
5	gem upplenum	1.445359E+06	4.306332E+12	2.465668E+13	2.207471E+14	1.716656E+14	7.144596E+13	5.284132E+13
6	loplenumcore	2.644269E+06	7.026201E+10	6.660615E+11	2.334035E+13	3.410597E+13	1.960739E+13	2.091210E+13
7	lower shield	2.227134E+06	5.695207E+09	6.357762E+10	2.165655E+12	2.744087E+12	1.069728E+12	8.468647E+11
8	radial b4cshie	1.768330E+07	7.134858E+10	7.042351E+11	1.952374E+13	1.874287E+13	9.210050E+12	8.577883E+12
	t o t a l	2.865817E+07	4.011712E+12	1.945447E+13	1.547953E+14	1.090821E+14	3.622410E+13	1.574871E+13

no.	n a m e	volume	group 7
1	incore init	1.435906E+06	2.535840E+11
2	oucore init	6.926985E+05	1.156541E+12
3	axbla lower	1.490024E+06	3.477279E+12
4	na fo112	1.039481E+06	4.892933E+12
5	gem upplenum	1.445359E+06	1.548369E+13
6	loplenumcore	2.644269E+06	9.307468E+12
7	lower shield	2.227134E+06	5.210184E+11
8	radial b4cshie	1.768330E+07	4.633763E+12
	t o t a l	5.731633E+07	2.469176E+12

図２．５　中性子束出力例

fbrco 1st cycle boc calculation (1-3rd core model) 96/10/17 Mon Apr 7 09:45:58 1997 page 22
step no.1-1 cell.(cr na-follower) cpu time (sec) 1138.5

mixture region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peaking position	peaking power(w/cc)	peaking r.peak
1	incore init	1.435906E+06	3.618817E+02	6.785706E+01	2.520232E+02	(1,29)	3.895021E+02	1.000000
2	oucore init	6.926985E+05	1.615771E+02	3.029761E+01	2.332576E+02	(88,30)	3.497402E+02	1.055443
3	axbla lower	1.490024E+06	9.841132E+00	1.845328E+00	6.604681E+00	(6,18)	2.102306E+01	1.073638
	total	3.618629E+06	5.333000E+02	1.000000E+02				

region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peaking position	peaking power(w/cc)	peaking r.peak
1	incore init	1.435906E+06	3.618817E+02	6.785706E+01	2.520232E+02	(1,29)	3.895021E+02	1.000000
2	oucore init	6.926985E+05	1.615771E+02	3.029761E+01	2.332576E+02	(88,30)	3.497402E+02	1.055443
3	axbla upper	7.450122E+05	4.880154E+00	9.150860E-01	6.550435E+00	(6,18)	2.102306E+01	1.073638
4	axbla lower	7.450119E+05	4.960979E+00	9.302416E-01	6.658926E+00	(6,43)	2.047973E+01	1.077206
	total	3.618629E+06	5.333000E+02	1.000000E+02				

breeding ratio by region

no.	name	volume	fertile capture	fissile absorptions	fissile decay	fissile absr.+decay	breeding ratio
1	incore init	1.43591E+06	2.35362E-01	2.44119E-01	6.26310E-03	2.50382E-01	6.38042E-01
2	oucore init	6.92698E+05	6.93765E-02	1.11237E-01	4.43346E-03	1.15670E-01	1.88072E-01
3	axbla upper	7.45012E+05	4.56795E-02	1.37999E-03	0.00000E+00	1.37999E-03	1.23832E-01
4	axbla lower	7.45012E+05	4.66757E-02	1.44988E-03	0.00000E+00	1.44988E-03	1.26533E-01
	total	3.61863E+06	3.97094E-01	3.58186E-01	1.06966E-02	3.68882E-01	1.07648E+00

図2．6　出力分布関連出力例

fbrco 1st cycle boc calculation (1-3rd core model)
step no.1-2 cell.(cr na-folower)

Mon Apr 7 09:59:36 1997 page 44
burnup time (days) 456.00 cpu time (sec) 1939.4

fuel inventory (kg) by mixture region

no.	n a m e		1 pu238	2 pu239	3 pu240	4 pu241	5 pu242	6 u235	7 u236	8 u238
1	incore init	b. o. c.	1.4188E+01	4.8490E+02	2.0865E+02	7.6782E+01	3.9226E+01	1.3145E+01	0.0000E+00	4.3684E+03
		e. o. c.	1.1954E+01	4.8616E+02	2.1624E+02	6.1672E+01	3.9846E+01	9.4872E+00	8.0237E-01	4.1527E+03
		g a i n	-2.2338E+00	1.2669E+00	7.5886E+00	-1.5110E+01	6.2040E-01	-3.6576E+00	8.0237E-01	-2.1571E+02
2	oucore init	b. o. c.	9.9430E+00	3.3982E+02	1.4622E+02	5.3809E+01	2.7490E+01	5.7439E+00	0.0000E+00	1.9089E+03
		e. o. c.	8.9025E+00	3.1824E+02	1.4923E+02	4.5680E+01	2.7926E+01	4.6876E+00	2.4183E-01	1.8593E+03
		g a i n	-1.0405E+00	-2.1581E+01	3.0065E+00	-8.1291E+00	4.3643E-01	-1.0563E+00	2.4183E-01	-4.9560E+01
3	axbla lower	b. o. c.	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.7426E+01	0.0000E+00	5.7913E+03
		e. o. c.	6.0475E-03	6.2327E+01	1.3375E+00	2.5338E-02	2.1512E-04	1.5421E+01	5.1894E-01	5.6831E+03
		g a i n	6.0475E-03	6.2327E+01	1.3375E+00	2.5338E-02	2.1512E-04	-2.0046E+00	5.1894E-01	-1.0812E+02
	t o t a l	b. o. c.	2.4131E+01	8.2471E+02	3.5487E+02	1.3059E+02	6.6715E+01	3.6315E+01	0.0000E+00	1.2069E+04
		e. o. c.	2.0863E+01	8.6672E+02	3.6680E+02	1.0738E+02	6.7772E+01	2.9596E+01	1.5631E+00	1.1695E+04
		g a i n	-3.2683E+00	4.2013E+01	1.1933E+01	-2.3214E+01	1.0570E+00	-6.7184E+00	1.5631E+00	-3.7339E+02

no.	n a m e		9 am241	10 am242m	11 am243	12 np237	13 cm242	14 cm243	15 cm244	16 cm245
1	incore init	b. o. c.	1.0850E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	1.1683E+01	4.3945E-01	2.1968E+00	7.3891E-01	7.7700E-01	3.2205E-02	2.3579E-01	5.9852E-03
		g a i n	8.3354E-01	4.3945E-01	2.1968E+00	7.3891E-01	7.7700E-01	3.2205E-02	2.3579E-01	5.9852E-03
2	oucore init	b. o. c.	7.6035E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	9.0604E+00	2.2393E-01	1.0182E+00	2.6084E-01	3.7544E-01	1.0200E-02	6.8704E-02	1.1367E-03
		g a i n	1.4570E+00	2.2393E-01	1.0182E+00	2.6084E-01	3.7544E-01	1.0200E-02	6.8704E-02	1.1367E-03
3	axbla lower	b. o. c.	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	3.7956E-04	1.8796E-06	1.7288E-06	1.0810E-01	4.7618E-06	3.7897E-08	3.7345E-08	2.7891E-10
		g a i n	3.7956E-04	1.8796E-06	1.7288E-06	1.0810E-01	4.7618E-06	3.7897E-08	3.7345E-08	2.7891E-10
	t o t a l	b. o. c.	1.8453E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	2.0744E+01	6.6338E-01	3.2150E+00	1.1079E+00	1.1524E+00	4.2405E-02	3.0450E-01	7.1219E-03
		g a i n	2.2909E+00	6.6338E-01	3.2150E+00	1.1079E+00	1.1524E+00	4.2405E-02	3.0450E-01	7.1219E-03

no.	n a m e		t o t a l
1	incore init	b. o. c.	5.2162E+03
		e. o. c.	4.9950E+03
		g a i n	-2.2117E+02
2	oucore init	b. o. c.	2.4995E+03
		e. o. c.	2.4252E+03
		g a i n	-7.4267E+01
3	axbla lower	b. o. c.	5.8087E+03
		e. o. c.	5.7629E+03
		g a i n	-4.5803E+01
	t o t a l	b. o. c.	1.3524E+04
		e. o. c.	1.3183E+04
		g a i n	-3.4124E+02

図２．７　燃料インベントリ関連出力例

fbrco 2nd cycle boc calculation (1-3rd core model)
step no.2-1 cell.(cr na-follower)

Tue Apr 8 20:57:03 1997 page 58
burnup time (days) 456.00 cpu time (sec) 1957.9

discharged fuels information mixture groups

1. no. name	1. incore init		2. oucore init
2. no. of fuels	22 fuels		11 fuels
3. ave. stay day	456 days		456 days

4. exposure(mwd/t)	average	peaking	pos.	average	peaking	pos.
zone 3	4.26165E+02	5.85828E+02	(4,1)	3.38487E+02	4.53509E+02	(79,3)
zone 4	1.56618E+03	1.96298E+03	(4,1)	1.19291E+03	1.55430E+03	(79,3)
zone 5	2.02293E+04	2.37594E+04	(3,4)	1.93345E+04	2.32112E+04	(79,5)
zone 6	2.94235E+04	3.53524E+04	(3,4)	2.77582E+04	3.38696E+04	(79,5)
zone 7	3.84378E+04	4.66356E+04	(3,4)	3.60953E+04	4.42736E+04	(79,5)
zone 8	4.04326E+04	4.91230E+04	(3,4)	3.79998E+04	4.66469E+04	(79,5)
zone 9	4.01295E+04	4.87357E+04	(3,4)	3.77444E+04	4.63117E+04	(79,5)
zone 10	3.65106E+04	4.41876E+04	(3,4)	3.44579E+04	4.21545E+04	(87,4)
zone 11	2.49800E+04	2.96844E+04	(3,4)	2.39714E+04	2.88537E+04	(79,5)
zone 12	1.75200E+03	2.17358E+03	(4,1)	1.36296E+03	1.74437E+03	(79,3)
zone 13	8.31576E+02	1.10948E+03	(4,1)	6.44783E+02	8.61637E+02	(79,3)
zone 14	3.62394E+02	5.10670E+02	(4,1)	2.91764E+02	3.93234E+02	(79,3)
core	3.22321E+04	3.88304E+04	(3,4)	3.04676E+04	3.71617E+04	(79,5)
blanket	8.54780E+02	1.10572E+03	(4,1)	6.64657E+02	8.71010E+02	(79,3)

5. inventory	--- core --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)	--- core --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)
1 pu238	3.96	0.24	0.00	0.00	3.05	0.37	0.00	0.00
2 pu239	161.32	9.74	15.53	1.20	109.20	13.11	5.73	0.89
3 pu240	71.83	4.34	0.36	0.03	51.30	6.16	0.10	0.02
4 pu241	20.44	1.23	0.01	0.00	15.64	1.88	0.00	0.00
5 pu242	13.22	0.80	0.00	0.00	9.60	1.15	0.00	0.00
6 u235	3.13	0.19	3.41	0.26	1.60	0.19	1.76	0.27
7 u236	0.27	0.02	0.13	0.01	0.09	0.01	0.05	0.01
8 u238	1376.61	83.12	1269.65	98.49	638.58	76.67	637.18	98.81
9 am241	3.86	0.23	0.00	0.00	3.10	0.37	0.00	0.00
10 am242m	0.15	0.01	0.00	0.00	0.08	0.01	0.00	0.00
11 am243	0.74	0.04	0.00	0.00	0.36	0.04	0.00	0.00
12 np237	0.24	0.01	0.03	0.00	0.09	0.01	0.01	0.00
13 cm242	0.26	0.02	0.00	0.00	0.13	0.02	0.00	0.00
14 cm243	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 cm244	0.08	0.00	0.00	0.00	0.02	0.00	0.00	0.00
16 cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
u total	1380.25	83.34	1273.21	98.77	640.36	76.89	638.99	99.10
pu total	275.88	16.66	15.90	1.23	192.49	23.11	5.83	0.90
pu fiss.	181.76	10.98	15.53	1.20	124.84	14.99	5.73	0.89
(u + pu)	1656.13	100.00	1289.11	100.00	832.84	100.00	644.82	100.00
20 o	227.63	12.08	173.68	11.87	114.13	12.05	86.84	11.87
uo2 total	1570.18	83.35	1444.76	98.77	728.25	76.90	725.05	99.10
puo2 total	313.59	16.65	18.03	1.23	218.73	23.10	6.61	0.90
mo2 total	1883.76	100.00	1462.78	100.00	946.98	100.00	731.66	100.00
27 u235-fp	0.90	-----	0.34	-----	0.29	-----	0.13	-----
28 u238-fp	7.70	-----	0.74	-----	2.84	-----	0.29	-----
29 pu239-fp	37.52	-----	0.73	-----	17.77	-----	0.20	-----
30 pu241-fp	11.08	-----	0.00	-----	5.67	-----	0.00	-----

図２．８　取り出し燃料関連出力例

３．　マルチプラットフォームへの対応

前述の改修はＳＵＮワークステーション上で実施し、改修したＭＯＳＥＳコードが正しく作動することを確認した。ここでは、他のＵＮＩＸ系計算機にも対応するように整備した。

３．１　整備内容

機種依存性は、一般には①FORTRAN文法上の違い、②タイマー等システム提供ルーチンの相違、③最適化処理の相違、などがある。これらを考慮して整備した。

（１）FORTRAN文法上の違い

これまでのＭＯＳＥＳコードはＩＢＭ／ＦＡＣＯＭ系のFORTRANで記述されていた。したがって、倍精度変数を４バイト変数２個で使用したり、文字定数を４バイト整数や倍精度実数で扱っていた。これらは、配列間のデータ授受に関しては問題ないものの、ファイルを介してデータ授受を行う場合には、データタイプの違いからエラーとなる。そこで、次のように変更した。

・倍精度実数は倍精度実数でＩ／Ｏする。

・文字型データは詳細メッシュ計算部ですべて実数で扱っているので実数型に戻す。

これにより問題なく動作することが確認できた。これにより、他のＵＮＩＸ計算機でも問題なく動作することが期待できる。

（２）タイマー等システム提供ルーチン

ＭＯＳＥＳコードは、ＣＰＵ時間や日付等を印刷出力ヘッダー部に書く。このような機能は計算機ベンダーが用意したシステムルーチンを利用することが一般的である。

今回改訂したＭＯＳＥＳでは、

・ｃｐｕｓｔ：ｃｐｕ時間の取り出し

・ｐｒｎｔｈ：ヘッダー部の印刷

等において、Ｓｕｎマイクロシステム社の以下のルーチンを使用している。

・ｅｔｉｍｅ：ｃｐｕ時間の取り出し

・ｆｄａｔｅ：日付、時刻の取り出し

これを図３．１および図３．２に示す。

他の計算機システムに移植する場合は、これらの機能を代替えする機能を用いればよい。ＩＢＭ（ＡＩＸ）、ＣＲＡＹ（ＵＮＩＣＯＳ）およびＨＰ（ＵＩＸ）等ＵＮＩＸにおける設定方法の比較を表３．１に示す。

（３）最適化処理の相違

コンパイラーの最適化レベルについては、計算機システムおよびソースプログラムの質により影響される。ＭＯＳＥＳの詳細メッシュ計算機能は、コンパイル時に最適化レベル指定オプションＯｎをたてると、１度目の計算が終了後、エラーで止まる。当面は非最適化によりコンパイルする必要がある。従来の粗メッシュおよび修正粗メッシュでは最適化レベル（Ｏ４）でも問題なく実行可能である。

表３．１　システムルーチンの比較

	cpu秒	時刻および日付
Sun(Sun OS)	dimension tarray(2) cpu=etime(tarray)	character*24 c24 call fdate(c24)
IBM(AIX)	cpu=mclock(x)*0.01	character*24 c24 character*8 hhmmss,modayr hhmmss=clock_() modayr=date() write(c24,'(a8,4x,a8,4x)') hhmmss,modayr
CRAY(UNICOS)	cpu=second()	hhmmss =clock() modayr=date() write(c24,'(a8,4x,a8,4x)') hhmmss,modayr
HP(UIX)	dimension tarray(2) cpu=etime(tarray)	character*24 c24 call date(c24)

```
      subroutine prnth (line)
c
c          print header routine
c
c*********************************************************************
      include 'sclcom.inc'
c*********************************************************************
c1V77       character*9 hday,htim
      character*24 hday
c
      call cpust (xcpu,xelap)

c
c1V77       call date(hday)
c1V77       call time(htim)
      call fdate(hday)
c
      if(tnow.gt.0.0)                          go to 1010
      write(nou,6010)
c1V77      1 (ntitl(i),i= 1,20),       hday,htim,npage,
     1 (ntitl(i),i= 1,20),       hday,npage,
     2 (ntitl(i),i=21,40),xcpu
      npage=npage+1
      line = 3
      return
c
 1010 continue
      write(nou,6020)
c1V77      1 (ntitl(i),i=01,20),       hday,htim,npage,
     1 (ntitl(i),i=01,20),       hday,npage,
     2 (ntitl(i),i=21,40),tnow,xcpu
      npage= npage+1
      line = 3
      return
c
c          format statements
c
c1V77 6010 format(1h1,20a4,2x,20x,a9,1x,a9,1x,'  page',i4/
 6010 format(1h1,20a4,2x,16x,a24,'  page',i4/
     1        1h ,20a4,30x,'cpu time (sec)',f8.1/)
c1V77 6020 format(1h1,20a4,2x,20x,a9,1x,a9,1x,'  page',i4/
 6020 format(1h1,20a4,2x,16x,a24,'  page',i4/
     1        1h ,20a4, 2x,'burnup time (days)',f8.2,2x,
     2                    'cpu time (sec)',f8.1/)
c
      end
```

prnth.f

図３．１　prnth のソースプログラム

```
      subroutine cpust (cpu,elps)
c
c calculation cpu & elapse time
c for Sun OS
      real ttt(2)
      tmp  = etime(ttt)
      cpu  = ttt(1)
      elps = tmp
c for FACOM MVS
c      call clockm(icpu)
c???      call time  (iela)
c      cpu = float(icpu)/10
c      elps= float(iela)/10
c
      return
      end
```


図3．2　cpustのソースプログラム

４．　テスト計算

コード整備が正しく行われていることを確認するために、典型的な燃焼計算問題を取り上げて検証解析を行った。

４．１　テスト問題

１／３体系で表された大型炉心を対象としたテスト問題を設定した。図４．１に集合体番号を示す。また、図４．２に集合体種別を示す。ここで、番号は、

1)内側炉心
2)外側炉心
3)ＧＥＭ
4)ＳＵＳ遮蔽体
5)B_4C遮蔽体
6)粗調整棒
7)微調整棒
8)後備棒

である。問題の詳細は付録２のテスト計算結果を参照されたい。ここでは同一問題を粗メッシュ、修正粗メッシュおよび詳細メッシュの各解法によって解き、各々の結果を比較することで詳細メッシュ計算が正しく計算できることを確認する。

４．２　テスト結果

（１）計算結果の傾向

表４．１に実効増倍率、増殖比および計算時間の比較を示す。

詳細メッシュの実効増倍率は、粗メッシュのそれに比べて約０．３％程度低めであり、これは一般的に言われているメッシュ効果の定量的な傾向と合致する。修正粗メッシュ計算とはより近く、約０．１％程度の差である。

増殖比は詳細メッシュ計算値が粗メッシュ計算値に比べて高め、修正粗メッシュ計算とはよく一致している。

計算時間は３章で述べたように粗メッシュおよび修正粗メッシュは最大限の最適化をしているため、同一条件の比較とはいえない。実際、粗メッシュ計算では非最適化のロードモジュールに比べて最適化により３倍以上の計算時間短縮効果が出ている。ロードモジュールの最適化レベルが異なる条件ではあるが、詳細メッシュ計算との計算時間を比較すると、詳細メッシュ計算は粗メッシュ計算に比べて２０～５０倍、修正粗メッシュ計算に比べても７～２０倍の計算時間を要した。

詳細メッシュ計算の計算時間はやや掛かりすぎのきらいがあるが、これは取り扱いメッシュが格段に増えるため、数値解法一般の問題として収束が遅くなることを反映している。また、これを克服するための収束加速法が古いため、新たな収束加速法を導入するなどの手を打たない限りこの問題は解決しない。

表４．２に同じく３解法の計算で得られた出力分担率と燃焼度を示す。全般的に３解法の間で特異な差は見られない。詳細に見ると、出力分担率やピーク燃焼度に%オーダの差が見られる。修正粗メッシュ解法におけるピーク燃焼度は１０%程度の差がみられる。

以上のように、詳細メッシュ計算(TriZ)機能は、他の解法と比べて特異な結果はないことから、ＵＮＩＸ計算機環境で正しく作動することが確認できた。

（２）詳細メッシュ計算における配列長の効果

２．１節で述べたように、詳細メッシュ計算部は外部ファイルＩ／Ｏを空きメモリが十分な場合に代用するようにプログラミングされている。そこで、上記テスト問題においてＭＯＳＥＳコードの配列設定ルーチンALLOCのコモン長を変更して比較した。結果を表４．３に示す。配列長２０００万のケースでは、解法モードが繰り返し計算時に全群、全空間メッシュのデータを用いて計算するもので、９８番にＤＡファイルＩ／Ｏを行うほかは、空きメモリを利用(coreと表示)している。このケース１を基準とすると、配列長１５００万および配列長７００万ではファイルＩ／Ｏおよび解法が変わり、それに応じて計算時間も長くなる。

このように、使用可能なメモリの範囲で配列長を大きくとることにより計算時間を短縮させることができる。

表４．１　テスト計算結果（実効増倍率等）

	項　目	HexZ 粗メッシュ	HexZ 修正粗メッシュ	TriZ 詳細メッシュ	HexZ/TriZ-1 粗メッシュ (%)	HexZ/TriZ-1 修正粗メッシュ (%)
step1-1	実効増倍率	1.03304	1.02807	1.02909	0.38	-0.10
	増殖比	1.06578	1.07648	1.07443	-0.81	0.19
	cpu(s)	329*	1,150*	7,712**	(23.4)	(6.7)
step1-2	実効増倍率	1.00296	0.99920	0.99996	0.30	-0.08
	増殖比	1.08282	1.08771	1.08693	-0.38	0.07
	cpu(s)	224*	790*	8,361**	(37.3)	(10.6)
step2-1	実効増倍率	1.01348	1.00940	1.01013	0.33	-0.07
	増殖比	1.07689	1.08409	1.08255	-0.52	0.14
	cpu(s)	208*	535*	10,766**	(51.8)	(20.1)

注）中性子束および固有値の収束条件は各々、1e-4,5e-5である。
＊　ＳｕｎＳＳ２０において最適化レベルＯ４によるロードモジュールを使用。
＊＊　ＳｕｎＳＳ２０において最適化なしロードモジュールを使用。
（）はｃｐｕ時間の比で、各々TriZ/HexZ（粗メッシュ）、TriZ/HexZ（修正粗メッシュ）を示している。

表４．２　テスト計算結果（出力分担等）

	項　目		HexZ 粗メッシュ	HexZ 修正粗メッシュ	TriZ 詳細メッシュ	HexZ/TriZ-1 粗メッシュ (%)	HexZ/TriZ-1 修正粗メッシュ (%)
step1-1	出力分担率 (%)	内側炉心	66.095	67.857	67.446	-2.00	0.61
		外側炉心	32.120	30.298	30.733	4.51	-1.42
		上部ブランケット	0.887	0.915	0.904	-1.91	1.21
		下部ブランケット	0.898	0.930	0.917	-2.09	1.39
	平均燃焼度 (MWD/T)	内側炉心	3.1181E+04	3.2024E+04	3.1828E+04	-2.03	0.61
		外側炉心	3.1250E+04	2.9478E+04	2.9901E+04	4.51	-1.42
		上部ブランケット	7.4853E+02	7.7258E+02	7.6324E+02	-1.93	1.22
		下部ブランケット	7.5793E+02	7.8532E+02	7.7427E+02	-2.11	1.43
		合　計	1.8125E+04	1.8134E+04	1.8132E+04	-0.04	0.01
	ピーク燃焼度 (MWD/T)	内側炉心	4.6570E+04	4.9379E+04	4.8833E+04	-4.63	1.12
		外側炉心	4.8374E+04	4.6647E+04	4.7182E+04	2.53	-1.13
		上部ブランケット	1.7304E+03	1.9630E+03	1.7841E+03	-3.01	10.03
		下部ブランケット	1.9039E+03	2.1736E+03	1.9667E+03	-3.19	10.52
step1-2	出力分担率	内側炉心	67.937	68.800	68.582	-0.94	0.32
		外側炉心	27.873	26.872	27.123	2.76	-0.93
		上部ブランケット	2.053	2.111	2.101	-2.28	0.50
		下部ブランケット	2.138	2.217	2.194	-2.57	1.02
step2-1	出力分担率	内側炉心	67.287	68.550	68.185	-1.32	0.53
		外側炉心	29.406	28.029	28.424	3.46	-1.39
		上部ブランケット	1.624	1.674	1.663	-2.35	0.67
		下部ブランケット	1.682	1.746	1.727	-2.63	1.10

表4．3　設定メモリ長の効果

ケース	設定メモリ長	CPU秒	相対値	解法モード	ユニット92	ユニット95	ユニット96	ユニット98
1	20,000,000	25,552	-	All Gr. ALL Space Stored	core	core	core	DA file
2	15,000,000	26,477	1.04	All Gr. ALL Space Stored	core	core	DA file	DA file
3	7,000,000	30,938	1.21	1 Gr. ALL Space Stored	core	core	DA file	DA file

assembly no. map

```
                                                                274
                                                            242   309
                                                        212   275
                                                    184   243   310
                                                158   213   276
                                            134   185   244   311
                                        112   159   214   277
                                    92   135   186   245   312
                                74   113   160   215   278
                            58    93   136   187   246   313
                        44    75   114   161   216   279
                    32    59    94   137   188   247   314
                22    45    76   115   162   217   280
            14    33    60    95   138   189   248   315
        8    23    46    77   116   163   218   281
    4    15    34    61    96   139   190   249   316
  2     9    24    47    78   117   164   219   282
1     5    16    35    62    97   140   191   250   317
  3    10    25    48    79   118   165   220   283
    6    17    36    63    98   141   192   251   318
  7    11    26    49    80   119   166   221   284
    12    18    37    64    99   142   193   252   319
 13    19    27    50    81   120   167   222   285
    20    28    38    65   100   143   194   253   320
 21    29    39    51    82   121   168   223   286
    30    40    52    66   101   144   195   254   321
 31    41    53    67    83   122   169   224   287
    42    54    68    84   102   145   196   255   322
 43    55    69    85   103   123   170   225   288
    56    70    86   104   124   146   197   256   323
 57    71    87   105   125   147   171   226   289
    72    88   106   126   148   172   198   257   324
 73    89   107   127   149   173   199   227   290
    90   108   128   150   174   200   228   258   325
 91   109   129   151   175   201   229   259   291
   110   130   152   176   202   230   260   292
111   131   153   177   203   231   261   293   327
   132   154   178   204   232   262   294   328
133   155   179   205   233   263   295   329
   156   180   206   234   264   296   330
157   181   207   235   265   297   331
   182   208   236   266   298   332
183   209   237   267   299   333
   210   238   268   300   334
211   239   269   301   335
   240   270   302   336
241   271   303   337
   272   304   338
273   305   339
   306   340
307   341
   342
343
```

図4．1　テスト問題の体系における集合体番号

assembly group map

```
                                                                5
                                                            5     5
                                                        5     5
                                                    4     5     5
                                                4     4     5
                                            4     4     5     5
                                        4     4     4     5
                                    3     4     4     5     5
                                2     3     4     4     5
                            1     2     4     4     5     5
                        1     2     3     4     4     5
                    7     1     2     4     4     5     5
                1     1     2     3     4     4     5
            1     1     1     2     4     4     5     5
        6     1     1     6     3     4     4     5
    1     1     1     1     2     4     4     5     5
  1     1     1     1     2     3     4     4     5
1     1     1     8     1     2     4     4     5     5
  1     1     1     1     1     2     3     4     4     5
    1     1     1     1     1     2     4     4     5     5
  1     6     1     1     6     3     4     4     5
    1     1     1     1     2     4     4     5     5
  1     1     1     1     2     3     4     4     5
    1     1     1     7     1     2     4     4     5     5
  1     1     1     1     2     3     4     4     5
    1     1     1     1     1     2     4     4     5     5
  1     8     1     1     2     3     4     4     5
    1     1     1     2     2     3     4     4     5     5
  1     1     1     2     2     4     4     4     5
    1     1     6     2     3     4     4     5     5
  1     1     2     2     3     4     4     4     5
    1     2     2     3     4     4     4     5     5
  1     6     2     3     4     4     4     5     5
    2     2     3     4     4     4     4     5     5
  2     2     3     4     4     4     4     5     5
    2     3     4     4     4     4     5     5     5
  2     3     4     4     4     4     5     5     5
    3     4     4     4     4     5     5     5
  3     4     4     4     4     5     5     5
    4     4     4     4     5     5     5
  4     4     4     4     5     5     5
    4     4     4     5     5     5
  4     4     4     5     5     5
    4     4     5     5     5
  4     4     5     5     5
    5     5     5     5
  5     5     5     5
    5     5     5
  5     5     5
    5     5
  5     5
    5
  5
```

図4．2　テスト問題の体系における集合体種別毎の配置

５．　結論と今後の課題

５．１　結論

ＭＯＳＥＳコードの詳細計算機能(TriZ)をＵＮＩＸ上で動かせるように整備した。併せて、これまでのソースプログラムを見直していくつかの不具合を解消した。作業内容の要点を以下に記す。

（１）３次元詳細メッシュ解法の改修

３次元詳細メッシュ(TriZ)ソルバーのメモリおよび外部ファイル制御部は、もともと大型計算機のハードウェア環境を前提としてプログラミングされているため、そのままではＵＮＩＸ計算機で動作しなかった。そこで、DOPC、REED/RITE のようなＩ／Ｏ制御部をＵＮＩＸ用に書き換えて計算が可能となるように整備した。また、これまでのプリント出力形式を見直した。

（２）　マルチプラットフォームへの対応

上記（１）の書き換えに当たっては、ＡＮＳＩ標準のFORTRAN仕様に従って書いたので、テスト用に整備したＳＵＮワークステーション以外の計算機環境でも計算は可能である。また、システム依存のタイマー、日付等の設定ルーチンについては、主要な計算機に合わせて変更できるように情報をまとめた。

（３）　テスト計算

上記（１）および（２）の整備が正しく行われていることを確認するために、典型的な大型炉を対象とした燃焼計算問題を取り上げて検証解析を行った。１／３体系の問題に対しては、粗メッシュ、修正粗メッシュおよび詳細メッシュ解法の３種の結果を比較し、概ね一致する結果が得られた。これにより、詳細メッシュ計算部が正しく機能していることを確認した。また、今後の利用に際しての参考のため、詳細メッシュ計算部は設定メモリ長に依存して計算時間が変動する例を示した。

５．２　今後の課題

ＭＯＳＥＳコードは、汎用的な体系を扱えること、修正粗メッシュ解法を利用できること、などを狙ってコード化したものであるが、当時の計算機環境はメモリを少なくすることが至上命令であった。ＭＯＳＥＳが多数の整合配列を使い、メモリ領域を節約したスタイルになっているのは当時の計算機環境のせいである。そのため、コードのメンテナンスや拡張が相当困難なコードになっている。しかし、現在はメモリは相対的に安価になり、

むしろメモリは使ってもコードのメンテナンスのし易さや拡張性の方が重視されてきている。また、大型汎用機の利用からＵＮＩＸワークステーションを個人ベースで利用する環境へとシフトしつつある。このような計算機環境の変化をみると、ＭＯＳＥＳは再度プログラミングする時期にさしかかっていると思われる。また、機能面でも、シャフリングを含む燃料管理、固有値計算、燃焼計算といった機能の再構成・モジュラー化が必要である。固有値計算には、より優れた加速法を採用したソルバー、輸送計算モジュールの導入などが望まれるところである。このようなＭＯＳＥＳレフレッシュ作業により、使い勝手の良く、信頼性の高い核設計計算システムの実現が期待できる。

さらに、断面積処理、摂動コード等ＭＯＳＥＳコードの周辺コードを含めてＵＮＩＸワークステーション上に移行し、一貫した設計システムの実現を図ることが望ましい。

付録１　Ｉ／Ｏ関連改訂部ソースリスト

以下に、詳細メッシュ計算部のＩ／Ｏ制御を行っているルーチンのソースリストを改訂部を明示して示す。

```
      subroutine dopc(itask,lu,nr,lr,ilr,ipsok)
c
      include 'comdop.inc'
c
      dimension  ipsok(1)
c
      real*8 dd,honor
c
c     the following are required for a module in the local system
c       1- initialize with a call to dopc
c       2- allocate storage
c       3- communicate storage locations with calls to roxx and roxy
c       4- open necessary files (not required for sequential fortran)
c          with calls to dopc
c       5- close files as desired with calls to dopc
c       6- determine interface file units with calls to seek
c       7- wrap up with a close call to dopc
c     (stand alone operation may use seek, reed, and rite with
c      sequential operation without these other requirements)
c
c     dopc does not alter the arguments communicated, so subsequent use
c     is possible with only the desired changes
c     note that array kk is reserved to store control information, so
c       it must be properly communicated and not tampered with
c
c                       argument use
c                       -------- ---
c     role of arguments
c     ---- -- ---------
c     itask         option on job to be done
c                     0 -initialization, usually required, storage arrays
c                        not yet available
c                        returns ipsok(1) = inpt  input unit
c                                ipsok(2) = iout  output unit
c                                ipsok(3) = jout  condensed output unit
c                                other values of ipsok not used or set
c                     1- open scratch data file
c                     2 -close scratch data file
c                         (closing files stored in extended core may best
c                         be done in reverse orded from opening)
c                     3 -wrap up, close all files before leaving a module
c     lu            logical unit number
c     nr            number of logical records in the file
c     lr            logical record length (required for fixed length
c                     records, otherwise maximum required), words
c     ilr           length of the data file, words
c     ipsok(1)      mode of data access
c                     0- sequential
c                     1- sequential, record lengths stored
c                     2- random access by record, fixed length records
c                     3- random access by record, fixed length records
c                        ramdom write required which may require prewrite
c     ipsok(2)      reference technique of data transfer
c                     0- manufacturers fortran
c                        ipsok(1) option 1 = option 0, 3 = 2  (ibm)
c                     1- local adaptation of the system routines
c                     2- default the file to extended core
c     ipsok(3)      debug message edit level, edits done if .gt. 0
c     ipsok(4)      return error flag, task completed only if 0
c     ipsok(5)      relative position in extended core data container
c                     array x where the file starts (ipsok(2) = 2 only)
c     ipsok(6)      reserved for special options in local transfer scheme
c     ipsok(7)      maximum block size of local transfer scheme
c                      zero recommended for local transfer scheme
c     ipsok(8-10)   reserved
c         primary input/output control parameters
```



```
c           --------------------------------------
c (names used here for description only, not program variables)
c       l  is the logical unit number
c       n  is the location of the control data in the kk array (if needed)
c       j  is the file location within the extended core data array x
c       np is the number of physical records per logical record
c       mr is the next position in the file by record count
c       nw is the next position in the file by word count
c       m  is the maximum record count written
c       ip is a flag indicating position for multiple physical records
c       il is the length of the previous record written
c       nl is normally one track length (local access scheme)
c
c   ipsok
c  (1) (2) imodd(1) nedum(1) kk(n) kk(n+1) kk(n+2) kk(n+3) kk(n+4) more
c  ------- -------- -------- ----- ------- ------- ------- ------- ----
c  0,1  0     0       mr    none
c  2,3  0     1       np    none
c       1     n       mr       2     ip       m       nr    ipsok(1) yes
c  0    2     n       nw       5     nr       j       mr     il
c  1    2     n       nw       4     nr       j       mr     il      yes
c  2,3  2     n       lr       3     nr       j       mr     -
c                                    storage requirements
c                     kk control array         x data container
c                     -- ------- -----         - ---- ---------
c       0                       -                      -
c 0,2,3 1             50 + 5*((lr-1)/nl)               -
c  1    1             50 + 5*((lr-1)/nl) + nr          -
c 0,2,3 2             5                                ilr
c  1    2             5 + nr                           ilr
c
c                 service routines used and entry points
c                 ------- -------- ---- --- ----- ------
c      dopc           handle file opening, etc
c           roxy
c      rite           data transfer
c           reed roxx
c      crit           core, extended core data transfer
c           cred
c      seek           manage interface data files
c      ferr           data transfer error termination after wrap-up
c      fbsam          local data transfer scheme using system routines
c           frew fdisp fread fwrite fpoint forspc fbkspc fpntr fcheck
c      defile         ibm fortran direct access file opening
c      closda         close fortran direct access files
c
ctemp debug write flag
c       ipsok(3) =2
ctemp
c
      mm=0
      nn=1
      if (itask.eq.0) go to 100
      ipsok(4) = 0
      if (iema.ne.14362) go to 410
      if (itask.eq.1) go to 130
      if (itask.eq.2) go to 230
      go to 350
c     variable length data blocks communicated here (on some of the
c        systems, this won't work - a fixed common block can be used)
chng     entry roxy ( n , m , x , l , kk )
      entry roxy
c
c     kk array initialized by roxx entry into rite routine
c
c     m        length of the extended core data container array x
```

```
c     x        extended core data container array
c     l        length of the kk control array
c     kk       control array
c     kk(1)        length of the control array
c     kk(2)        size of the extended core data container array
c     kk(3)        next unused location in the control data array
c     kk(4)        amount of the extended core data array used
c     kk(5)        largest use of the extended core data array
      iema = 14362
      go to 500
  100 continue
c     ******************************************************************
c     initialization
c     ******************************************************************
      dd = 0
      i = 0
      ltrack = 0
      notep = 0
      kksta = 0
      kber = 0
      if (lu.le.0) go to 110
      n = lu
      mxx = 3
      call  seek(dd,i,n,mxx)
  110 continue
      mxx = 8
      call  seek ( dd, i, i, mxx)
      do 120 i=1,11
      iav(i) = 0
  120 continue
      iema = 0
      ipsok(1) = inpt
      ipsok(2) = iout
      ipsok(3) = jout
      if (lu.gt.0) write(jout,10800)
      go to 500
  130 continue
c     ******************************************************************
c     open file(s)
c     ******************************************************************
      imode = ipsok(1)
      if (imode.gt.3) go to 450
      jmode = ipsok(2)
      if (ilr.le.0) ilr=nr*lr
      if (lu.le.0) go to 220
      if (lu.gt.99) go to 430
      j = kk(3)
      if (imodd(lu).ne.0) write(iout,11300) lu,imode,imodd(lu)
c     sequential access default
      imodd(lu) = 0
      if (nvers(lu).le.0) go to 140
      write(iout,10500) honor(lu),nvers(lu)
      if (nedum(lu).eq.0) go to 150
      call  reed(lu,mm,kk,nn,mm)
      go to 150
  140 nedum(lu) = 0
  150 if (jmode.gt.1) go to 160
      if (jmode.eq.1) go to 190
      if (imode.gt.1) go to 200
      go to 210
c     locate the file in the extended core data container array
  160 continue
      m = ipsok(5)
      if (m.le.0.or.m.gt.kk(2)) go to 420
      if (ilr.le.0) go to 440
      if (imode.gt.1) kk(j) = 3
```



```
      if (imode.eq.1) kk(j) = 5
      if (imode.lt.1) kk(j) = 4
      imodd(lu) = j
      kk(j+1) = nr
      kk(j+2) = m
      kk(j+3) = 1
      kk(j+4) = 0
      lp = j + 5
      if (imode.eq.1) lp = lp + nr
c
      if (lp.gt.kk(1)+1) go to 440
      if (m+ilr.gt.kk(2)+1) go to 440
      if (imode.gt.1) go to 170
      nedum(lu) = 1
      if (imode.eq.1) kk(j+5) = 0
      go to 180
c     core to core - simulating direct access
  170 continue
      nedum(lu) = lr
  180 continue
      kk(4) = max0(kk(4),m+ilr)
      kk(3) = lp
      go to 210
c     local scheme of data access and transfer, core - disc
  190 continue
      write(iout,10000)
      go to 470
  200 continue
c     fortran direct access, limited to ten units here
      mlpr = ipsok(7)
chng      if (mlpr.le.0) mlpr = 8188
chng  changed for max physical record length
      if (mlpr.le.0) mlpr =maxprl
      mlpr = (((mlpr-1)/4)+1)*4
c     maximum physical record length (4byte word unit)
      nlr = nr
c     number of logical records
      lp = lr
c     length of logical record (4byte word unit)
      if (nlr.le.0.or.lp.le.0) go to 450
      nblk = (lp - 1)/mlpr + 1
c     length of physical block record (4byte word unit)
      nlr = nlr*nblk
c     number of real records
      lp = (lp - 1)/nblk + 1
c     length of real record (4byte word unit)
      ll = ((( lp -1)/4)+1)*4
c     length of real record (4byte word unit)
      iav(11) = iav(11) + 1
      jj=iav(11)
      if (jj.gt.10) go to 450
cmri update 1 line    4/1992
c      call  defile(lu,nlr, ll,lhu,iav(jj))
c end
cmri for unix system
c      call dspace(lu,nlr,i\cond)
      open(lu,status='unknown',access='direct',form='unformatted',
     *        recl=ll*4)
      imodd(lu) = 1
      nedum(lu) = nblk
chng added 1 line for direct access file i/o
c     real record length (4byte word unit) for lu unit d/a file
      nnnrec(lu)=ll
cend
  210 continue
      if (kk(4).gt.kk(2)+1) go to 460
```

```
      if (kk(3).gt.kk(1)+1) go to 460
      if (ipsok(3).eq.0) go to 220
      write(iout,10700) lu,nr,lr,ilr,imode,jmode,nedum(lu),imodd(lu),
     *  kk(1),kk(2),kk(3),kk(4),j,kk(j)
10700 format(1h 'dopc file opening data for unit=',i3/
     &       '   # of logical records in file =',i10,
     &       '   logical record length (word) =',i10/
     &       '   length of the file (word)    =',i10,
     &       '   access mode (0;1/2;3=sa/da)  =',i10/
     &       '   ref technique (0/1/2)        =',i10,
     &       '   # of blocks for logical rec. =',i10/
     &       '   ref tech (0/1/n=sa/da/core)  =',i10/
     &       ' * kk(1) length of control array=',i10,
     &       '   kk(2) size of ext-core       =',i10/
     &       '   kk(3) next unused loc        =',i10,
     &       '   kk(4) amount of ext-core used=',i10/
     &       '   j                            =',i10,
     &       '   kk(j)                        =',i10)
  220 continue
      j = kk(3)
      if (j.lt.7) go to 490
      if (ipsok(3).gt.1) write(iout,11200) (kk(i),i=1,j)
      go to 490
  230 continue
c     ****************************************************************
c     close file       control array repacked
c     ****************************************************************
      if (ipsok(3).gt.0) write(iout,11400) lu,kk(3),kk(4)
      if (lu.le.0) go to 460
      if (lu.gt.99) go to 460
      m=imodd(lu)
      nlr = 0
      if (m.lt.1) go to 340
      if (m.eq.1) go to 250
      if (kk(m).eq.2) go to 240
      nlr = 1
      go to 260
  240 continue
      write(iout,10000)
      go to 470
  250 continue
c     direct access
cmri update 1 line    4/1992
c      call  closda(lu)
      close(lu)
      go to 340
  260 continue
      l = kk(3)
      if (l.le.6) go to 340
      lp = kk(m+2)
      ll= kk(4)
      do 280 j=1,99
      n = imodd(j)
      if (n.lt.3) go to 280
      if (nlr.eq.0) go to 270
      jj = kk(n+2)
      if (jj.gt.lp) ll = min0(ll,jj)
  270 if (n.le.m) go to 280
c     can not now relocate the control data for fbsam (kbsam)
      if (kk(n).eq.2) go to 340
      l = min0(n,l)
  280 continue
      if (ll.eq.kk(4).and.nlr.eq.1) kk(4) = lp
      if (l.ne.kk(3)) go to 290
      kk(3) = m
      go to 320
```



```
  290 ll = l - 1
      l = l - m
      if (l.lt.1) go to 340
      do 300 j = 1,99
      n = imodd(j)
      if (n.gt.m) imodd(j) = n-1
  300 continue
      kk(3) = kk(3) - 1
      n = kk(3) - 1
      do 310 j = m,n
      ll = ll + 1
      kk(j) = kk(ll)
  310 continue
  320 l = kk(1)
      n = kk(3)
      do 330 j=n,1
      kk(j) = 0
  330 continue
  340 continue
      if (m.eq.0) call  reed(lu,mm,kk,nn,mm)
      if (nvers(lu).ne.0) write(iout,11100) honor(lu),nvers(lu)
      imodd(lu) = 0
      nedum(lu) = 0
      go to 490
  350 continue
c     ****************************************************************
c     close all files
c     ****************************************************************
      j = kk(3)
      if (j.lt.7) go to 360
      if (j.gt.kk(1)) j = kk(1)
      if (ipsok(3).gt.0) write(iout,11200) (kk(i),i=1,j)
  360 continue
      do 400 l=1,99
      m=imodd(l)
      if (m.gt.0) go to 370
      if (m.lt.0) go to 390
      if (nedum(l).ne.0) call  reed(l,mm,kk,nn,mm)
      if (nvers(l).eq.0) go to 390
      go to 400
  370 continue
      if (m.eq.1) go to 380
      if (kk(m).ne.2) go to 390
      write(iout,10000)
      go to 470
  380 continue
cmri update 1 line    4/1992
c      call  closda(l)
      close(l)
  390 continue
      imodd(l) = 0
      nedum(l) = 0
  400 continue
      dd=0
      mxx = 9
      call  seek(dd,mm,mm,mxx)
      if (kk(3).lt.7.and.kk(5).eq.0) go to 500
      write(iout,10900) kk(3),kk(5)
      kk(3) = 6
      kk(4) = 1
      kk(5) = 0
      go to 500
  410 continue
      write(iout,11000) itask,lu
      go to 480
  420 continue
```

```
      write(iout,10300) itask,lu,m,imode,jmode
      go to 480
  430 continue
      write(iout,10100) itask,lu
      go to 480
  440 continue
      write(iout,10200) imode,jmode
      go to 480
  450 continue
      write(iout,10400) itask,imode,nlr,lp,iav(11)
      go to 480
  460 continue
      write(iout,10600) itask,imode,lu,kk(3),kk(4)
      ipsok(4) = 1
      go to 490
  470 call  ferr(6hdopc  ,iout,444)
  480 continue
      ipsok(4) = 2
  490 kk(5) = max0(kk(5),kk(4) - 1)
  500 continue
      return
10000 format(1h0,'****trying to use fbsam - coding error - see authors')
10100 format(1h0,28h***dopc invalid task request,2i5)
10200 format(1h0,28h***dopc invalid mode request,2i5)
10300 format(1h0,28h***dopc task request invalid,5i5)
10400 format(1h0,'***dopc request invalid, task',i5,' mode',i5,
     * 1h 'records, length, d.a. count'3i5)
10500 format(1h '***dopc opening interface file for scratch  ',a6,i4)
10600 format(1h0,'***dopc request invalid, task',i5,'mode',i5,
     * 43h no extended memory left available for unit,i5,2h ,,2i8)
c10700 format(1h 'dopc file opening data'i4,3i8,2i3,8i7)
10800 format(1h0'dopc, seek used to initialize file data')
10900 format(1h0'dopc use of container arrays, control',i8,', max data',
     *  i8)
11000 format(1h0'***dopc task requested, no control array',2i8)
11100 format(1h '***dopc cl0sing interface file  ',a6,i4)
c11200 format(1h0'dopc kk array',18i6/(1h ,i19,17i6))
11200 format(1h0'dopc kk array'/(1h ,10i12))
11300 format(1h0'***dopc opening an open file ',3i5)
11400 format(1h 'dopc file closing data - unit, arrays',5i8)
      end
```

```
cdasu          *** venture ***
c
c     setup direct access requirements
c
ctun       subroutine dasu(ida1,ida2,ida3,ida4,iout,jmax,imax,kbmax,
      subroutine dasu(ida1,ida2,ida3,ida4,nout,jmax,imax,kbmax,
     *ida5,ida6,ida7,ida8,kmax,jda,idp,idim,igom,
     *ifiss,itots,mode,
     *a,mtot,mues,mlet,
     *nr1,lrw1,nr2,lrw2,nr8,lrw8,kcsam,ltrbck)
c
      real*8 share8
c
      common/cntrl/  share8(100),share(100),lx(200)
      common/deasu/idfult,kbsam,msam,ksam,mext,kext,mad2,mad5,mad6,
     *mtots,mfiss,ntss,ltss,mtss,ktsm,nfss,lfss,mfss,kfsm
cx       common/comsam/ltrack,notep,kksta,kber
cadd
      include 'comdop.inc'
c
      dimension ipsok(10)
      dimension a(1)
c
      share(37) = mues
      muse = mues+10
      mlft = mlet-10
      mode = lx(155)
      mprl = lx(144)
      isoln = lx(157)
      iprob = lx(12)
      iponly = lx(21)
      shar39 = share(39)
      kbsam = 0
      if(share(19).gt.0.0) kbsam = 1
c
ctun       if(mprl.gt.0) go to 400
cmri update 1 line    4/1992
c      maxprl = 7200
ctun
      maxprl = 131 072 /4
ctun       maxprl = 8188
ctun       if(kbsam.gt.0) maxprl =0
ctun       go to 401
ctun  400 continue
ctun       ind = 1
ctun       maxprl = mprl
ctun       if(maxprl.gt.8188) maxprl = 8188
ctun  401 continue
c
      if(shar39   .le.0.0) write(nout,2030) maxprl
c
c     open direct access files as needed
c
      nzero = 0
c
      lrw1 = jda
      nr1 = imax*kbmax*kmax
      ilr1 = nr1*lrw1
      if(mode.eq.1 .or. mode.eq.4) go to 101
      if(mode.eq.0 .or. mode.eq.2) go to 103
      lrw2 = idp*jmax*imax
      nr2 = kbmax*kmax
      go to 102
  101 continue
      lrw2 = idp*jmax
      nr2 = imax*kbmax*kmax
```



```
      go to 102
  103 continue
      lrw2 = idp*jmax*imax*kbmax
      nr2 = kmax
  102 continue
      ilr2 = nr2*lrw2
c
      ih = 0
      if((igom.eq.10).or.(igom.eq.18)) ih = 1
      if(mode.eq.0 .or. mode.eq.2) go to 500
      if(mode.eq.3) go to 501
      if(mode.eq.5) go to 502
      lrw8 = 0
      nr8 = 0
      ilr8 = 0
      go to 5003
  501 continue
      la = 2*jmax*imax+idp*jmax*imax+(jmax+1)*imax
      if(idim.ge.2) la = la+jmax*(imax+1)
      if(idim.ge.3) la = la+2*jmax*imax
      if(ih.gt.0) la = la+(jmax+1)*(imax+1)
      lb = kbmax*kmax
      go to 503
  502 continue
      la = idp*jmax+2*jmax+jmax+1
      if(idim.ge.2) la = la+2*jmax
      if(idim.ge.3) la = la+2*jmax
      if(ih.gt.0) la = la+2*(jmax+1)
      if((la/2)*2 .ne. la) la = la + 1
      la = la*imax
      lb = kbmax*kmax
      go to 503
  500 continue
      la = idp*jmax*imax*kbmax+(jmax+1)*imax*kbmax
      if(idim.ge.2) la = la+jmax*(imax+1)*kbmax
      if(idim.ge.3) la = la+jmax*imax*(kbmax+1)
      if(ih.gt.0) la = la+(jmax+1)*(imax+1)*kbmax
      lb = kmax
      go to 503
  503 continue
      lrw8 = la
      nr8 = lb
      ilr8 = nr8*lrw8
 5003 continue
c
c     idfult = 0 - default files to core.
c
c     kbsam = 1 - use fbsam.
      idfult = 0
      if(mlft.gt.6 ) go to 600
      write(nout,2040)
      go to 699
  600 continue
      if(mlft.gt.36) go to 601
      if(kbsam.gt.0) write(nout,2041)
      kbsam = 0
      idfult = 1
      msam = 6
      go to 603
  601 continue
      if(mlft.gt.600) go to 602
      if(kbsam.gt.0) write(nout,2041)
      kbsam = 0
      msam = 36
      go to 603
  602 continue
```

```
      if(kbsam.gt.0) msam = 600
      if(kbsam.le.0) msam = 36
  603 continue
ctun      mext = mlft-msam
      mext = mlft
      ksam = muse+1
ctun      ksam = (ksam/2)*2+1
ctun      kext = ksam+msam
      kext = ksam
ctun      kext = (kext/2)*2+1
ctun mod
cx      call roxx(nzero,mext,a(kext),msam,a(ksam))
cx      call roxy(nzero,mext,a(kext),msam,a(ksam))
cx      write(66,*) ' dasu kext,mext,ksam,msam=',
cx     &            kext,mext,ksam,msam
      call roxx
      call roxy
cmod end
c
c     ts,fs,23,24,27,28,40.
      mtots = 0
      mfiss = 0
      mad1 = 0
      mad2 = 0
      mad5 = 0
      mad6 = 0
      mad8 = 0
      if(share(94).gt.0.0) idfult = 1
      if(idfult.gt.0) go to 609
      itask = 1
      do 6003 n = 1,10
      ipsok(n) = 0
 6003 continue
      ipsok(2) = 2
      mrem = mext
      krem = 1
      lfs = idp*jmax*imax*kbmax
      lfp = lfs*kmax
      lf23 = 0
      lf40 = 0
      if((mode.eq.1).or.(mode.eq.4)) go to 604
      lf40 = ilr8
      go to 605
  604 continue
      lf23 = ilr1
  605 continue
      if(iponly.lt.0) go to 6007
      if(mode.eq.0) go to 6005
      if(mode.eq.2) go to 6005
      if(mrem.lt.lfs  ) go to 609
      ipsok(1) = 0
      ipsok(5) = krem
      if((mode.eq.1).or.(mode.eq.4)) nrec = imax*kbmax
      if((mode.eq.1).or.(mode.eq.4)) lrec = idp*jmax
      if((mode.eq.3).or.(mode.eq.5)) nrec = kbmax
      if((mode.eq.3).or.(mode.eq.5)) lrec = idp*jmax*imax
      nwds = lfs
      nfss = nrec
      lfss = lrec
      mfss = nwds
      kfsm = krem
c
c     call dopc(itask,ifiss,nrec,lrec,nwds,ipsok)
c     this file is opened in diff.
      lrem = krem+lfs
      lrem = (lrem/2)*2+1
```



```
      nrem = mext-lrem+1
      if(shar39   .le.0.0) write(nout,2045) ifiss,nrec,lrec,nwds,krem,
     *nrem
      if(ipsok(4).ne.0) go to 800
      mfiss = 1
      krem = krem+lfs
      krem = (krem/2)*2+1
      mrem = mext-krem+1
      if(mrem.lt.lfs  ) go to 609
      ipsok(1) = 0
      ipsok(5) = krem
      if((mode.eq.1).or.(mode.eq.4)) nrec = imax*kbmax
      if((mode.eq.1).or.(mode.eq.4)) lrec = idp*jmax
      if((mode.eq.3).or.(mode.eq.5)) nrec = kbmax
      if((mode.eq.3).or.(mode.eq.5)) lrec = idp*jmax*imax
      nwds = lfs
      ntss = nrec
      ltss = lrec
      mtss = nwds
      ktsm = krem
c
c     call dopc(itask,itots,nrec,lrec,nwds,ipsok)
c     this file is opened in diff.
      lrem = krem+lfs
      lrem = (lrem/2)*2+1
      nrem = mext-lrem+1
      if(shar39   .le.0.0) write(nout,2045) itots,nrec,lrec,nwds,krem,
     *nrem
      if(ipsok(4).ne.0) go to 800
      mtots = 1
      krem = krem+lfs
      krem = (krem/2)*2+1
      mrem = mext-krem+1
 6005 continue
      if(mrem.lt.lfp  ) go to 609
      ipsok(1) = 2
      ipsok(5) = krem
      if((mode.eq.1).or.(mode.eq.4)) nrec = imax*kbmax*kmax
      if((mode.eq.1).or.(mode.eq.4)) lrec = idp*jmax
      if((mode.eq.3).or.(mode.eq.5)) nrec = kbmax*kmax
      if((mode.eq.3).or.(mode.eq.5)) lrec = idp*jmax*imax
      if((mode.eq.0).or.(mode.eq.2)) nrec = kmax
      if((mode.eq.0).or.(mode.eq.2)) lrec = idp*jmax*imax*kbmax
      nwds = lfp
chun      call dopc(itask,ida2 ,nrec,lrec,nwds,ipsok)
ctun      call dopc(itask,ida2,nrec,lrec,nwds,ipsok,a(ksam))
      call dopc(itask,ida2,nrec,lrec,nwds,ipsok)
      lrem = krem+lfp
      lrem = (lrem/2)*2+1
      nrem = mext-lrem+1
      if(shar39   .le.0.0) write(nout,2045) ida2 ,nrec,lrec,nwds,krem,
     *nrem
      if(ipsok(4).ne.0) go to 800
      mad2 = 1
      krem = krem+lfp
      krem = (krem/2)*2+1
      mrem = mext-krem+1
  606 continue
 6007 continue
      if(mrem.lt.lfp  ) go to 609
      ipsok(1) = 2
      ipsok(5) = krem
      if((mode.eq.1).or.(mode.eq.4)) nrec = imax*kbmax*kmax
      if((mode.eq.1).or.(mode.eq.4)) lrec = idp*jmax
      if((mode.eq.3).or.(mode.eq.5)) nrec = kbmax*kmax
      if((mode.eq.3).or.(mode.eq.5)) lrec = idp*jmax*imax
```

```
      if((mode.eq.0).or.(mode.eq.2)) nrec = kmax
      if((mode.eq.0).or.(mode.eq.2)) lrec = idp*jmax*imax*kbmax
      nwds = lfp
chun  call dopc(itask,ida5 ,nrec,lrec,nwds,ipsok)
ctun      call dopc(itask,ida5,nrec,lrec,nwds,ipsok,a(ksam))
      call dopc(itask,ida5,nrec,lrec,nwds,ipsok)
      lrem = krem+lfp
      lrem = (lrem/2)*2+1
      nrem = mext-lrem+1
      if(shar39   .le.0.0) write(nout,2045) ida5 ,nrec,lrec,nwds,krem,
     *nrem
      if(ipsok(4).ne.0) go to 800
      mad5 = 1
      krem = krem+lfp
      krem = (krem/2)*2+1
      mrem = mext-krem+1
      if(mrem.lt.lfp  ) go to 609
      ipsok(1) = 2
      ipsok(5) = krem
      if((mode.eq.1).or.(mode.eq.4)) nrec = imax*kbmax*kmax
      if((mode.eq.1).or.(mode.eq.4)) lrec = idp*jmax
      if((mode.eq.3).or.(mode.eq.5)) nrec = kbmax*kmax
      if((mode.eq.3).or.(mode.eq.5)) lrec = idp*jmax*imax
      if((mode.eq.0).or.(mode.eq.2)) nrec = kmax
      if((mode.eq.0).or.(mode.eq.2)) lrec = idp*jmax*imax*kbmax
      nwds = lfp
chun  call dopc(itask,ida6 ,nrec,lrec,nwds,ipsok)
ctun      call dopc(itask,ida6,nrec,lrec,nwds,ipsok,a(ksam))
      call dopc(itask,ida6,nrec,lrec,nwds,ipsok)
      lrem = krem+lfp
      lrem = (lrem/2)*2+1
      nrem = mext-lrem+1
      if(shar39   .le.0.0) write(nout,2045) ida6 ,nrec,lrec,nwds,krem,
     *nrem
      if(ipsok(4).ne.0) go to 800
      mad6 = 1
      krem = krem+lfp
      krem = (krem/2)*2+1
      mrem = mext-krem+1
      if(lf23.gt.0) go to 607
      if(lf40.gt.0) go to 608
  607 continue
      if(mrem.lt.lf23 ) go to 609
      ipsok(1) = 2
      ipsok(5) = krem
      nrec = nr1
      lrec = lrw1
      nwds = lf23
      call dopc(itask,ida1 ,nrec,lrec,nwds,ipsok)
      lrem = krem+lf23
      lrem = (lrem/2)*2+1
      nrem = mext-lrem+1
      if(shar39   .le.0.0) write(nout,2045) ida1 ,nrec,lrec,nwds,krem,
     *nrem
      if(ipsok(4).ne.0) go to 800
      mad1 = 1
      krem = krem+lf23
      krem = (krem/2)*2+1
      mrem = mext-krem+1
      go to 609
  608 continue
      if(mrem.lt.lf40 ) go to 609
      ipsok(1) = 2
      ipsok(5) = krem
      nrec = nr8
      lrec = lrw8
```



```
      nwds = lf40
      call dopc(itask,ida8 ,nrec,lrec,nwds,ipsok)
      lrem = krem+lf40
      lrem = (lrem/2)*2+1
      nrem = mext-lrem+1
      if(shar39   .le.0.0) write(nout,2045) ida8 ,nrec,lrec,nwds,krem,
     *nrem
      if(ipsok(4).ne.0) go to 800
      mad8 = 1
      krem = krem+lf40
      krem = (krem/2)*2+1
      mrem = mext-krem+1
  609 continue
c
      itask = 1
      do 700 l=1,10
      ipsok(l) = 0
  700 continue
      ipsok(1) = 2
      if(kbsam.gt.0) ipsok(2) = 1
      ipsok(7) = maxprl
c
c
c     ida1 = 23 equation constants (row modes)
c
      if(mad1.gt.0) go to 301
      if(mode.eq.1 .or. mode.eq.4) go to 201
      if(share(36).le.0.0) go to 301
  201 continue
      if(shar39   .le.0.0) write(nout,2031) ida1,nr1,lrw1
c
      call dopc(itask,ida1,nr1,lrw1,ilr1,ipsok)
c
      if(ipsok(4).ne.0) go to 800
  301 continue
      if(iponly.lt.0) go to 760
c
c     ida2 = 24 flux
c
      if(mad2.gt.0) go to 760
      if(shar39   .le.0.0) write(nout,2031) ida2,nr2,lrw2
c
      call dopc(itask,ida2,nr2,lrw2,ilr2,ipsok)
c
      if(ipsok(4).ne.0) go to 800
c
c     ida5 = 27 flux
c
  760 continue
      if(mad5.gt.0) go to 701
      nr5 = nr2
      lrw5 = lrw2
      ilr5 = ilr2
      if(shar39   .le.0.0) write(nout,2031) ida5,nr5,lrw5
c
      call dopc(itask,ida5,nr5,lrw5,ilr5,ipsok)
c
      if(ipsok(4).ne.0) go to 800
c
c     ida6 = 28 flux
c
  701 continue
      if(mad6.gt.0) go to 702
      nr6 = nr2
      lrw6 = lrw2
      ilr6 = ilr2
```

```
      if(shar39   .le.0.0) write(nout,2031) ida6,nr6,lrw6
c
      call dopc(itask,ida6,nr6,lrw6,ilr6,ipsok)
c
      if(ipsok(4).ne.0) go to 800
c
c     ida7 = 29 p1 current
c
  702 continue
      if(isoln.ne.2) go to 307
      nr7 = nr2
      lrw7 = lrw2
      ilr7 = ilr2
      if(shar39   .le.0.0) write(nout,2031) ida7,nr7,lrw7
c
      call dopc(itask,ida7,nr7,lrw7,ilr7,ipsok)
c
      if(ipsok(4).ne.0) go to 800
  307 continue
c
c     ida8 = 40 equation constants (other modes)
      if(mad8.gt.0) go to 404
      if(nr8.le.0) go to 404
      if(shar39   .le.0.0) write(nout,2031) ida8,nr8,lrw8
c
      call dopc(itask,ida8,nr8,lrw8,ilr8,ipsok)
c
      if(ipsok(4).ne.0) go to 800
  404 continue
c
c
  900 continue
      kcsam = kbsam
      ltrbck = ltrack
      mad = mad1+mad2+mad5+mad6+mad8
      if(kbsam.le.0) go to 999
      if(mad.eq.5) go to 999
      write(nout,3067) ltrack
  999 continue
c
      return
c
  800 continue
      write(nout,1014)
  699 continue
      ner = 113
      call ferr(6hdasu  ,nout,ner)
c     will stop in ferr
      go to 900
c
 1014 format(1h0,43htrouble trying to open a direct access file)
 2030 format(1h0,5x,36hspecial scratch dataset requirements/
     * 1h ,5x,27hmaximum physical record is ,i8,6h words)
 2031 format(1h ,18hdirect access file,i3,10h  requires,i10,
     *  8h records,3x,i10,16h words in length)
 2040 format(1h0,'less than 6 storage locations avaliable for oppenning
     *files')
 2041 format(1h0,'not enough storage locations to use fbsam')
ctun 2045 format(1h ,'file',i3,' defaults to core - no.recs, rec.lnth, tot.l
ctun     *nth, start loc, core left.',5i7)
 2045 format(1h ,'file ',i3,' defaults to core '/
     &       '   # of logical records in file =',i10,
     &       '   logical record length (word) =',i10/
     &       '   length of the file (word)    =',i10,
     &       '   start location in core (word)=',i10/
     &       '   remaining core (word)        =',i10)
```



```
 3067 format(1h0,'random access i/o will use fbsam - max block size is',
     *i6,' bytes')
      end
```

```
crite data transfer routine, ornl version
c        modified 4-15-76 ornl version
      subroutine rite(lun,irec,array,nwds,mode)
c
chng added
      include 'comdop.inc'
      common /pnc/mem,x(1)
      common /trimos/ i$gues ,ii$tri ,jj$tri ,vol$bl,ltadrs
      common/deasu/idfult,kbsam,msam,ksam,mext,kext,mad2,mad5,mad6,
     *mtots,mfiss,ntss,ltss,mtss,ktsm,nfss,lfss,mfss,kfsm
cadd end
chng      dimension array(nwds),  kk(1), lll
      dimension array(nwds)
c
      real*8 honor
c
c     this routine packages the procedures for transfer of data between
c     memory and disk and memory - memory (pseudo extended core)
c
c     on some computers it will be necessary to communicate the
c       starting addresses of arrays kk and x in some other manner
c
c     lun       logical unit number of the file
c     irec      record number to be addressed
c                   if 0, rewind only
c                   if .lt. 0, end file and rewind only
c     array     reference array in core to provide location for transfer
c     nwds      length of the array the be transferred
c     mode      used for asynchronous operations
c                 0- no
c                 1- transfer operation
c                 2- check previous transfer completion, required as a
c                    special or extra call prior to use of the data,
c                    except when protection is provided by a subsequent
c                    call for additional data transfer prior to use
      io = 0
c--------
cx      write(66,*) ' * rite * '
cx      write(66,*) ' * rite * lun,irec,nwds,mode,nedum,imodd=',
cx     &                       lun,irec,nwds,mode,nedum(lun),imodd(lun)
c--------
      go to 110
c
c     variable length data blocks communicated here (on some of the
c       systems, this won't work - a fixed common block can be used)
chng      entry roxx ( n , m , x , lxx , kk )
      entry roxx
c
c     m         length of the extended core data container array x
c     x         extended core data container array
c     l         length of the kk control array
c     kk        control array
c     kk(1)         length of the control array
c     kk(2)         size of the extended core data container array
c     kk(3)         use of the space for control data
c     kk(4)         amount of the extended core data array used
c     kk(5)         largest use of the extended core data array
chng added
       lxx = msam
       m   = mext
cend
      kk(1) = lxx
      kk(2) = m
      if (lxx.lt.5) go to 330
      kk(3) = 6
      kk(4) = 1
```



```
      do 100 i =5,lxx
      kk(i) = 0
  100 continue
      write(iout,10300) kk(1),kk(2)
      go to 330
creed data transfer from auxiliary device
      entry reed (lun,irec,array,nwds,mode)
      io = 1
  110 continue
      if (lun.le.0) go to 300
      if (lun.gt.100) go to 300
      lll = imodd(lun)
      if (lll.gt.1) go to 120
      if (mode.gt.1) go to 330
      if (lll.eq.0) go to 220
      if (lll.eq.1) go to 290
      go to 310
  120 m = kk(lll)
      if (m.eq.2) go to 130
      if (mode.gt.1) go to 330
      go to 140
c       local data access technique
  130 continue
      write(iout,10000)
      go to 320
c     core to core, random, ordered
  140 continue
      if (irec.gt.kk(lll+1)) go to 310
      if (irec.gt.1) go to 150
      if (m.ne.3) nedum(lun) = 1
      kk(lll+3) = 1
      if (irec.lt.1) go to 330
  150 if (m.gt.3) go to 160
      kad = kk(lll+2) + (irec-1)*nedum(lun)
      go to 210
  160 continue
      kad = nedum(lun) - 1
      if (irec.eq.kk(lll+3)) go to 190
      if (irec.ne.kk(lll+3)-1) go to 170
      kad = kad + kk(lll+2) -kk(lll+4)
      go to 210
  170 if (m.ne.5) go to 310
      kad = -1
      j = lll + 5
      lk = j + irec - 1
      do 180 i=j,lk
      if (kk(i).eq.0) go to 310
      kad=kad + kk( i)
  180 continue
      nedum(lun) = kad
  190 if (m.ne.5) go to 200
      if (io.gt.0) go to 200
      ll = lll + 4 + irec
      kk(ll) = nwds
  200 kad = kad + kk(lll+2)
      nedum(lun) = nedum(lun) + nwds
      if (io.eq.0) kk(lll+4) = nwds
  210 continue
chng
        ktmp = kext+ltadrs
        kad  = ktmp+kad
      if (io.eq.0) call  crit(array,x(kad),nwds,j)
      if (io.eq.1) call  cred(array,x(kad),nwds,j)
chng end
      kk(lll+3) = irec +1
      go to 330
```

```
c       fortran sequential
  220 continue
      if (irec.le.0) go to 280
      if (nedum(lun).gt.0) go to 240
      if (io.eq.0) go to 230
      write(iout,10100) lun
  230 nedum(lun) = 1
  240 iskip = irec-nedum(lun)
      if (iskip.eq.0) go to 270
      if (iskip.gt.0) go to 250
      rewind lun
      iskip = irec-1
      if (iskip.le.0) go to 270
  250 continue
      do 260 n = 1,iskip
      read(lun)
  260 continue
  270 continue
      if (io.eq.0) write(lun) array
      if (io.eq.1) read(lun) array
      nedum(lun) = irec+1
      go to 330
  280 continue
      if (io.eq.0.and.irec.lt.0) end file lun
      rewind lun
      if (nedum(lun).ne.0) nedum(lun) = 1
      go to 330
c       fortran direct access
  290 continue
      if (irec.le.0) go to 330
      nblk = nedum(lun)
c      nrec = (irec -1)*nblk +1
chng      if (io.eq.0) write(lun'nrec) (array(ia),ia=1,nwds)
chng      if (io.eq.1) read(lun'nrec)  (array(ia),ia=1,nwds)
         nrec = (irec-1)*nblk
         114  = nnnrec(lun)
         ial  = 0
         do 295 iii=1,nblk
         ias  = ial + 1
         ial  = ias + 114 - 1
         if( ial.gt.nwds ) ial = nwds
         nrec = nrec + 1
         if( io.eq.0 ) write(lun,rec=nrec) (array(ia),ia=ias,ial)
         if( io.eq.1 ) read (lun,rec=nrec) (array(ia),ia=ias,ial)
295      continue
chng end
      go to 330
  300 write(iout,10200) lun
      go to 330
  310 write(iout,10200) lun, nedum(lun), imodd(lun),irec,nwds
  320 call  ferr(6hrite  ,iout,444)
  330 continue
      return
10000 format(1h0,'****trying to use fbsam - coding error - see authors')
10100 format(1h0,'***reed warning, unit',i5,
     * 47h  will be read but it may not have been written)
10200 format(1h '***reed routine i/o error, unit'3i8,' record',i8,
     * ' words',i8)
10300 format(1h0,'rite container arrays, control',i8,' data',i8)
      end
```

付録２　テスト計算結果

以下に、ＳＵＮワークステーション上で実行したテスト計算結果を示す。この結果は本文中で引用している。他の解法についても同様に問題なく実行できているが、ここでは詳細メッシュ計算の結果のみを添付する。

なお、印刷の都合上一行が１３３カラム表示できず重複している部分がある。

```
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step no.1-1 cell.(cr na-follower)                                                        cpu time (sec)

     cross section file informations
      following cross section set was read

        set=   1  title=IN  CORE            (1)
                 type= -2  nn= 27  ng=  7
        xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
        xs id =  29  30
        set=   2  title=OUT CORE            (2)
                 type= -2  nn= 27  ng=  7
        xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
        xs id =  29  30
        set=   3  title=AX  BLANK(UPPER)    (3)
                 type= -2  nn= 27  ng=  7
        xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
        xs id =  29  30
        set=   4  title=AX  BLANK(LOWER)    (4)
                 type= -2  nn= 27  ng=  7
        xs id =   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  20  21  22  23  24  25  26  27  28
        xs id =  29  30
        set=   5  title=NA  FOLLOWER   1    (5)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=   6  title=NA  FOLLOWER   2    (6)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=   7  title=GEM                      (7)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=   8  title=UP-PLENUM(CORE        (8)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=   9  title=LO-PLENUM(CORE       (9)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=  10  title=UP  SHIELD (CORE-B4C)(10)
                 type= -2  nn=  9  ng=  7
        xs id =  17  18  19  21  22  23  24  25  26
        set=  11  title=GEM-SHIELD(UPPER)   (11)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=  12  title=LOW SHIELD           (12)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=  13  title=RD  SHIELD(SUS)     (13)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=  14  title=RD  SHIELD(B4C)     (14)
                 type= -2  nn=  9  ng=  7
        xs id =  17  18  19  21  22  23  24  25  26
        set=  15  title=GEM-UPPER-PLENUM    (15)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=  16  title=CR(CCR)              (1)
                 type= -2  nn=  9  ng=  7
        xs id =  17  18  19  21  22  23  24  25  26
        set=  17  title=CR(BCR)              (1)
                 type= -2  nn=  9  ng=  7
        xs id =  17  18  19  21  22  23  24  25  26
        set=  18  title=CR(BCR)              (2)
                 type= -2  nn=  6  ng=  7
        xs id =  21  22  23  24  25  26
        set=  19  title=CR(BCR)              (3)
                 type= -2  nn=  9  ng=  7
        xs id =  17  18  19  21  22  23  24  25  26
        set=  20  title=CR(BCR)              (4)
                 type= -2  nn=  9  ng=  7
        xs id =  17  18  19  21  22  23  24  25  26
 at Rload; no.  1 nload=  1 kload=  1 ires=  0 kflg=  0
```

B-3

```
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fbrco 1st cycle boc calculation (full core model) 96/10/17                    Tue Apr  8 21:06:31 1997  page   2
0s0ep no.1-1 cell.(cr na-follower)                                                       cpu time (sec)    17.8

                                  edit option list     (setup module)

 1) edit option data list print      (0=no,1=yes) .         1   26) assembly/layer no. plot  (0=no,1=asm,2=l+lay) .   0
 2) general input data list print    (0=no,1=yes) .         1   27) assembly group no. plot           (0=no,1=yes) .   0
 3) library data list print          (0=no,1=yes) .         1   28) orifice zone no. plot             (0=no,1=yes) .   0
 4) assembly group - mixture group   (0=no,1=yes) .         1   29) ..............................................    0
 5) region - mixture region table    (0=no,1=yes) .         1   30) ..............................................    0
 6) axial geometry by groups   (0=no,1=cr,2=all) .          0   31) ..............................................    0
 7) assembly no. map print           (0=no,1=yes) .         1   32) ..............................................    0
 8) assembly group map print         (0=no,1=yes) .         1   33) ..............................................    0
 9) mixture group map print          (0=no,1=yes) .         0   34) ..............................................    0
10) orifice zone map print           (0=no,1=yes) .         0   35) ..............................................    0
11) subchannel temp. cal.assembly map(0=no,1=yes) .         0   36) ..............................................    0
12) fine mesh dep. cal. assembly map (0=no,1=yes) .         0   37) ..............................................    0
13) control rod draw stroke print    (0=no,1=yes) .         1   38) ..............................................    0
14) ..............................................          0   39) ..............................................    0
15) ..............................................          0   40) ..............................................    0
16) ..............................................          0   41) ..............................................    0
17) ..............................................          0   42) ..............................................    0
18) ..............................................          0   43) ..............................................    0
19) ..............................................          0   44) ..............................................    0
20) ..............................................          0   45) ..............................................    0
21) ..............................................          0   46) ..............................................    0
22) ..............................................          0   47) ..............................................    0
23) ..............................................          0   48) ..............................................    0
24) ..............................................          0   49) ..............................................    0
25) ..............................................          0   50) ..............................................    0

                                  edit of report data list (setup module)

( 1) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 2) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 3) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 4) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 5) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 6) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 7) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 8) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
( 9) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
(10) ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
     ..........................  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
```

fBrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

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cpu time (sec) 17s8ep

fBrco 1st cycle boc calculation (full core model) 96/10/17
no.1-1 cell.(cr na-follower)

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cpu time (sec) 17.8

general input data list (setup module)

nsym	rotational symmetry (1,2,3,6)	2
nlay	no. of layers (include center block)	19
nplu	no. of planes	58
nazn	no. of axial zones	16
naem	material type no. for axial expansion	1
naee	element no. for axial expansion	3
naea	sub assembly no. for axial expansion	2
naet	temperature no. for axial expansion	4
nrem	material type no. for radial expansion	1
nree	element no. for radial expansion	3
nblc	no. of sub assemblies.....	343
nbcl	no. of outside assemblies	381
nagp	no. of assembly groups	8
nmx	no. of mixture groups	5
norf	no. of orifice zones	0
nrg	no. of regions	15
nmix	no. of mixture regions	8
nadc	no. of fine mesh depletion cal. assemblies .	0
natc	no. of subchannel temp. cal. assemblies	0

tin	operation coolant inlet temp (deg.c)	3.950000E+02
fpitch	hot/cold of subassembly pitch fraction	1.000000E+00
cpitch	cold sub assembly pitch (cm)	1.581000E+01
hpitch	hot-op sub assembly pitch (cm)	1.581000E+01
hxarea	hexagonal area (cm**2)	2.164683E+02
height	core height (cm)	3.889999E+02
hexvol	subassembly volume (cm**3)	8.420617E+04

cross section library data

nlib	library cross section option	0
nset	no. of cross section sets	20
nnuc	no. of nuclides	30
nrac	no. of reactions	6
nhat	heating cross section option	1
ngrp	no. of energy groups	7
nfgp	group no. for fast flux energy (e>0.1mev) .	3
nfuel	no. of fuel nuclides	16
nfp	no. of fp nuclides	4

-- nuclide --		--------- o p t i o n ---------				- atomic -	- fission -	- capture -	-- decay --
no.	name	fis	nburn	nanal	klib	weight	energy	energy	constants
1	pu238	2	3	0	1	2.38050E+02	3.15500E-11	0.00000E+00	0.00000E+00
2	pu239	2	1	0	1	2.39055E+02	3.22200E-11	0.00000E+00	0.00000E+00
3	pu240	2	2	0	1	2.40054E+02	3.24400E-11	0.00000E+00	0.00000E+00
4	pu241	2	1	0	1	2.41057E+02	3.24800E-11	0.00000E+00	1.52600E-09
5	pu242	2	2	0	1	2.42059E+02	3.30100E-11	0.00000E+00	0.00000E+00
6	u235	1	1	0	1	2.35044E+02	3.12700E-11	0.00000E+00	0.00000E+00
7	u236	1	3	0	1	2.36046E+02	3.34000E-11	0.00000E+00	0.00000E+00
8	u238	1	2	0	1	2.38051E+02	3.50000E-11	0.00000E+00	0.00000E+00
9	am241	2	3	0	1	2.41056E+02	3.53800E-11	0.00000E+00	0.00000E+00
10	am242m	2	3	0	1	2.42060E+02	3.44900E-11	0.00000E+00	0.00000E+00
11	am243	2	3	0	1	2.43061E+02	3.44300E-11	0.00000E+00	0.00000E+00
12	np237	1	3	0	1	2.37048E+02	3.33600E-11	0.00000E+00	0.00000E+00
13	cm242	2	3	0	1	2.42059E+02	3.51000E-11	0.00000E+00	4.92182E-08
14	cm243	2	3	0	1	2.43060E+02	3.51600E-11	0.00000E+00	0.00000E+00
15	cm244	2	3	0	1	2.44063E+02	3.40100E-11	0.00000E+00	0.00000E+00
16	cm245	2	3	0	1	2.45066E+02	3.52900E-11	0.00000E+00	0.00000E+00
17	b-10	0	7	0	1	1.00123E+01	0.00000E+00	0.00000E+00	0.00000E+00
18	b-11	0	7	0	1	1.10093E+01	0.00000E+00	0.00000E+00	0.00000E+00
19	c	0	7	0	1	1.20110E+01	0.00000E+00	0.00000E+00	0.00000E+00
20	o	0	5	0	1	1.59990E+01	0.00000E+00	0.00000E+00	0.00000E+00
21	na	0	6	0	1	2.29900E+01	0.00000E+00	0.00000E+00	0.00000E+00
22	fe	0	6	0	1	5.58470E+01	0.00000E+00	0.00000E+00	0.00000E+00
23	cr	0	6	0	1	5.19960E+01	0.00000E+00	0.00000E+00	0.00000E+00
24	ni	0	6	0	1	5.87000E+01	0.00000E+00	0.00000E+00	0.00000E+00
25	mo	0	6	0	1	9.59400E+01	0.00000E+00	0.00000E+00	0.00000E+00
26	mn	0	6	0	1	5.49380E+01	0.00000E+00	0.00000E+00	0.00000E+00
27	u235-fp	-1	4	0	1	2.35044E+02	0.00000E+00	0.00000E+00	0.00000E+00
28	u238-fp	-1	4	0	1	2.38051E+02	0.00000E+00	0.00000E+00	0.00000E+00
29	pu239-fp	-1	4	0	1	2.39055E+02	0.00000E+00	0.00000E+00	0.00000E+00
30	pu241-fp	-1	4	0	1	2.41057E+02	0.00000E+00	0.00000E+00	0.00000E+00

fbrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

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cpu time (sec) 17s8ep no.1-1 cell.(cr na-follower)

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cpu time (sec) 17.3

assembly group table

assembly group table

no.	name		flag	mix.	edit.	attr.	plot.	name	assem
1	incore	init	1	1	1	1	1	icl	67
2	oucore	init	1	2	1	2	2	ocl	32
3	gem	na	1	3	1	4	0	gem	22
4	radial	shisus	1	4	1	4	0	rss	108
5	radial	shib4c	1	4	1	4	0	rsh	102
6	course	rod	2	5	1	4	-1	ccr	6
7	fine	rod	2	5	1	4	-1	fcr	2
8	backup	rod	2	5	1	4	-1	bcr	2
	total								341

mixture group table

no.	name		assem
1	incore	init	67
2	oucore	init	32
3	gem	na	22
4	radial	shib4c	210
5	backup	rod	10
	total		341

region table

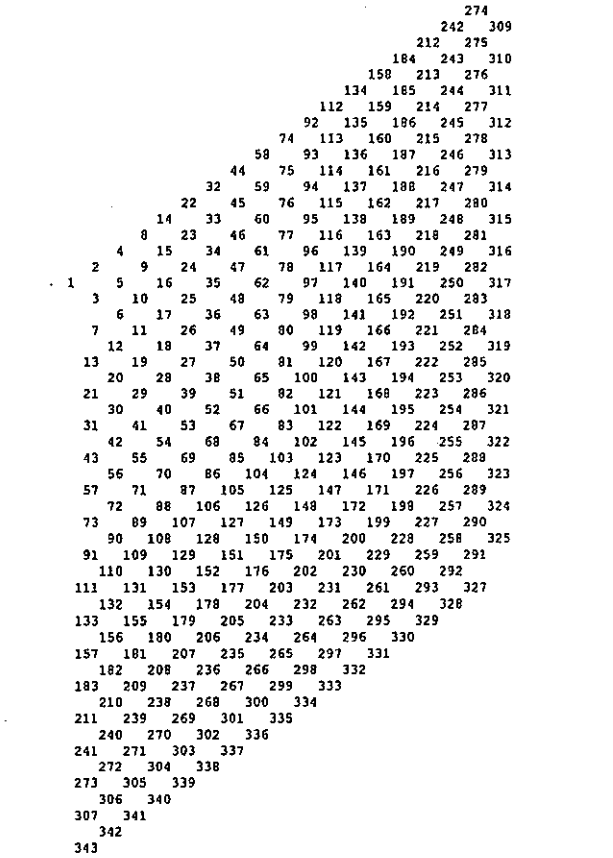
region table

no.	name		x-sect.	mixture	edit.op.	attr.	plot.rgn	atr.name	volume
1	incore	init	1	1	1	1	1	\icl	1.435906E+06
2	oucore	init	2	2	1	1	1	\oil	6.926985E+05
3	axbla	upper	3	3	1	2	1	\abu	7.450122E+05
4	axbla	lower	4	3	1	2	1	\abl	7.450119E+05
5	na	foll1	5	4	0	5	0	\nac	6.736494E+05
6	na	foll2	6	4	0	5	0	\nab	3.658314E+05
7	gem	na	7	5	0	5	0	\gem	1.204863E+06
8	upplenumcore		8	6	0	3	0	\upc	4.092332E+05
9	loplenumcore		9	6	0	3	0	\lpc	2.235036E+06
10	upb4c	shield	10	7	0	3	0	\usc	1.426166E+06
11	upgem	shield	11	7	0	3	0	\ugs	3.190743E+05
12	lower	shield	12	7	0	3	0	\lsc	4.818938E+05
13	radial	susshie	13	8	0	5	0	\rsh	9.094266E+06
14	radial	b4cshie	14	8	0	5	0	\rsb	8.589029E+06
15	gen	upplenum	15	5	0	5	0	\gep	2.404963E+05
	total								2.865817E+07

mixture region table

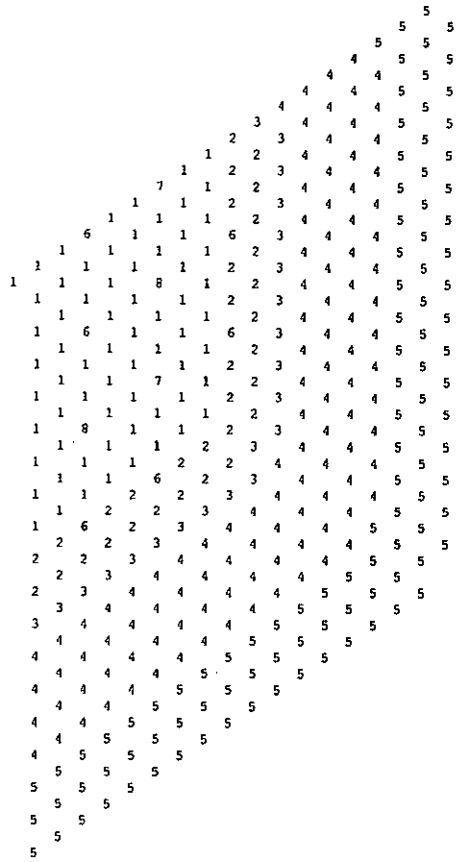
no.	name		volume
1	incore	init	1.435906E+06
2	oucore	init	6.926985E+05
3	axbla	lower	1.490024E+06
4	na	foll2	1.039481E+06
5	gem	upplenum	1.445359E+06
6	loplenumcore		2.644269E+06
7	lower	shield	2.227134E+06
8	radial	b4cshie	1.768330E+07
	total		2.865817E+07

assembly no. map



fbrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

assembly group map



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cpu time (sec) 17.8

fBrco 1st cycle boc calculation (full core model) 96/10/17
17.8ep no.1-1 cell.(cr na-follower)

control rod draw stroke (cm)

	389.0	
389.0		389.0
	389.0	
389.0		389.0
	389.0	
389.0		
	389.0	
389.0		

edit option list (fuel management module)

1)	edit option data list print	(0=no,1=yes) .	1	26)	loading assembly group map plot	(0=no,1=yes) .	0
2)	general input data list print	(0=no,1=yes) .	1	27)	discharged fuel stay days plot	(0=no,1=yes) .	0
3)	loading assembly groups map	(0=no,1=yes) .	1	28)	refueling pattern map plot	(0=no,n=yes) .	0
4)	stay cycle map	(0=no,1=yes) .	1	29)	dis.exp.plt(core)	(0=no,1=ave,2=1+elm,3=2+pel) .	0
5)	stay days map	(0=no,1=yes) .	1	30)	dis.exp.plt(blkt)	(0=no,1=ave,2=1+elm,3=2+pel) .	0
6)	discharged information (mix.grp)	(0=no,1=yes) .	1	31)	.....		0
7)	discharged information (asm.grp)	(0=no,1=yes) .	1	32)	.....		0
8)	discharged information (orifice)	(0=no,1=yes) .	0	33)	.....		0
9)	discharged information (assembly)	(0=no,1=yes) .	0	34)	.....		0
10)	loading information (mix.grp)	(0=no,1=yes) .	1	35)	.....		0
11)	loading information (asm.grp)	(0=no,1=yes) .	1	36)	.....		0
12)	loading information (orifice)	(0=no,1=yes) .	0	37)	.....		0
13)	loading information (assembly)	(0=no,1=yes) .	0	38)	.....		0
14)	.....		0	39)	.....		0
15)	.....		0	40)	.....		0
16)	.....		0	41)	.....		0
17)	.....		0	42)	.....		0
18)	.....		0	43)	.....		0
19)	.....		0	44)	.....		0
20)	.....		0	45)	.....		0
21)	.....		0	46)	.....		0
22)	.....		0	47)	.....		0
23)	.....		0	48)	.....		0
24)	.....		0	49)	.....		0
25)	.....		0	50)	.....		0

edit of report data list (fuel management module)

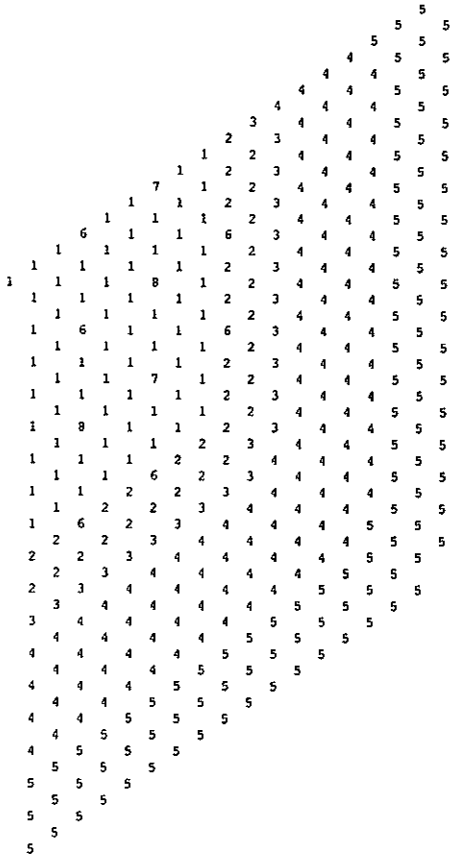
(1)	refueling patt. map plot .	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(first.#, strt.#, end#) ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(3)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(5)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(6)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(7)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(8)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(9)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(10)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

general input data list (fuel management module)

nlod	refueling pattern no.	1
nald	no. of loading fuel assemblies	99
nadh	no. of discharged fuel assemblies	0
detim	refueling time (days)	456.0
ncyl	maximum stay cycles	0

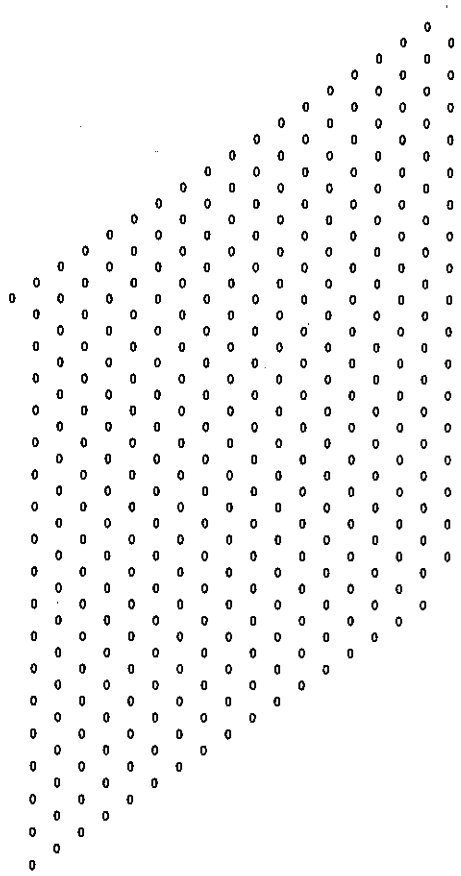
Ebrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

loading assembly group map



Tue Apr 8 21:06:32 1997 page Ebrco 1st cycle boc calculation (full core model) 96/10/17
cpu time (sec) 18.5 Sep no.1-1 cell.(cr na-follower)

stay cycle map



fbrco 1st cycle boc calculation (full core model) 96/10/17 Tue Apr 8 21:06:32 1997 page
step no.1-1 cell.(cr na-follower) cpu time (sec) 18

stay days map

```
                                                                    0.0
                                                                0.0     0.0
                                                            0.0     0.0
                                                        0.0     0.0     0.0
                                                    0.0     0.0     0.0
                                                0.0     0.0     0.0     0.0
                                            0.0     0.0     0.0     0.0
                                        0.0     0.0     0.0     0.0     0.0
                                    0.0     0.0     0.0     0.0     0.0
                                0.0     0.0     0.0     0.0     0.0     0.0
                            0.0     0.0     0.0     0.0     0.0     0.0
                        0.0     0.0     0.0     0.0     0.0     0.0     0.0
                    0.0     0.0     0.0     0.0     0.0     0.0     0.0
                0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
            0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0     0.0
        0.0     0.0     0.0     0.0
    0.0     0.0     0.0     0.0
        0.0     0.0     0.0
    0.0     0.0     0.0
        0.0     0.0
    0.0     0.0
        0.0
    0.0
```


fBrco 1st cycle boc calculation (full core model) 96/10/17 Tue Apr 8 21:06:32 1997 page 14
step no.1-1 cell.(cr na-follower) cpu time (sec) 18.4

loading fuels information mixture groups

1. no. name — 1. incore init — 2. oucore init

2. no. of fuels — 67 fuels — 32 fuels

3. inventory

	--- c o r e --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)	--- c o r e --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)
1 pu238	14.19	0.27	0.00	0.00	9.94	0.40	0.00	0.00
2 pu239	484.90	9.30	0.00	0.00	339.82	13.60	0.00	0.00
3 pu240	208.65	4.00	0.00	0.00	146.22	5.85	0.00	0.00
4 pu241	76.78	1.47	0.00	0.00	53.81	2.15	0.00	0.00
5 pu242	39.23	0.75	0.00	0.00	27.49	1.10	0.00	0.00
6 u235	13.14	0.25	11.79	0.30	5.74	0.23	5.63	0.30
7 u236	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8 u238	4368.44	83.75	3919.34	99.70	1908.87	76.37	1871.92	99.70
9 am241	10.85	0.21	0.00	0.00	7.60	0.30	0.00	0.00
10 am242m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11 am243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12 np237	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13 cm242	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14 cm243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 cm244	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16 cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
u total	4381.59	84.00	3931.13	100.00	1914.62	76.60	1877.55	100.00
pu total	834.59	16.00	0.00	0.00	584.88	23.40	0.00	0.00
pu fiss.	561.68	10.77	0.00	0.00	393.63	15.75	0.00	0.00
(u + pu)	5216.18	100.00	3931.13	100.00	2499.50	100.00	1877.55	100.00
20 o	693.24	11.73	528.92	11.86	332.03	11.73	252.62	11.86
uo2 total	4964.53	84.01	4460.05	100.00	2169.35	76.61	2130.17	100.00
puo2 total	944.89	15.99	0.00	0.00	662.18	23.39	0.00	0.00
mo2 total	5909.42	100.00	4460.05	100.00	2831.53	100.00	2130.17	100.00
27 u235-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
28 u238-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
29 pu239-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
30 pu241-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
fp total	0.00	-----	0.00	-----	0.00	-----	0.00	-----

ffbrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

loading fuels information assembly groups

1. no.	name	1. incore init				2. oucore init			
2. no. of fuels		67 fuels				32 fuels			
3. inventory		--- c o r e ---		-- a.blanket --		--- c o r e ---		-- a.blanket --	
		(kg)	(w%)	(kg)	(w%)	(kg)	(w%)	(kg)	(w%)
1	pu238	14.19	0.27	0.00	0.00	9.94	0.40	0.00	0.00
2	pu239	484.90	9.30	0.00	0.00	339.82	13.60	0.00	0.00
3	pu240	208.65	4.00	0.00	0.00	146.22	5.85	0.00	0.00
4	pu241	76.78	1.47	0.00	0.00	53.81	2.15	0.00	0.00
5	pu242	39.23	0.75	0.00	0.00	27.49	1.10	0.00	0.00
6	u235	13.14	0.25	11.79	0.30	5.74	0.23	5.63	0.30
7	u236	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	u238	4368.44	83.75	3919.34	99.70	1908.87	76.37	1871.92	99.70
9	am241	10.85	0.21	0.00	0.00	7.60	0.30	0.00	0.00
10	am242m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	am243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	np237	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	cm242	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	cm243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	cm244	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	u total	4381.59	84.00	3931.13	100.00	1914.62	76.60	1877.55	100.00
	pu total	834.59	16.00	0.00	0.00	584.88	23.40	0.00	0.00
	pu fiss.	561.68	10.77	0.00	0.00	393.63	15.75	0.00	0.00
	(u + pu)	5216.18	100.00	3931.13	100.00	2499.50	100.00	1877.55	100.00
20	o	693.24	11.73	528.92	11.86	332.03	11.73	252.62	11.86
	uo2 total	4964.53	84.01	4460.05	100.00	2169.35	76.61	2130.17	100.00
	puo2 total	944.89	15.99	0.00	0.00	662.18	23.39	0.00	0.00
	no2 total	5909.42	100.00	4460.05	100.00	2831.53	100.00	2130.17	100.00
27	u235-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
28	u238-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
29	pu239-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
30	pu241-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
	fp total	0.00	-----	0.00	-----	0.00	-----	0.00	-----

Tue Apr 8 21:06:32 1997 page 16 ffbrco 1st cycle boc calculation (full core model) 96/10/17
cpu time (sec) 18.5 step no.1-1 cell.(cr na-follower)

edit option list (diffusion module)

1)	edit option data list print (0=no,1=yes)	1	26)	normal flux distribution map plot (0=no,1=yes)	0
2)	general input data list print (0=no,1=yes)	0	27)	adjoint flux distribution map plot(0=no,1=yes)	0
3)	macro cross section print (0=no,1=mix,2=reg)	0	28)	power distribution map plot (0=no,1=yes)	0
4)	diffusion cal. information (0=no,1=prt,2=all)	2	29)	.....	0
5)	gross neutron balance (0=no,1=yes)	0	30)	.....	0
6)	neutron balance by mixture region(0=no,1=yes)	0	31)	.....	0
7)	neutron balance by region (0=no,1=yes)	0	32)	.....	0
8)	average flux by mixture region (0=no,1=yes)	1	33)	.....	0
9)	average flux by region (0=no,1=yes)	0	34)	.....	0
10)	average power by mixture region (0=no,1=yes)	1	35)	.....	0
11)	average power by region (0=no,1=yes)	1	36)	.....	0
12)	normal flux distribution (0=no,1,2,3,4=prt)	0	37)	.....	0
13)	adjoint flux distribution (0=no,1,2,3,4=prt)	0	38)	.....	0
14)	power distribution (0=no,1=ave,2=plane)	0	39)	.....	0
15)	axial power dist. (0=no,1=peak,2=asm,3=1+2)	0	40)	.....	0
16)	total nuclude reaction rate (0=no,1=yes)	0	41)	.....	0
17)	reaction rate by mixture region (0=no,1=yes)	0	42)	.....	0
18)	reaction rate by region (0=no,1=yes)	0	43)	.....	0
19)	breeding ratio by mixture region (0=no,1=yes)	0	44)	.....	0
20)	breeding ratio by region (0=no,1=yes)	1	45)	.....	0
21)	fission inventory print (0=no,1=yes)	1	46)	.....	0
22)	doubling time print (0=no,1=yes)	0	47)	.....	0
23)	delta-flux file(unit no.90) write(0=no,1=yes)	0	48)	.....	0
24)	.....	0	49)	.....	0
25)	.....	0	50)	.....	0

edit of report data list (diffusion module)

(1)	axial power dist.	1	2	4	8	6	14	22	32	44	58	74	92	112	134	158	184	212	242	274	0	0	0	0	0	0
	(asssembly no.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(3)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(5)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(6)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(7)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(8)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(9)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(10)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

```
venture - neutronics module - version 3.1 - fall, 1981 -- quality assurance level 1

run title - fbrco 1st cycle boc calculation (full core model) 96/10/17
            step no.1-1 cell.(cr na-follower)

storage required for cross section check   98796 words

title of the latest version cross section file

        grupxs made  by moses

cross section check completed normally

reference real time from znatdn interface file =  0.00000E+00 days

solution by finite-difference diffusion theory
-eigenvalue problem
geometry no. 17   3-d triagonal-z
triagonal option  0   parallelogram - 120 degree
number of energy groups                          7
number of upscatter groups (max)                 0
number of downscatter groups (max)               6
number of intervals in dimension 1 (columns)    74
number of intervals in dimension 2 (rows)       37
number of intervals in dimension 3 (planes)     58
number of zones                               5489
number of regions                            43808
number of black absorber zones                   1
boundary indicators-    left  2  right  4
                         top  2 bottom  4
                       front  2   rear  2
```

B-11

memory requirements for data storage

	total minimum	total maximum	a	b	c	d
storage available	19984626					
macro calculation	246989					
equation constants calculation						
core contained or space stored	1081459	1232049				
plane stored	354559	505149				
row stored	354559	505149				
multi-level plane stored	354559	505149				
initial flux						
core contained or space stored	408989	565055				
other modes	91381	247447				
iterative process						
core contained	10164457		8798454	24882	537924	803197
space stored	2235738		2073629	24882	137227	0
58 planes stored	2090681		1928572	24882	137227	0
1 plane stored	211505		49396	24882	137227	0
37 rows stored	198221		36112	24882	137227	0
1 row stored	162109		0	24882	137227	0
58 multi-level planes stored	2258233		16428	24882	137227	2079696
perturbation calculation	208544					

```
data will be stored for all groups, all space

memory locations reserved for data storage---19984626
max memory locations required for this prob--10164457
memory locations not used-------------------- 9820169

    special scratch dataset requirements
    maximum physical record is     32768 words

rite container arrays, control        36 data 9820159
file  92 defaults to core
  # of logical records in file =         7   logical record length (word) =    317608
```



```
  length of the file (word)      =   2223256   start location in core (word)=          1
  remaining core (word)          =   7596903
file  95 defaults to core
  # of logical records in file =           7   logical record length (word) =     317608
  length of the file (word)      =   2223256   start location in core (word)=   2223257
  remaining core (word)          =   5373647
file  96 defaults to core
  # of logical records in file =           7   logical record length (word) =     317608
  length of the file (word)      =   2223256   start location in core (word)=   4446513
  remaining core (word)          =   3150391
direct access file 98  requires           7 records        803196 words in length

*****(watt.sec/fiss) and (watt.sec/capt) are zero on grupxs - defaulting to 3.2e-11

maximum storage used for macroscopic cross section calculation    246988 words

the maximum and minimum diffusion coefficients are  1.79560E+01  0.00000E+00

fine mesh description - point is located at the centroid of the volume element
equilateral triangles - side =    9.1279
distance to point - dimension 3 (front to rear)
    1   6.7000    2  20.1000    3  33.5000    4  46.9000    5  60.3000    6  69.8500    7  75.5500    8  81.2500
    9  86.9500   10  92.6500   11  97.7000   12 102.1000   13 106.5000   14 110.9000   15 115.3000   16 119.6667
   17 124.0000   18 128.3333   19 132.3750   20 136.1250   21 140.5000   22 145.5000   23 150.5000   24 155.5000
   25 160.5000   26 165.5000   27 170.5000   28 175.5000   29 179.3250   30 181.9750   31 184.6000   32 187.2000
   33 190.6000   34 194.8000   35 199.0000   36 203.2000   37 207.4000   38 211.6000   39 215.8000   40 220.0000
   41 224.2000   42 228.4000   43 233.0000   44 238.0000   45 242.3750   46 246.1250   47 250.1875   48 254.5625
   49 258.9375   50 263.3125   51 276.0000   52 297.0000   53 318.0000   54 339.0000   55 360.0000   56 373.5833
   57 379.7500   58 385.9166

determine initial parameters for iterative procedure

reference point for initialization will be at column =     38 row =     30 plane =     39 zone =  3541
   x,xx,y,yy,z,share(3),nouter=   0.917732    0.789716    0.789716     4.23581
   4.70000     1.00000E-04  43
initial outer iteration eigenvalue         0.917732  option  -99
initial overrelaxation coefficients max.  1.475807  min.  1.293473  inner iterations max.    4  min.    4  option    0
mesh point sweep option     1
outer iteration limit to be used    100  estimated     43

maximum storage used for calculating initial parameters was      806186

initial flux is fxk(j,k)*fy(i)*fz(kb)

total core required for data storage is******* words
elapsed cpu and clock minutes are        0.00        0.00
```

```
a flux - eigenvalue problem follows
     4 inners min,  4 inners max - chebychev  beta on inners
   sigma-1 ordering
procedure=0,1,2,3,4-normal,chebyshev,semex,demex,semexf.   icvr=0,1-yes,no inners convr.   ocvr=0,1-yes,no outers convr.
iter  proc  icvr  ocvr   flux change   mu-bar  other-mu  sem-ind   acceleration parameters   source      k-used    k-calc
  1    0     0     0    7.22515E+07  0.00000  0.00000  1.00000     0.00000     0.00000  1.01579E+18  1.0000000  0.6957363
  2    0     0     0    1.25147E+05  0.00013  0.00000  1.00000     1.00000     0.00000  1.02716E+18  1.0000000  0.7425440
  3    0     1     0    8.89275E+05  1.00000  0.00000  1.00000     1.00000     0.00000  1.04307E+18  1.0000000  0.8010718
  4    0     0     0    1.46570E+04  1.00000  0.00000  1.00000     1.00000     0.00000  1.05504E+18  1.0000000  0.8568254
  5    0     0     0    2.16136E+02  0.14955  0.00000  1.00000     0.17585     0.00000  1.06589E+18  1.0000000  0.9035517
  6    0     0     0    3.30341E+00  0.15609  0.00000  1.00000     0.17585     0.00135  1.07676E+18  1.0000000  0.9397868
  7    0     1     0    2.14405E+00  0.51529  0.00000  1.00000    -1.15498     0.19885  1.08818E+18  1.0000000  0.9665095
  8    0     0     0    1.31673E+00  0.51139  0.00000  1.00000     1.04319     0.00178  1.10032E+18  1.0000000  0.9856557
  9    0     0     0    7.63246E-01  0.52205  0.00000  1.00000    -0.14261     0.61773  1.11315E+18  1.0000000  0.9992008
 10    0     1     0   -5.24703E-01  0.53766  0.00000  1.00000     8.56572    -3.73845  1.12660E+18  1.0000000  1.0087727
 11    0     1     0   -4.12573E-01  0.60564  0.00000  1.00000    -2.52237     1.86108  1.14060E+18  1.0043672  1.0149869
 12    0     1     0   -3.27425E-01  0.67740  0.00000  1.00000     9.12333    -3.47972  1.15253E+18  1.0149869  1.0181599
new overrelaxation coefficients calculated  1.50284  1.56689  1.67783  1.62213  1.50937  1.60650  1.59738
new inners calculated   4   4   4   4   4   4   4
 13    0     0     1    9.87001E-01  1.00000  0.00000  1.00000     1.00000     2.09978  1.15870E+18  1.0181599  1.0219503
 14    0     1     1    2.43772E+00  1.00000  0.00000  1.00000     1.00000     0.00000  1.16687E+18  1.0219503  1.0244070
 15    0     1     1    5.52487E+00  1.00000  0.00000  1.00000     1.00000     0.00000  1.17233E+18  1.0244070  1.0256769
 16    0     1     1    2.49427E+02  1.00000  0.00000  1.00000     1.00000     0.00000  1.17553E+18  1.0256769  1.0263856
    forced extrapolation lamda          0.85573


 9.16450E+15  1.07096E+16  1.98674E+16  0.00000E+00  8.55731E-01  4.61284E-01  8.56265E-01  9.95681E-01  4.31938E-03
 17    4     0     1    2.30918E+01  0.85573  0.00000  1.00000     2.73519     0.00000  1.17766E+18  1.0263856  1.0268434
 18    1     1     0    1.52484E+01  0.00000  0.00000  1.00000     0.60737     0.00000  1.18945E+18  1.0284310
 19    1     1     0    4.68694E+00  0.00000  0.00000  1.00000     1.27994     0.41843  1.19051E+18  1.0293467
 20    1     1     1    3.72563E+00  1.00000  2.65771  1.00000     1.03262     0.26456  1.19044E+18  1.0292837
 21    1     1     1    2.12082E+02  0.81213162.96646  1.00000     0.97592     0.22929  1.18920E+18  1.0287492
 22    1     1     1    3.39181E+01  0.73530 17.11895  1.00000     0.96336     0.22147  1.18943E+18  1.0288916
 23    1     1     0    6.48263E+01  0.63350 34.32441  1.00000     0.96060     0.21976  1.18986E+18  1.0290778
 24    1     1     1    5.39478E+01  0.64659  0.59381  1.00000     0.95999     0.21938  1.18974E+18  1.0290108
 25    0     1     1    5.16168E+05  0.00000  0.00000  1.00000     1.00000     1.82960  1.18992E+18  1.0290906  1.0290629
 26    1     1     0    2.54811E+01  0.00000  0.00000  1.00000     0.46228     0.00000  1.18986E+18  1.0290629
 27    1     1     0    3.69207E+01  0.00000  0.00000  1.00000     0.63061     0.11511  1.18985E+18  1.0290558
 28    1     1     1    5.91250E+01  1.00000 31.16390  1.00000     0.63061     0.11511  1.18991E+18  1.0291081
 29    1     1     0    2.68594E+01  0.88569 13.88397  1.00000     0.63061     0.11511  1.18985E+18  1.0290792
 30    1     1     1    2.85143E+01  0.84772 15.31879  1.00000     0.63061     0.11511  1.18986E+18  1.0290864
 31    1     1     1    5.78715E+01  0.80558 30.96533  1.00000     0.63061     0.11511  1.18984E+18  1.0290806
 32    1     1     1    4.31099E+01  0.81274 22.29989  1.00000     0.63061     0.11511  1.18986E+18  1.0290862
 33    0     1     1    3.25373E+04  0.00000  0.00000  1.00000     1.00000     4.34024  1.18985E+18  1.0290830  1.0290826
 34    1     1     0    1.81399E+01  0.00000  0.00000  1.00000     0.28966     0.00000  1.18986E+18  1.0290826
 35    1     1     0    2.05422E+01  0.00000  0.00000  1.00000     0.35174     0.04813  1.18986E+18  1.0290848
 36    1     1     1    3.85779E+01  1.00000 21.16692  1.00000     0.35174     0.04813  1.18987E+18  1.0290905
 37    1     1     0    9.89100E+00  0.88724  5.20189  1.00000     0.35174     0.04813  1.18987E+18  1.0290890
 38    1     1     0    1.38648E+01  0.86577  8.33415  1.00000     0.35174     0.04813  1.18987E+18  1.0290886
 39    1     1     0    4.07273E+00  0.85658  0.83876  1.00000     0.35174     0.04813  1.18987E+18  1.0290895
 40    3     0     0    6.12611E+00  2.32680  4.56723  0.00000    14.30507    -3.01551  1.18987E+18  1.0290895
 41    0     0     1    8.39272E+02  0.00000  0.00000  1.00000     1.00000    -1.75369  1.18988E+18  1.0290980  1.0290860
 42    1     1     0    2.05187E+00  0.00000  0.00000  1.00000     0.28966     0.00000  1.18988E+18  1.0290860
 43    1     1     0    8.94317E-01  0.00000  0.00000  1.00000     0.35174     0.04813  1.18988E+18  1.0290893
 44    1     0     0    8.22522E-01  0.70928  0.70928  1.00000     0.35174     0.04813  1.18989E+18  1.0290934
 45    1     1     0    3.15025E-01  0.76238  0.62372  1.00000     0.35174     0.04813  1.18989E+18  1.0290921
 46    1     1     0    2.42746E-01  0.76767  0.59948  1.00000     0.35174     0.04813  1.18989E+18  1.0290912
 47    1     1     0   -1.13073E-01  0.83147  0.57250  1.00000     0.35174     0.04813  1.18989E+18  1.0290920
 48    1     0     0    7.11988E-02  0.90600  0.54367  1.00000     0.35174     0.04813  1.18989E+18  1.0290916
 49    1     0     0   -3.66885E-02  0.88709  0.53102  1.00000     0.35174     0.04813  1.18989E+18  1.0290918
 50    1     0     0    2.19317E-02  0.83357  0.65405  1.00000     0.35174     0.04813  1.18989E+18  1.0290920
 51    1     1     0    1.58337E-02  0.83899  0.76561  1.00000     0.35174     0.04813  1.18989E+18  1.0290917
 52    1     1     0   -1.68378E-02  0.90300  1.07183  1.00000     0.35174     0.04813  1.18989E+18  1.0290919
 53    0     1     1    1.95490E-02  0.00000  0.00000  1.00000     9.67939    -0.18721  1.18989E+18  1.0290919
 54    0     1     1   -5.04571E-02  1.00000  0.00000  1.00000     1.00000     9.46886  1.18989E+18  1.0290916
 55    0     0     0    1.90590E-02  0.38255  0.00000  1.00000     0.61957     9.46886  1.18989E+18  1.0290920
 56    0     0     0   -9.50156E-03  0.48386  0.00000  1.00000     0.61957     0.10166  1.18989E+18  1.0290918
 57    0     0     0    4.97970E-03  0.52732  0.00000  1.00000     1.57749    -0.20467  1.18989E+18  1.0290918
 58    3     0     0    6.22567E-03  0.54238  0.00000  1.00000     1.62367    -0.23367  1.18989E+18  1.0290918
 59    0     0     0   -2.94312E-03  0.00000  0.00000  1.00000     0.00000     0.00000  1.18989E+18  1.0290918
 60    0     0     0    1.34407E-03  0.45757  0.00000  1.00000     0.84355     1.18522  1.18989E+18  1.0290918
 61    0     0     0   -7.04619E-04  0.51450  0.00000  1.00000     0.84355     0.08853  1.18989E+18  1.0290918
 62    0     0     0   -3.63491E-04  0.52874  0.00000  1.00000     1.40564    -0.14167  1.18989E+18  1.0290918
 63    0     0     0    1.74983E-04  0.46074  0.00000  1.00000    -0.41070     0.76543  1.18989E+18  1.0290918
 64    0     0     0   -8.56469E-05  0.49728  0.00000  1.00000     0.52454     0.19958  1.18989E+18  1.0290918
                                                                                                          1.0290918
```



```
estimated absolute point flux relative error  1.04345E-04

multiplication reliability estimators
neutron balance keffective-----------------------------------------  1.0290918
by the sum of the squares of the residues--------------------------  1.0290918
upper and lower bounds estimates by max rel flux change------------  1.0291799   1.0290037
upper and lower bounds estimates over all significant points-------  1.0338546   1.0236233


number of inner iterations, outer iteration error eigenvalue, and overrelaxation coefficients     4  5.49207E-01
  1.40423  1.51777  1.63000  1.57354  1.50937  1.60650  1.54853


cpu and clock minutes required for this eigenvalue problem are  0.000   0.000
dopc file closing data - unit, arrays      96      21 6669769
dopc file closing data - unit, arrays      92      16 4446513

    leakage  1.57101E+16  total losses  4.71965E+19  total productions  4.85695E+19  reactor power(watts)  1.59990E+09


boundary neutron leakage
group    left         right        top          bottom        front        back
 1   0.00000E+00  5.58765E+17  0.00000E+00 -5.58765E+17  3.60767E+11  2.62143E+11
 2   0.00000E+00  2.22911E+18  0.00000E+00 -2.22911E+18  4.03093E+12  1.21657E+13
 3   0.00000E+00  1.02173E+19  0.00000E+00 -1.02173E+19  6.53006E+14  3.66947E+15
 4   0.00000E+00  4.82137E+18  0.00000E+00 -4.82137E+18  5.25910E+14  4.38876E+15
 5   0.00000E+00  9.27579E+17  0.00000E+00 -9.27579E+17  1.36217E+14  1.56458E+15
 6   0.00000E+00  4.77107E+17  0.00000E+00 -4.77107E+17  1.46980E+14  2.41129E+15
 7   0.00000E+00  1.10665E+17  0.00000E+00 -1.10665E+17  9.40385E+13  2.10307E+15
sum  0.00000E+00  1.93419E+19  0.00000E+00 -1.93419E+19  1.56054E+15  1.41496E+16


overall neutron balance

     group absorptions  b**2 losses    1/v loss   out-scatter  in-scatter  p1 in-scatter   source     power(watts)
       1    9.88226E+17  0.00000E+00  0.00000E+00  6.18999E+18  0.00000E+00  0.00000E+00  7.17825E+18  2.39094E+07
       2    3.37088E+18  0.00000E+00  0.00000E+00  2.02990E+19  3.21108E+18  0.00000E+00  2.04590E+19  9.68242E+07
       3    1.15089E+19  0.00000E+00  0.00000E+00  2.97288E+19  2.22088E+19  0.00000E+00  1.90332E+19  1.94259E+08
       4    1.45584E+19  0.00000E+00  0.00000E+00  1.66129E+19  3.06680E+19  0.00000E+00  5.08126E+17  1.23423E+08
       5    1.04554E+19  0.00000E+00  0.00000E+00  6.29913E+18  1.67383E+19  0.00000E+00  1.79560E+16  6.34688E+07
       6    4.89496E+18  0.00000E+00  0.00000E+00  1.40599E+18  6.30347E+18  0.00000E+00  0.00000E+00  2.91400E+07
       7    1.40392E+18  0.00000E+00  0.00000E+00  0.00000E+00  1.40612E+18  0.00000E+00  0.00000E+00  2.27582E+06
sum         4.71807E+19  0.00000E+00  0.00000E+00  8.05358E+19  8.05358E+19  0.00000E+00  4.71966E+19  5.33299E+08


point regular flux interface file rtflux (version  1) has been written on unit number  82


the maximum power density is at plane  29, row  37,  and column  74  and is   3.84977559E+02  watts/cc.

the maximum neutron density is at plane  29, row  37, and column  74  and is   4.83919397E+15  neutrons/cc.


the relative power density traverse left-to-right is
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  6.63948E-01  7.22621E-01  8.03497E-01
  8.72900E-01  9.33373E-01  9.71720E-01  7.28943E-01  7.43331E-01  7.59685E-01  7.72219E-01  7.85395E-01  8.01216E-01
  0.00000E+00  0.00000E+00  0.00000E+00  8.38004E-01  8.49884E-01  8.64677E-01  8.78256E-01  8.89172E-01  9.00267E-01
  9.08738E-01  9.20518E-01  9.30108E-01  9.44331E-01  9.55485E-01  9.69482E-01  9.79105E-01  9.89436E-01  9.94691E-01
  1.00000E+00  1.00000E+00


the relative power density traverse top-to-bottom is
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  6.63948E-01  8.03497E-01  9.33373E-01  7.28943E-01  7.59685E-01  7.85395E-01
  0.00000E+00  0.00000E+00  8.49884E-01  8.78256E-01  9.00267E-01  9.20518E-01  9.44331E-01  9.69482E-01  9.89436E-01
  1.00000E+00


the relative power density traverse front-to-back is
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  4.78028E-03  6.05304E-03  8.18977E-03  1.14710E-02  1.64205E-02  2.38651E-02  3.51367E-02  5.25925E-02
  4.50023E-01  5.17404E-01  5.97551E-01  6.85013E-01  7.64786E-01  8.34788E-01  8.93633E-01  9.40337E-01  9.74193E-01
  9.94717E-01  1.00000E+00  9.99814E-01  9.95822E-01  9.88180E-01  9.73402E-01  9.45745E-01  9.08963E-01  8.63441E-01
  8.09693E-01  7.48400E-01  6.80487E-01  6.07292E-01  5.30973E-01  4.55559E-01  5.08939E-02  3.20527E-02  2.20117E-02
```

```
 1.60395E-02  1.15178E-02  8.30355E-03  6.24978E-03  5.11660E-03  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
 0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00

the relative neutron density traverse left-to-right is
 0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
 0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
 2.85223E-06  8.56964E-06  2.15721E-05  5.26475E-05  1.27558E-04  3.06335E-04  7.32323E-04  1.74252E-03  4.24763E-03
 1.21093E-02  1.97849E-02  2.86893E-02  3.96174E-02  5.31496E-02  7.03029E-02  9.16979E-02  1.18604E-01  1.51468E-01
 1.91463E-01  2.37987E-01  2.90696E-01  3.30363E-01  3.57477E-01  3.85810E-01  4.35361E-01  5.08068E-01  5.75298E-01
 6.27821E-01  6.73062E-01  7.00885E-01  7.25825E-01  7.41600E-01  7.58294E-01  7.70048E-01  7.80397E-01  7.90025E-01
 7.99814E-01  8.06301E-01  8.12972E-01  8.26488E-01  8.44488E-01  8.62021E-01  8.76425E-01  8.87279E-01  8.98357E-01
 9.05863E-01  9.18274E-01  9.27335E-01  9.42684E-01  9.54114E-01  9.68767E-01  9.78660E-01  9.89248E-01  9.94605E-01
 1.00000E+00  1.00000E+00

the relative neutron density traverse top-to-bottom is
 0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
 2.85223E-06  2.15721E-05  1.27558E-04  7.32323E-04  4.24763E-03  1.97849E-02  3.96174E-02  7.03029E-02  1.18604E-01
 1.91463E-01  2.90696E-01  3.57477E-01  4.35361E-01  5.75298E-01  6.73062E-01  7.25825E-01  7.58294E-01  7.80397E-01
 7.99814E-01  8.12972E-01  8.44488E-01  8.76425E-01  8.98357E-01  9.18274E-01  9.42684E-01  9.68767E-01  9.89248E-01
 1.00000E+00

the relative neutron density traverse front-to-back is
 5.93018E-07  4.89919E-06  4.10189E-05  3.66511E-04  3.52925E-03  2.90660E-02  3.50887E-02  4.10303E-02  4.68040E-02
 5.22775E-02  5.99326E-02  7.67553E-02  1.00596E-01  1.32582E-01  1.74195E-01  2.26555E-01  2.90363E-01  3.65853E-01
 4.42345E-01  5.13269E-01  5.95258E-01  6.83684E-01  7.63991E-01  8.34320E-01  8.93372E-01  9.40206E-01  9.74141E-01
 9.94706E-01  1.00000E+00  9.99814E-01  9.95814E-01  9.88157E-01  9.73349E-01  9.45628E-01  9.08746E-01  8.63075E-01
 8.09107E-01  7.47481E-01  6.79050E-01  6.04976E-01  5.26937E-01  4.47503E-01  3.60192E-01  2.74726E-01  2.13901E-01
 1.70554E-01  1.32334E-01  1.00787E-01  7.74416E-02  6.12903E-02  4.85267E-02  3.16734E-02  1.91313E-02  1.09812E-02
 6.00664E-03  3.30189E-03  1.76917E-03  6.91167E-04

dspc use of container arrays, control      11, max data 6669768

total cpu minutes used  0.000   total clock minutes used   0.000   total i/o used      0
```


fbrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

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cpu time (sec) 7648.5

mixture region normal flux distribution (n/sec.cm**2)

no.	n a m e	volume	group 1	group 2	group 3	group 4	group 5	group 6
1	incore init	1.435906E+06	4.660373E+13	2.173510E+14	1.538789E+15	9.631348E+14	2.565660E+14	3.958929E+13
2	oucore init	6.926985E+05	3.704308E+13	1.702733E+14	1.063400E+15	5.957662E+14	1.476420E+14	2.879412E+13
3	axbla lower	1.490024E+06	3.972535E+12	2.135081E+13	2.605111E+14	2.583974E+14	9.895797E+13	3.784182E+13
4	na foll2	1.039481E+06	8.287149E+12	4.298038E+13	3.490985E+14	2.527106E+14	9.273326E+13	3.129851E+13
5	gem upplenum	1.445359E+06	4.266441E+12	2.449970E+13	2.227440E+14	1.725902E+14	7.121604E+13	5.027828E+13
6	loplenumcore	2.644269E+06	7.021104E+10	6.654282E+11	2.354617E+13	3.424327E+13	1.976594E+13	2.144864E+13
7	lower shield	2.227134E+06	5.141623E+09	5.765949E+10	2.030958E+12	2.585782E+12	9.929007E+11	7.814600E+11
8	radial b4cshie	1.768330E+07	8.120859E+10	7.593398E+11	1.982022E+13	1.890921E+13	9.227674E+12	8.459449E+12
	t o t a l	2.865817E+07	4.009728E+12	1.944509E+13	1.548054E+14	1.089917E+14	3.611908E+13	1.557773E+13

no.	n a m e	volume	group 7
1	incore init	1.435906E+06	2.465357E+11
2	oucore init	6.926985E+05	1.238432E+12
3	axbla lower	1.490024E+06	3.560112E+12
4	na foll2	1.039481E+06	5.092895E+12
5	gem upplenum	1.445359E+06	1.447666E+13
6	loplenumcore	2.644269E+06	9.621712E+12
7	lower shield	2.227134E+06	5.003790E+11
8	radial b4cshie	1.768330E+07	4.503438E+12
	t o t a l	5.731633E+07	2.423862E+12

fBrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

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cpu time (sec) 7648.5

mixture region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peak position	peak power(w/cc)	peak r.peak
1	incore init	1.435906E+06	3.596874E+02	6.744561E+01	2.504951E+02	(1,29)	3.851912E+02	1.000000
2	oucore init	6.926985E+05	1.638995E+02	3.073308E+01	2.366102E+02	(88,30)	3.528284E+02	1.058195
3	axbla lower	1.490024E+06	9.713008E+00	1.821303E+00	6.518692E+00	(1,18)	2.124118E+01	1.000000
8	radial b4cshie	1.768330E+07	1.765636E-43	3.363116E-44	9.809089E-45	(343,58)	8.155557E-43	0.000000
	total	2.130192E+07	5.333000E+02	1.000000E+02				

region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peak position	peak power(w/cc)	peak r.peak
1	incore init	1.435906E+06	3.596874E+02	6.744561E+01	2.504951E+02	(1,29)	3.851912E+02	1.000000
2	oucore init	6.926985E+05	1.638995E+02	3.073308E+01	2.366102E+02	(88,30)	3.528284E+02	1.058195
3	axbla upper	7.450122E+05	4.821491E+00	9.040861E-01	6.471694E+00	(1,18)	2.124118E+01	1.000000
4	axbla lower	7.450119E+05	4.891517E+00	9.172167E-01	6.565690E+00	(1,43)	2.053796E+01	1.000000
14	radial b4cshie	8.589029E+06	1.765636E-43	3.363116E-44	2.101948E-44	(343,58)	8.155557E-43	0.000000
	total	1.220766E+07	5.333000E+02	1.000000E+02				

breeding ratio by region

no.	name	volume	fertile capture	fissile absorptions	fissile decay	fissile absr.+decay	breeding ratio
1	incore init	1.43591E+06	2.27569E-01	2.36016E-01	6.09178E-03	2.42107E-01	6.33651E-01
2	oucore init	6.92698E+05	6.86334E-02	1.09968E-01	4.31219E-03	1.14280E-01	1.91106E-01
3	axbla upper	7.45012E+05	4.44394E-02	1.34638E-03	0.00000E+00	1.34638E-03	1.23739E-01
4	axbla lower	7.45012E+05	4.52275E-02	1.40500E-03	0.00000E+00	1.40500E-03	1.25933E-01
	total	3.61863E+06	3.85869E-01	3.48735E-01	1.04040E-02	3.59139E-01	1.07443E+00

fBrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

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burnup time (days) 456.00 cpu time (sec) 7688.5

edit option list (depletion module)

1)	edit option data list print	(0=no,1=yes)	1	26)	stay cycle map plot (0=no,1=yes) 0
2)	general input data list print	(0=no,1=yes)	1	27)	stay days map plot (0=no,1=yes) 0
3)	fine mesh depletion assembly map	(0=no,1=yes)	0	28)	expos.plot(core) (0=no,1=ave,2=1+elm,3=2+pel) 0
4)	stay cycle map	(0=no,1=yes)	0	29)	expos.plot(blkt) (0=no,1=ave,2=1+elm,3=2+pel) 0
5)	stay days map	(0=no,1=yes)	0	30)	0
6)	mixture region exposure	(0=no,1=yes)	1	31)	0
7)	region exposure	(0=no,1=yes)	1	32)	0
8)	mixture group exposure	(0=no,1=yes)	1	33)	0
9)	assembly group exposure	(0=no,1=yes)	1	34)	0
10)	orifice zone exposure	(0=no,1=yes)	0	35)	0
11)	exposure distribution	(0=no,1=yes,2=1+zone)	1	36)	0
12)	fine mesh expo.	(0=no,1=max.asm,2=asm,3=1+2)	1	37)	0
13)	mixture region no. density	(0=no,1=yes)	0	38)	0
14)	region no. density	(0=no,1=yes)	0	39)	0
15)	no. density by axial zone	(0=no,1=yes)	0	40)	0
16)	fine mesh no. dens. by asm.	(0=no,1=asm,2=all)	1	41)	0
17)			0	42)	0
18)			0	43)	0
19)			0	44)	0
20)			0	45)	0
21)			0	46)	0
22)			0	47)	0
23)			0	48)	0
24)			0	49)	0
25)			0	50)	0

edit of report data list (depletion module)

(1)	fine mesh exposure	1	2	4	8	6	14	22	32	44	58	92	112	134	0	0	0	0	0	0	0	0	0	0	0	0	0
	(assembly no.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	fine mesh no. density	1	2	4	8	6	14	22	32	44	58	92	112	134	0	0	0	0	0	0	0	0	0	0	0	0	0
	(assembly no.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(3)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(-5)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(-6)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(7)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(8)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(9)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(10)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

general input data list (depletion module)

nchain	no. of depletion chain	0
nsmall	no. of small time steps	1
tnow	burnup time (days)	4.560000E+02
delday	burnup time step (days)	4.560000E+02
epserr	error criterion related to burnup	0.000000E+00
epsexp	error criterion for burnup	0.000000E+00
epsdel	error critetion for burnup	0.000000E+00
tsmall	burnup small time step (sec)	3.939840E+07

mixture region average exposure distribution (mwd/t)

no.	n a m e	volume	weight(kg)	exposure	p e a k i n g position	weight(kg)	exposure	peak exposure
1	incore init	1.435906E+06	5.216158E+03	3.182848E+04	(1, 8)	4.126228E+00	4.883339E+04	4.883339E+04(1)
2	oucore init	6.926985E+05	2.499500E+03	2.990126E+04	(78, 8)	4.139797E+00	4.458696E+04	4.718246E+04(4)
3	axbla lower	1.490024E+06	5.808680E+03	7.687552E+02	(4,12)	8.381936E+00	1.927990E+03	1.966696E+03(1)
	t o t a l	3.618629E+06	1.352434E+04	1.813220E+04				

region averege exposure distribution (mwd/t)

no.	n a m e	volume	weight(kg)	exposure	p e a k i n g position	weight(kg)	exposure	peak exposure
1	incore init	1.435906E+06	5.216158E+03	3.182848E+04	(1, 8)	4.126228E+00	4.883339E+04	4.883339E+04(1)
2	oucore init	6.926985E+05	2.499500E+03	2.990126E+04	(78, 8)	4.139797E+00	4.458696E+04	4.718246E+04(4)
3	axbla upper	7.450122E+05	2.904339E+03	7.632424E+02	(4, 4)	1.089652E+01	1.737776E+03	1.784075E+03(1)
4	axbla lower	7.450119E+05	2.904346E+03	7.742651E+02	(4,12)	8.381936E+00	1.927990E+03	1.966696E+03(1)
	t o t a l	3.618629E+06	1.352434E+04	1.813219E+04				

mixture group exposure distribution (mwd/t) in c o r e

mixture group no.	n a m e	a v e r a g e fuel	average	pos.	p.fact.	stay 1 cycle 456.00 days fuel	average	pos.	p.fact.
1	incore init	67	3.1828E+04	(1,1)	1.21364	67	3.1828E+04	(1,1)	1.21364
2	oucore init	32	2.9901E+04	(79,5)	1.26009	32	2.9901E+04	(79,5)	1.26009
	o v e r - a l l	99	3.1204E+04	(1,1)	1.23792	99	3.1204E+04	(1,1)	1.23792

mixture group exposure distribution (mwd/t) in blanket

mixture group no.	n a m e	a v e r a g e fuel	average	pos.	p.fact.	stay 1 cycle 456.00 days fuel	average	pos.	p.fact.
1	incore init	67	8.3148E+02	(4,1)	1.20648	67	8.3148E+02	(4,1)	1.20648
2	oucore init	32	6.3743E+02	(79,3)	1.23553	32	6.3743E+02	(79,3)	1.23553
	o v e r - a l l	99	7.6875E+02	(4,1)	1.30492	99	7.6875E+02	(4,1)	1.30492

fbrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

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burnup time (days) 456.00 cpu time (sec) 7712.6

assembly group exposure distribution (mwd/t) in c o r e

assembly group		a v e r a g e				stay 1 cycle 456.00 days			
no.	n a m e	fuel	average	pos.	p.fact.	fuel	average	pos.	p.fact.
1	incore init	67	3.1828E+04	(1,1)	1.21364	67	3.1828E+04	(1,1)	1.21364
2	oucore init	32	2.9901E+04	(79,5)	1.26009	32	2.9901E+04	(79,5)	1.26009
	o v e r - a l l	99	3.1204E+04	(1,1)	1.23792	99	3.1204E+04	(1,1)	1.23792

assembly group exposure distribution (mwd/t) in blanket

assembly group		a v e r a g e				stay 1 cycle 456.00 days			
no.	n a m e	fuel	average	pos.	p.fact.	fuel	average	pos.	p.fact.
1	incore init	67	8.3148E+02	(4,1)	1.20648	67	8.3148E+02	(4,1)	1.20648
2	oucore init	32	6.3743E+02	(79,3)	1.23553	32	6.3743E+02	(79,3)	1.23553
	o v e r - a l l	99	7.6875E+02	(4,1)	1.30492	99	7.6875E+02	(4,1)	1.30492

fbrco 1st cycle boc calculation (full core model) 96/10/17
step no.1-1 cell.(cr na-follower)

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burnup time (days) 456.00 cpu time (sec) 7712.6

exposure distribution (10** 4) (mwd/t)
c o r e

```
                                    2.916
                                 2.682 2.396
                              2.925 3.326
                                 2.797 2.650
                        3.227 2.987 3.461
                     3.394 3.141 2.801 2.782
                        3.299 3.021
                  3.660 3.445 3.186 2.835 2.845
               3.807 3.571 3.320 3.061 3.570
            3.863 3.709 3.460       2.898 2.866
               3.807 3.571 3.320 3.061 3.570
                  3.660 3.445 3.186 2.835 2.845
               3.709       3.299 3.021
                  3.571 3.394 3.141 2.801 2.782
               3.571 3.445 3.227 2.987 3.461
                  3.460 3.299       2.797 2.650
               3.445 3.320 3.141 2.925 3.326
                  3.320 3.186 2.987 2.682 2.396
               3.299       3.021 2.797 2.916
                  3.186 3.061 2.801 3.326
               3.141 3.061 2.835 3.461 2.396
                  3.021 2.898       2.650
               2.987 2.835 3.570 2.782
                  2.801 3.570 2.845
               2.797       2.866
                  3.461 2.845
               3.326 2.782
                  2.650
               2.396
```

exposure distribution (10** 2) (mwd/t)
b l a n k e t

```
                              5.941
                          6.840 5.227
                      7.718 6.515
                          7.181 5.716
              8.510 7.910 7.162
          8.973 8.300 7.569 6.325
              8.420 7.747
  9.490 9.099 8.480 7.688 6.482
9.246 9.363 8.811 8.196 7.458
9.285 9.206 8.809       7.581 6.278
9.246 9.363 8.811 8.196 7.458
  9.490 9.099 8.480 7.688 6.482
9.206       8.420 7.747
  9.363 8.973 8.300 7.569 6.325
9.363 9.099 8.510 7.910 7.162
  8.809 8.420       7.181 5.716
9.099 8.811 8.300 7.718 6.515
  8.811 8.480 7.910 6.840 5.227
8.420       7.747 7.181 5.941
  8.480 8.196 7.569 6.515
8.300 8.196 7.688 7.162 5.227
  7.747 7.581       5.716
7.910 7.688 7.458 6.325
  7.569 7.458 6.482
7.181       6.278
  7.162 6.482
6.515 6.325
  5.716
5.227
```


fine mesh exposure distribution (mwd/t) (assembly no.= 1)

assembly group : 1. incore init

-axial- zone.	volume	weight(kg)	- average - exposure	peak. mesh	- mesh 1 - exposure	- mesh 2 - exposure	- mesh 3 - exposure	- mesh 4 - exposure	- mesh 5 - exposure	- mesh 6 - exposure
3	4.76230E+03	1.84403E+01	4.33311E+02	(1)	4.33311E+02	4.33311E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
4	2.81409E+03	1.08965E+01	1.76041E+03	(1)	1.76041E+03	1.76041E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
5	1.62351E+03	5.83900E+00	2.35857E+04	(1)	2.35857E+04	2.35856E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
6	4.32937E+03	1.55707E+01	3.51834E+04	(1)	3.51834E+04	3.51834E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
7	4.32937E+03	1.55707E+01	4.64311E+04	(1)	4.64311E+04	4.64311E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
8	1.14728E+03	4.12623E+00	4.88334E+04	(1)	4.88334E+04	4.88334E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
9	1.12564E+03	4.04837E+00	4.84475E+04	(1)	4.84475E+04	4.84475E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
10	4.54584E+03	1.63492E+01	4.39657E+04	(2)	4.39657E+04	4.39657E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
11	4.54584E+03	1.63492E+01	2.95059E+04	(1)	2.95059E+04	2.95059E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
12	2.16468E+03	8.38194E+00	1.96487E+03	(1)	1.96487E+03	1.96487E+03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
13	1.62351E+03	6.28645E+00	8.88731E+02	(1)	8.88731E+02	8.88731E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
14	3.78820E+03	1.46684E+01	3.57822E+02	(1)	3.57822E+02	3.57822E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
c o r e	2.16468E+04	7.78534E+01	3.86283E+04	(1)	3.86283E+04	3.86283E+04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
blanket	1.51528E+04	5.86736E+01	9.28489E+02	(1)	9.28489E+02	9.28489E+02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

fine mesh exposure distribution (mwd/t) (assembly no.= 79)

assembly group : 2. oucore init

-axial- zone.	volume	weight(kg)	- average - exposure	peak. mesh	- mesh 1 - exposure	- mesh 2 - exposure	- mesh 3 - exposure	- mesh 4 - exposure	- mesh 5 - exposure	- mesh 6 - exposure
3	4.76230E+03	1.84403E+01	3.72534E+02	(3)	3.48466E+02	3.69148E+02	4.14339E+02	3.84867E+02	3.65029E+02	3.53355E+02
4	2.81409E+03	1.08965E+01	1.36202E+03	(3)	1.30261E+03	1.31063E+03	1.40017E+03	1.39863E+03	1.39496E+03	1.36515E+03
5	1.62351E+03	5.85820E+00	2.24792E+04	(5)	2.12860E+04	2.13036E+04	2.27254E+04	2.34551E+04	2.35272E+04	2.25779E+04
6	4.32937E+03	1.56219E+01	3.25967E+04	(5)	3.09930E+04	3.07253E+04	3.24413E+04	3.39842E+04	3.43835E+04	3.30529E+04
7	4.32937E+03	1.56219E+01	4.24488E+04	(5)	4.03724E+04	3.99199E+04	4.20550E+04	4.42806E+04	4.49086E+04	4.31563E+04
8	1.14728E+03	4.13980E+00	4.45870E+04	(5)	4.24048E+04	4.19219E+04	4.41590E+04	4.65148E+04	4.71825E+04	4.53388E+04
9	1.12564E+03	4.06169E+00	4.42709E+04	(5)	4.21086E+04	4.16299E+04	4.38478E+04	4.61807E+04	4.68424E+04	4.50162E+04
10	4.54584E+03	1.64030E+01	4.04182E+04	(5)	3.84655E+04	3.80449E+04	4.00644E+04	4.21355E+04	4.27204E+04	4.10786E+04
11	4.54584E+03	1.64030E+01	2.78896E+04	(5)	2.65378E+04	2.63990E+04	2.79205E+04	2.90292E+04	2.92747E+04	2.81762E+04
12	2.16468E+03	8.38194E+00	1.53536E+03	(5)	1.47868E+03	1.48147E+03	1.56694E+03	1.56940E+03	1.57107E+03	1.54457E+03
13	1.62351E+03	6.28645E+00	7.22379E+02	(3)	6.78311E+02	7.07167E+02	7.86647E+02	7.45991E+02	7.19086E+02	6.97072E+02
14	3.78820E+03	1.46684E+01	3.16074E+02	(3)	2.95415E+02	3.16044E+02	3.56703E+02	3.25970E+02	3.05977E+02	2.96332E+02
c o r e	2.16468E+04	7.81094E+01	3.57049E+04	(5)	3.39573E+04	3.36467E+04	3.55010E+04	3.72234E+04	3.76784E+04	3.62225E+04
blanket	1.51528E+04	5.86736E+01	7.45782E+02	(3)	7.09203E+02	7.25838E+02	7.87560E+02	7.66323E+02	7.51766E+02	7.34003E+02

```
three 1st cycle boc  calculation (full core model)                                  Tue Apr  8 23:15:57 1997  page .
step no.1-2 cell.(cr na-folower)                                        burnup time (days)  456.00  cpu time (sec)  7714

  cross section file informations
   following cross section set was read

     set=   1  title=IN  CORE           (1)
             type= -2  nn= 27  ng=  7
     xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
     xs id = 29 30
     set=   2  title=OUT CORE           (2)
             type= -2  nn= 27  ng=  7
     xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
     xs id = 29 30
     set=   3  title=AX  BLANK(UPPER)   (3)
             type= -2  nn= 27  ng=  7
     xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
     xs id = 29 30
     set=   4  title=AX  BLANK(LOWER)   (4)
             type= -2  nn= 27  ng=  7
     xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
     xs id = 29 30
     set=   5  title=NA  FOLLOWER   1   (5)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=   6  title=NA  FOLLOWER   2   (6)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=   7  title=GEM                    (7)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=   8  title=UP-PLENUM(CORE         (8)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=   9  title=LO-PLENUM(CORE       (9)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=  10  title=UP  SHIELD (CORE-B4C)(10)
             type= -2  nn=  9  ng=  7
     xs id = 17 18 19 21 22 23 24 25 26
     set=  11  title=GEM-SHIELD(UPPER)    (11)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=  12  title=LOW SHIELD           (12)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=  13  title=RD  SHIELD(SUS)      (13)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=  14  title=RD  SHIELD(B4C)      (14)
             type= -2  nn=  9  ng=  7
     xs id = 17 18 19 21 22 23 24 25 26
     set=  15  title=GEM-UPPER-PLENUM     (15)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=  16  title=CR(CCR)            (1)
             type= -2  nn=  9  ng=  7
     xs id = 17 18 19 21 22 23 24 25 26
     set=  17  title=CR(BCR)            (1)
             type= -2  nn=  9  ng=  7
     xs id = 17 18 19 21 22 23 24 25 26
     set=  18  title=CR(BCR)            (2)
             type= -2  nn=  6  ng=  7
     xs id = 21 22 23 24 25 26
     set=  19  title=CR(BCR)            (3)
             type= -2  nn=  9  ng=  7
     xs id = 17 18 19 21 22 23 24 25 26
     set=  20  title=CR(BCR)            (4)
             type= -2  nn=  9  ng=  7
     xs id = 17 18 19 21 22 23 24 25 26
 at Rload; no.  1 nload=  0 kload=  1 ires=  0 kflg=  0
```

B-18


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26rco 1st cycle boc  calculation (full core model)                                  Tue Apr  8 23:16:02 1997  page 27
s6ep no.1-2 cell.(cr na-folower)                                        burnup time (days)  456.00  cpu time (sec)  7718.1

                              edit option list     (setup module)

  1) edit option data list print      (0=no,1=yes) .        1    26) assembly/layer no. plot  (0=no,1=asm,2=1+lay) .     0
  2) general input data list print    (0=no,1=yes) .        1    27) assembly group no. plot          (0=no,1=yes) .     0
  3) library data list print          (0=no,1=yes) .        1    28) orifice zone no. plot            (0=no,1=yes) .     0
  4) assembly group - mixture group   (0=no,1=yes) .        1    29) ..............................................     0
  5) region - mixture region table    (0=no,1=yes) .        1    30) ..............................................     0
  6) axial geometry by groups    (0=no,1=cr,2=all) .        0    31) ..............................................     0
  7) assembly no. map print           (0=no,1=yes) .        1    32) ..............................................     0
  8) assembly group map print         (0=no,1=yes) .        1    33) ..............................................     0
  9) mixture group map print          (0=no,1=yes) .        0    34) ..............................................     0
 10) orifice zone map print           (0=no,1=yes) .        0    35) ..............................................     0
 11) subchannel temp. cal.assembly map(0=no,1=yes) .        0    36) ..............................................     0
 12) fine mesh dep. cal. assembly map (0=no,1=yes) .        0    37) ..............................................     0
 13) control rod draw stroke print    (0=no,1=yes) .        1    38) ..............................................     0
 14) ..............................................         0    39) ..............................................     0
 15) ..............................................         0    40) ..............................................     0
 16) ..............................................         0    41) ..............................................     0
 17) ..............................................         0    42) ..............................................     0
 18) ..............................................         0    43) ..............................................     0
 19) ..............................................         0    44) ..............................................     0
 20) ..............................................         0    45) ..............................................     0
 21) ..............................................         0    46) ..............................................     0
 22) ..............................................         0    47) ..............................................     0
 23) ..............................................         0    48) ..............................................     0
 24) ..............................................         0    49) ..............................................     0
 25) ..............................................         0    50) ..............................................     0


                              edit of report data list (setup module)

 ( 1) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 2) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 3) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 4) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 5) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 6) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 7) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 8) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 ( 9) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 (10) .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
      .........................   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

FBrco 1st cycle boc calculation (full core model)
burnup time (days) 456.00 cpu time (sec) 7718step no.1-2 cell.(cr na-folower)
Tue Apr 8 23:16:02 1997 page 29

general input data list (setup module)

nsym	rotational symmetry (1,2,3,6)	2
nlay	no. of layers (include center block)	19
npln	no. of planes	58
nazn	no. of axial zones	16
naem	material type no. for axial expansion	1
naee	element no. for axial expansion	3
naea	sub assembly no. for axial expansion	2
naet	temperature no. for axial expansion	4
nrem	material type no. for radial expansion	1
nree	element no. for radial expansion	3
nblc	no. of sub assemblies.....	343
nbel	no. of outside assemblies	381
nagp	no. of assembly groups	8
nmx	no. of mixture groups	5
naor	no. of orifice zones	0
nreg	no. of regions	15
nmix	no. of mixture regions	8
nadc	no. of fine mesh depletion cal. assemblies .	0
natc	no. of subchannel temp. cal. assemblies	0

tin	operation coolant inlet temp (deg.c)	3.950000E+02
fpitch	hot/cold of subassembly pitch fraction	1.000000E+00
cpitch	cold sub assembly pitch (cm)	1.581000E+01
hpitch	hot-op sub assembly pitch (cm)	1.581000E+01
hxarea	hexagonal area (cm**2)	2.164683E+02
height	core height (cm)	3.889999E+02
hexvol	subassembly volume (cm**3)	8.420617E+04

cross section library data

nlib	library cross section option	0
nset	no. of cross section sets	20
nnuc	no. of nuclides	30
nrac	no. of reactions	6
nhat	heating cross section option	1
ngrp	no. of energy groups	7
nfgp	group no. for fast flux energy (e>0.1mev) .	3
nfuel	no. of fuel nuclides	16
nfp	no. of fp nuclides	4

-- nuclide --		--------- o p t i o n ---------				- atomic -	- fission -	- capture -	-- decay --
no.	name	fis	nburn	nanal	klib	weight	energy	energy	constants
1	pu238	2	3	0	1	2.38050E+02	3.15500E-11	0.00000E+00	0.00000E+00
2	pu239	2	1	0	1	2.39055E+02	3.22200E-11	0.00000E+00	0.00000E+00
3	pu240	2	2	0	1	2.40054E+02	3.24400E-11	0.00000E+00	0.00000E+00
4	pu241	2	1	0	1	2.41057E+02	3.24800E-11	0.00000E+00	1.52600E-09
5	pu242	2	2	0	1	2.42059E+02	3.30100E-11	0.00000E+00	0.00000E+00
6	u235	1	1	0	1	2.35044E+02	3.12700E-11	0.00000E+00	0.00000E+00
7	u236	1	3	0	1	2.36046E+02	3.34000E-11	0.00000E+00	0.00000E+00
8	u238	1	2	0	1	2.38051E+02	3.50000E-11	0.00000E+00	0.00000E+00
9	am241	2	3	0	1	2.41056E+02	3.53800E-11	0.00000E+00	0.00000E+00
10	am242m	2	3	0	1	2.42060E+02	3.44900E-11	0.00000E+00	0.00000E+00
11	am243	2	3	0	1	2.43061E+02	3.44300E-11	0.00000E+00	0.00000E+00
12	np237	1	3	0	1	2.37048E+02	3.33600E-11	0.00000E+00	0.00000E+00
13	cm242	2	3	0	1	2.42059E+02	3.51000E-11	0.00000E+00	4.92182E-08
14	cm243	2	3	0	1	2.43060E+02	3.51600E-11	0.00000E+00	0.00000E+00
15	cm244	2	3	0	1	2.44063E+02	3.40100E-11	0.00000E+00	0.00000E+00
16	cm245	2	3	0	1	2.45066E+02	3.52900E-11	0.00000E+00	0.00000E+00
17	b-10	0	7	0	1	1.00123E+01	0.00000E+00	0.00000E+00	0.00000E+00
18	b-11	0	7	0	1	1.10093E+01	0.00000E+00	0.00000E+00	0.00000E+00
19	c	0	7	0	1	1.20110E+01	0.00000E+00	0.00000E+00	0.00000E+00
20	o	0	5	0	1	1.59990E+01	0.00000E+00	0.00000E+00	0.00000E+00
21	na	0	6	0	1	2.29900E+01	0.00000E+00	0.00000E+00	0.00000E+00
22	fe	0	6	0	1	5.58470E+01	0.00000E+00	0.00000E+00	0.00000E+00
23	cr	0	6	0	1	5.19960E+01	0.00000E+00	0.00000E+00	0.00000E+00
24	ni	0	6	0	1	5.87000E+01	0.00000E+00	0.00000E+00	0.00000E+00
25	mo	0	6	0	1	9.59400E+01	0.00000E+00	0.00000E+00	0.00000E+00
26	mn	0	6	0	1	5.49380E+01	0.00000E+00	0.00000E+00	0.00000E+00
27	u235-fp	-1	4	0	1	2.35044E+02	0.00000E+00	0.00000E+00	0.00000E+00
28	u238-fp	-1	4	0	1	2.38051E+02	0.00000E+00	0.00000E+00	0.00000E+00
29	pu239-fp	-1	4	0	1	2.39055E+02	0.00000E+00	0.00000E+00	0.00000E+00
30	pu241-fp	-1	4	0	1	2.41057E+02	0.00000E+00	0.00000E+00	0.00000E+00

Uorco 1st cycle boc calculation (full core model)
step no.1-2 cell.(cr na-folower)

a s s e m b l y g r o u p t a b l e

no.	n a m e		flag	mix.	edit.	attr.	plot.	name	assem
1	incore	init	1	1	1	1	1	icl	67
2	oucore	init	1	2	1	2	2	ocl	32
3	gem	na	1	3	1	4	0	gem	22
4	radial	shisus	1	4	1	4	0	rss	108
5	radial	shib4c	1	4	1	4	0	rsh	102
6	course	rod	2	5	1	4	-1	ccr	6
7	time	rod	2	5	1	4	-1	fcr	2
8	backup	rod	2	5	1	4	-1	bcr	2
	t o t a l								341

mixture group table

no.	n a m e		assem
1	incore	init	67
2	oucore	init	32
3	gem	na	22
4	radial	shib4c	210
5	backup	rod	10
	t o t a l		341

r e g i o n t a b l e

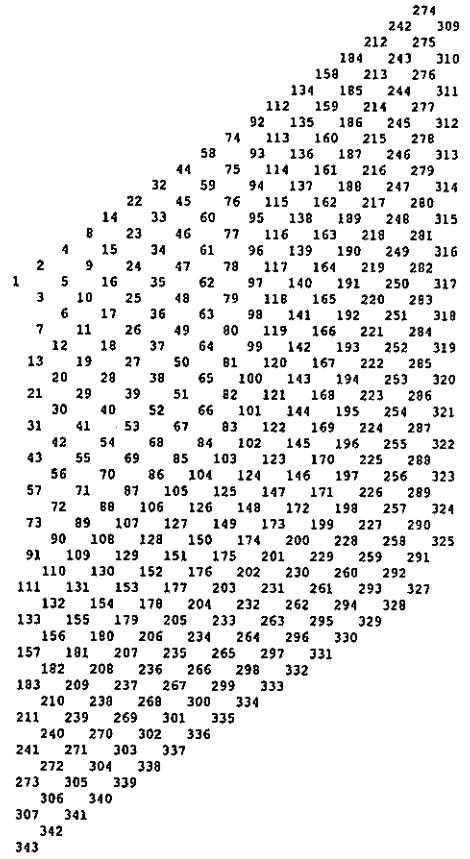
no.	n a m e		x-sect.	mixture	edit.op.	attr.	plot.rgn	atr.name	volume
1	incore	init	1	1	1	1	1	\icl	1.435906E+06
2	oucore	init	2	2	1	1	1	\oil	6.926985E+05
3	axbla	upper	3	3	1	2	1	\abu	7.450122E+05
4	axbla	lower	4	3	1	2	1	\abl	7.450119E+05
5	na	foll1	5	4	0	5	0	\nac	6.736494E+05
6	na	foll2	6	4	0	5	0	\nab	3.658314E+05
7	gem	na	7	5	0	5	0	\gem	1.204863E+06
8	upplenumcore		8	6	0	3	0	\upc	4.092332E+05
9	loplenumcore		9	6	0	3	0	\lpc	2.235036E+06
10	upb4c	shield	10	7	0	3	0	\usc	1.426166E+06
11	upgem	shield	11	7	0	3	0	\ugs	3.190743E+05
12	lower	shield	12	7	0	3	0	\lsc	4.818938E+05
13	radial	sussbie	13	8	0	5	0	\rsh	9.094266E+06
14	radial	b4cshie	14	8	0	5	0	\rsb	8.589029E+06
15	gem	upplenum	15	5	0	5	0	\gep	2.404963E+05
	t o t a l								2.865817E+07

mixture region table

no.	n a m e		volume
1	incore	init	1.435906E+06
2	oucore	init	6.926985E+05
3	axbla	lower	1.490024E+06
4	na	foll2	1.039481E+06
5	gem	upplenum	1.445359E+06
6	loplenumcore		2.644269E+06
7	lower	shield	2.227134E+06
8	radial	b4cshie	1.768330E+07
	t o t a l		2.865817E+07

Tue Apr 8 23:16:02 1997 page 30rco 1st cycle boc calculation (full core model)
burnup time (days) 456.00 cpu time (sec) 7718.1step no.1-2 cell.(cr na-folower)

assembly no. map



thrco 1st cycle boc calculation (full core model)
step no.1-2 cell.(cr na-folower)

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burnup time (days) 456.00 cpu time (sec) 7718.2

assembly group map

```
                                                                    5
                                                                5   5
                                                            5   5   5
                                                        4   5   5   5
                                                    4   4   4   5
                                                4   4   4   5   5   5
                                            4   4   4   5   5   5
                                        3   4   4   4   5   5   5
                                    2   3   4   4   4   5   5
                                1   2   4   4   4   5   5
                            1   2   3   4   4   4   5
                        7   1   2   4   4   4   5   5
                    1   1   2   3   4   4   4   5
                1   1   1   2   4   4   4   5   5
            6   1   1   6   3   4   4   4   5
        1   1   1   1   2   4   4   4   5   5
    1   1   1   1   2   3   4   4   4   5
1   1   1   8   1   2   4   4   4   5   5
    1   1   1   1   2   3   4   4   4   5
        1   1   1   2   4   4   4   5   5
    1   6   1   1   6   3   4   4   4   5
        1   1   1   1   2   4   4   4   5   5
    1   1   1   1   2   3   4   4   4   5
        1   1   7   1   2   4   4   4   5   5
    1   1   1   1   2   3   4   4   4   5
        1   1   1   1   2   4   4   4   5   5
    1   8   1   1   2   3   4   4   4   5
        1   1   1   2   3   4   4   4   5   5
    1   1   1   2   2   4   4   4   4   5
        1   1   6   2   3   4   4   4   5   5
    1   1   2   2   3   4   4   4   5
        1   2   2   3   4   4   4   4   5   5
    1   6   2   3   4   4   4   4   5   5
        2   2   3   4   4   4   4   5   5   5
    2   2   3   4   4   4   4   5   5
        2   3   4   4   4   4   5   5   5
    2   3   4   4   4   4   5   5   5
        3   4   4   4   4   5   5   5
    3   4   4   4   4   5   5   5
        4   4   4   4   5   5   5
    4   4   4   4   5   5   5
        4   4   4   5   5   5
    4   4   4   5   5   5
        4   4   5   5   5
    4   4   5   5   5
        4   5   5   5
    5   5   5   5
        5   5   5
    5   5
        5
    5
```

control rod draw stroke (cm)

```
                    389.0
        389.0               389.0
                    389.0
        389.0               389.0
                    389.0
        389.0
                    389.0
        389.0
```

fbrco 1st cycle boc calculation (full core model)
step no.1-2 cell.(cr na-folower)

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burnup time (days) 456.00 cpu time (sec) 7718.2

edit option list (diffusion module)

1) edit option data list print (0=no,1=yes) .	1	26) normal flux distribution map plot (0=no,1=yes)
2) general input data list print (0=no,1=yes) .	0	27) adjoint flux distribution map plot(0=no,1=yes)
3) macro cross section print (0=no,1=mix,2=reg) .	0	28) power distribution map plot (0=no,1=yes)
4) diffusion cal. information (0=no,1=prt,2=all) .	2	29) ....
5) gross neutron balance (0=no,1=yes) .	0	30) ....
6) neutron balance by mixture region(0=no,1=yes) .	0	31) ....
7) neutron balance by region (0=no,1=yes) .	0	32) ....
8) average flux by mixture region (0=no,1=yes) .	1	33) ....
9) average flux by region (0=no,1=yes) .	0	34) ....
10) average power by mixture region (0=no,1=yes) .	1	35) ....
11) average power by region (0=no,1=yes) .	1	36) ....
12) normal flux distribution (0=no,1,2,3,4=prt) .	0	37) ....
13) adjoint flux distribution (0=no,1,2,3,4=prt) .	0	38) ....
14) power distribution (0=no,1=ave,2=plane) .	0	39) ....
15) axial power dist. (0=no,1=peak,2=asm,3=1+2) .	0	40) ....
16) total nuclude reaction rate (0=no,1=yes) .	0	41) ....
17) reaction rate by mixture region (0=no,1=yes) .	0	42) ....
18) reaction rate by region (0=no,1=yes) .	0	43) ....
19) breeding ratio by mixture region (0=no,1=yes) .	0	44) ....
20) breeding ratio by region (0=no,1=yes) .	1	45) ....
21) fission inventory print (0=no,1=yes) .	1	46) ....
22) doubling time print (0=no,1=yes) .	0	47) ....
23) delta-flux file(unit no.90) write(0=no,1=yes) .	0	48) ....
24)	0	49) ....
25)	0	50) ....

edit of report data list (diffusion module)

(1) axial power dist.	1	2	4	8	6	14	22	32	44	58	74	92	112	134	158	184	212	242	274	0	0	0	0	0
(assembly no.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(5)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(8)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(10)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

venture - neutronics module - version 3.1 - fall, 1981 -- quality assurance level 1

run title - fbrco 1st cycle boc calculation (full core model)
step no.1-2 cell.(cr na-folower)

```
0
storage required for cross section check   98796 words
0
title of the latest version cross section file
0
0
0
0      grupxs made  by moses
0
0
cross section check completed normally
0
reference real time from znatdn interface file =  0.00000E+00 days
0
0
solution by finite-difference diffusion theory
eigenvalue problem
geometry no. 17   3-d triagonal-z
triagonal option  0   parallelogram - 120 degree
number of energy groups                           7
number of upscatter groups (max)                  0
number of downscatter groups (max)                6
number of intervals in dimension 1 (columns)     74
number of intervals in dimension 2 (rows)        37
number of intervals in dimension 3 (planes)      58
number of zones                                5489
number of regions                             43808
number of black absorber zones                    1
boundary indicators-   left  2  right  4
                        top  2 bottom  4
                      front  2  rear  2
0
0
0
0
0
0
0
0
0
0
```

memory requirements for data storage

	total minimum	total maximum	a	b	c	d
storage available	19984626					
micro calculation	246989					
equation constants calculation						
0 core contained or space stored	1081459	1232049				
0 plane stored	354559	505149				
0 row stored	354559	505149				
0 multi-level plane stored	354559	505149				
initial flux						
0 core contained or space stored	408989	565055				
0 other modes	91381	247447				
iterative process						
core contained	10164457		8798454	24882	537924	803197
space stored	2235738		2073629	24882	137227	0
58 planes stored	2090681		1928572	24882	137227	0
1 plane stored	211505		49396	24882	137227	0
37 rows stored	198221		36112	24882	137227	0
1 row stored	162109		0	24882	137227	0
58 multi-level planes stored	2258233		16428	24882	137227	2079696
perturbation calculation	208544					

data will be stored for all groups, all space

```
memory locations reserved for data storage---19984626
max memory locations required for this prob--10164457
memory locations not used------------------- 9820169

     special scratch dataset requirements
     maximum physical record is     32768 words

rite container arrays, control        36 data 9820159
file  92 defaults to core
  # of logical records in file =         7   logical record length (word) =     317608
```

```
  length of the file (word)     =   2223256   start location in core (word)=          1
  remaining core (word)         =   7596903
file  95 defaults to core
  # of logical records in file =          7   logical record length (word) =    317608
  length of the file (word)     =   2223256   start location in core (word)=   2223257
  remaining core (word)         =   5373647
file  96 defaults to core
  # of logical records in file =          7   logical record length (word) =    317608
  length of the file (word)     =   2223256   start location in core (word)=   4446513
  remaining core (word)         =   3150391
direct access file 98  requires          7 records        803196 words in length

*****(watt.sec/fiss) and (watt.sec/capt) are zero on grupxs - defaulting to 3.2e-11


maximum storage used for macroscopic cross section calculation    246988 words

the maximum and minimum diffusion coefficients are  1.79560E+01  0.00000E+00


fine mesh description - point is located at the centroid of the volume element
equilateral triangles - side =   9.1279
distance to point - dimension 3 (front to rear)
    1   6.7000    2  20.1000    3  33.5000    4  46.9000    5  60.3000    6  69.8500    7  75.5500    8  81.2500
    9  86.9500   10  92.6500   11  97.7000   12 102.1000   13 106.5000   14 110.9000   15 115.3000   16 119.6667
   17 124.0000   18 128.3333   19 132.3750   20 136.1250   21 140.5000   22 145.5000   23 150.5000   24 155.5000
   25 160.5000   26 165.5000   27 170.5000   28 175.5000   29 179.3250   30 181.9750   31 184.6000   32 187.2000
   33 190.6000   34 194.8000   35 199.0000   36 203.2000   37 207.4000   38 211.6000   39 215.8000   40 220.0000
   41 224.2000   42 228.4000   43 233.0000   44 238.0000   45 242.3750   46 246.1250   47 250.1875   48 254.5625
   49 258.9375   50 263.3125   51 276.0000   52 297.0000   53 318.0000   54 339.0000   55 360.0000   56 373.5833
   57 379.7500   58 385.9166

determine initial parameters for iterative procedure


reference point for initialization will be at column =    38 row =    30 plane =    39 zone =  3541
   x,xx,y,yy,z,share(3),nouter=   0.915961   0.787603   0.787603   4.18828
   4.70000    1.00000E-04  43
initial outer iteration eigenvalue        0.915961  option  -99
initial overrelaxation coefficients max.  1.475758  min.  1.293372  inner iterations max.    4  min.    4  option    0
mesh point sweep option    1
outer iteration limit to be used   100  estimated    43

maximum storage used for calculating initial parameters was      806186


initial flux from existing interface
3d,    7 groups, fine mesh is   74 by   37 by   58, iter   64, effk 1.0290918, power  1.5998999E+09


total core required for data storage is******* words
elapsed cpu and clock minutes are       0.00       0.00


initial multiplication factor   1.029092E+00
```



```
a flux - eigenvalue problem follows
      4 inners min,  4 inners max - chebychev  beta on inners
    sigma-1 ordering
procedure=0,1,2,3,4-normal,chebyshev,semex,demex,semexf.   icvr=0,1-yes,no inners convr.   ocvr=0,1-yes,no outers convr.
iter  proc  icvr  ocvr   flux change    mu-bar  other-mu  sem-ind   acceleration parameters   source      k-used     k-calc
   1     0     0     0   1.03826E+00  0.00000  0.00000  1.00000      0.00000    0.00000  4.76531E+19  1.0290918  1.0028459
   2     0     0     0   4.70752E-01  0.25297  0.00000  1.00000      1.00000    0.00000  4.70229E+19  1.0290918  0.9987822
   3     0     0     0   4.23297E-01  1.00000  0.00000  1.00000      1.00000    0.00000  4.63849E+19  1.0137105  0.9976968
   4     0     0     0   3.02608E-01  0.89210  0.00000  1.00000      8.26751    0.33864  4.60924E+19  0.9976968  0.9985871
   5     0     0     0   1.69232E-01  0.71740  0.00000  1.00000      8.26751  -13.38535  4.61551E+19  0.9985871  0.9986521
   6     0     0     0   1.02166E-01  0.70435  0.00000  1.00000      2.61244   -0.17269  4.61895E+19  0.9986521  0.9985851
   7     0     0     0   6.84642E-02  0.72439  0.00000  1.00000      0.66305    1.29037  4.62146E+19  0.9985851  0.9985305
   8     0     0     0   4.86055E-02  0.73337  0.00000  1.00000      4.56821   -1.27380  4.62371E+19  0.9985305  0.9985121
   9     0     0     0   3.51230E-02  0.74360  0.00000  1.00000     26.50949  -16.64965  4.62583E+19  0.9985121  0.9985274
  10     0     0     0   2.59310E-02  0.76554  0.00000  1.00000     -6.93369    6.93504  4.62787E+19  0.9985274  0.9985678
  11     0     0     0   1.96309E-02  0.79618  0.00000  1.00000    -26.16764   20.01383  4.62981E+19  0.9985678  0.9986246
  12     0     0     0   1.56348E-02  0.83047  0.00000  1.00000   -198.30686  134.56992  4.63166E+19  0.9986246  0.9986909
new overrelaxation coefficients calculated  1.49958  1.56490  1.67637  1.61838  1.50327  1.60192  1.58866
new inners calculated   4   4   4   4   4   4   4
  13     0     0     1  -4.07294E-02  1.00000  0.00000  1.00000      1.00000    4.89881  4.63341E+19  0.9986909  0.9988187
  14     0     0     1  -4.70056E-02  1.00000  0.00000  1.00000      1.00000    0.00000  4.63631E+19  0.9988187  0.9989812
  15     0     1     1   6.09747E-02  1.00000  0.00000  1.00000      1.00000    0.00000  4.63891E+19  0.9989812  0.9991139
  16     0     1     1   2.27688E-01  1.00000  0.00000  1.00000      1.00000    0.00000  4.64102E+19  0.9991139  0.9992171
     forced extrapolation lamda          0.87624


  1.01300E+17  1.15608E+17  2.16900E+17  0.00000E+00  8.76240E-01  4.67036E-01  8.76300E-01  9.99444E-01  5.56089E-04
  17     4     1     1  -2.08853E-01  0.87624  0.00000  1.00000      3.30656    0.00000  4.64279E+19  0.9992171  0.9993087
  18     1     1     1   4.84542E-01  0.00000  0.00000  1.00000      0.63431    0.00000  4.65530E+19  0.9996303
  19     1     1     1  -4.12442E-01  0.00000  0.00000  1.00000      1.39702    0.46669  4.65688E+19  0.9999702
  20     1     1     1  -7.79306E-01  1.00000  1.49984  1.00000      1.13174    0.30437  4.65764E+19  1.0001333
  21     1     1     1   5.95015E+00  0.95725  4.66012  1.00000      1.06227    0.26186  4.65598E+19  0.9999544
  22     1     1     1   3.44423E+00  0.82227  2.30096  1.00000      1.04482    0.25119  4.65555E+19  0.9998628
  23     1     1     1   1.39142E+01  0.72578 10.99697  1.00000      1.04048    0.24853  4.65631E+19  0.9999443
  24     0     1     1   5.90229E+04  0.00000  0.00000  1.00000      1.00000    2.64664  4.65655E+19  0.9999958  0.9999567
  25     1     1     0   5.94177E+00  0.00000  0.00000  1.00000      0.50127    0.00000  4.65647E+19  0.9999567
  26     1     1     1   4.63845E+00  0.00000  0.00000  1.00000      0.70722    0.13718  4.65649E+19  0.9999609
  27     1     1     1   1.23874E+01  1.00000  8.86425  1.00000      0.70722    0.13718  4.65650E+19  0.9999619
  28     1     1     0   2.49995E+00  0.86416  0.81659  1.00000      0.70722    0.13718  4.65653E+19  0.9999649
  29     1     1     0   2.93035E+00  0.77972  2.63734  1.00000      0.70722    0.13718  4.65650E+19  0.9999626
  30     1     1     0   1.07211E+01  0.70921  9.01923  1.00000      0.70722    0.13718  4.65652E+19  0.9999637
  31     3     1     0   2.64233E+00  2.43340  1.56763  0.00000     12.37756   -3.19258  4.65652E+19  0.9999637
  32     0     1     1   5.29775E+03  0.00000  0.00000  1.00000      1.00000   -1.69764  4.65654E+19  0.9999659  0.9999620
  33     1     1     1   6.20238E+00  0.00000  0.00000  1.00000      0.50127    0.00000  4.65653E+19  0.9999620
  34     1     1     0   1.19228E+01  0.00000  0.00000  1.00000      0.70722    0.13718  4.65654E+19  0.9999647
  35     1     1     1   8.79100E+00  1.00000  5.13282  1.00000      0.70722    0.13718  4.65655E+19  0.9999650
  36     1     1     1   1.32680E+01  0.82828  8.14325  1.00000      0.70722    0.13718  4.65654E+19  0.9999643
  37     1     1     0   6.06313E+00  0.90236  3.48854  1.00000      0.70722    0.13718  4.65654E+19  0.9999646
  38     1     1     1   1.45197E+01  0.98669  9.65459  1.00000      0.70722    0.13718  4.65654E+19  0.9999647
  39     0     1     1   8.62058E+01  0.00000  0.00000  1.00000      1.00000   74.15444  4.65654E+19  0.9999644  0.9999644
  40     1     0     0   2.21652E+00  0.00000  0.00000  1.00000      0.32407    0.00000  4.65654E+19  0.9999644
  41     1     1     0  -3.96268E-01  0.00000  0.00000  1.00000      0.40134    0.05835  4.65654E+19  0.9999647
  42     1     0     0   4.55805E-01  0.92234  0.92234  1.00000      0.40134    0.05835  4.65654E+19  0.9999643
  43     1     1     0  -2.10968E-01  0.87873  0.56833  1.00000      0.40134    0.05835  4.65654E+19  0.9999646
  44     1     1     0   1.71923E-01  0.94754  0.72896  1.00000      0.40134    0.05835  4.65654E+19  0.9999645
  45     1     1     0  -9.26705E-02  0.96523  0.58536  1.00000      0.40134    0.05835  4.65654E+19  0.9999646
  46     1     0     0   5.86139E-02  0.89243  0.60319  1.00000      0.40134    0.05835  4.65654E+19  0.9999647
  47     1     0     0  -2.89673E-02  0.87825  0.50869  1.00000      0.40134    0.05835  4.65654E+19  0.9999645
  48     1     1     0   1.45330E-02  0.95335  0.49444  1.00000      0.40134    0.05835  4.65654E+19  0.9999647
  49     1     1     0   9.38548E-03  0.98352  0.71739  1.00000      0.40134    0.05835  4.65654E+19  0.9999646
  50     1     1     0   9.73443E-03  0.91586  1.04205  1.00000      0.40134    0.05835  4.65654E+19  0.9999646
  51     0     0     1  -2.81416E-02  0.00000  0.00000  1.00000      1.00000   10.88497  4.65654E+19  0.9999647  0.9999646
  52     1     0     0   4.80625E-03  0.00000  0.00000  1.00000      0.32407    0.00000  4.65654E+19  0.9999646
  53     1     0     0  -3.74890E-03  0.00000  0.00000  1.00000      0.40134    0.05835  4.65654E+19  0.9999647
  54     1     0     0  -3.85563E-03  1.00000  1.02654  1.00000      0.40134    0.05835  4.65654E+19  0.9999647
  55     1     0     1  -3.77997E-03  0.87898  0.92384  1.00000      0.40134    0.05835  4.65654E+19  0.9999646
  56     1     0     0  -3.65234E-03  0.93919  0.98138  1.00000      0.40134    0.05835  4.65654E+19  0.9999647
  57     1     0     0  -2.75252E-03  0.97740  0.79340  1.00000      0.40134    0.05835  4.65654E+19  0.9999646
  58     1     0     0  -2.94954E-03  0.91657  1.07010  1.00000      0.40134    0.05835  4.65654E+19  0.9999646
  59     1     0     1   2.76810E-03  0.86096  0.91338  1.00000      0.40134    0.05835  4.65654E+19  0.9999647
  60     0     0     1  -8.42595E-03  0.00000  0.00000  1.00000      1.00000    6.19234  4.65654E+19  0.9999646
     forced extrapolation lamda          0.51063


  2.09364E+13  4.10014E+13  3.79602E+13  2.16900E+17  5.10626E-01  5.51535E-01  1.22983E+00 -1.94995E-01  1.19500E+00
  61     0     0     1  -8.55017E-04  0.55118  0.00000  1.00000      1.22807    6.19234  4.65654E+19  0.9999647
  62     0     0     0   2.18635E-03  0.46333  0.00000  1.00000      1.22807   -0.24039  4.65654E+19  0.9999647
```

```
    forced extrapolation lamda          0.48341


  1.00472E+13  3.79602E+13  5.14468E-01  1.05960E+00
  63    4     0     0   -3.67047E-04    0.51447  0.00000  1.00000      0.35995     0.00000  4.65654E+19  0.9999646
  64    0     0     0   -5.32166E-04    0.00000  0.00000  1.00000      0.00000     0.00000  4.65654E+19  0.9999646  0.9999646
  65    1     0     0   -7.67847E-05    0.00000  0.00000  1.00000      0.24524     0.00000  4.65654E+19  0.9999646
                                                                                                          0.9999646

estimated absolute point flux relative error  7.49305E-05


multiplication reliability estimators
neutron balance keffective-----------------------------------------  0.9999646
by the sum of the squares of the residues--------------------------  0.9999646
upper and lower bounds estimates by max rel flux change------------  1.0000414   0.9998879
upper and lower bounds estimates over all significant points-------  1.0074046   0.9917746

number of inner iterations, outer iteration error eigenvalue, and overrelaxation coefficients     4  4.93889E-01
  1.45019  1.46639  1.62852  1.47130  1.50327  1.60192  1.58866

cpu and clock minutes required for this eigenvalue problem are  0.000   0.000
dopc file closing data - unit, arrays      96      21 6669769
dopc file closing data - unit, arrays      95      16 4446513


    leakage  1.96616E+16  total losses  4.85873E+19  total productions  4.85855E+19  reactor power(watts)  1.59990E+09
```

boundary neutron leakage

group	left	right	top	bottom	front	back
1	0.00000E+00	5.92284E+17	0.00000E+00	-5.92284E+17	6.67117E+11	5.22408E+11
2	0.00000E+00	2.38070E+18	0.00000E+00	-2.38070E+18	6.62738E+12	2.17197E+13
3	0.00000E+00	1.09408E+19	0.00000E+00	-1.09408E+19	6.99550E+14	4.78941E+15
4	0.00000E+00	5.17459E+18	0.00000E+00	-5.17459E+18	5.61799E+14	5.60199E+15
5	0.00000E+00	9.89129E+17	0.00000E+00	-9.89129E+17	1.44285E+14	1.98782E+15
6	0.00000E+00	5.02777E+17	0.00000E+00	-5.02777E+17	1.54434E+14	3.00953E+15
7	0.00000E+00	1.18239E+17	0.00000E+00	-1.18239E+17	9.81969E+13	2.58508E+15
sum	0.00000E+00	2.06985E+19	0.00000E+00	-2.06985E+19	1.66556E+15	1.79961E+16

overall neutron balance

group	absorptions	b**2 losses	1/v loss	out-scatter	in-scatter	pl in-scatter	source	power(watts)
1	9.94766E+17	0.00000E+00	0.00000E+00	6.39496E+18	0.00000E+00	0.00000E+00	7.38977E+18	2.38227E+07
2	3.39256E+18	0.00000E+00	0.00000E+00	2.09868E+19	3.31755E+18	0.00000E+00	2.10619E+19	9.71182E+07
3	1.17519E+19	0.00000E+00	0.00000E+00	3.08153E+19	2.29787E+19	0.00000E+00	1.95941E+19	1.93689E+08
4	1.51150E+19	0.00000E+00	0.00000E+00	1.71708E+19	3.17688E+19	0.00000E+00	5.23100E+17	1.23002E+08
5	1.08937E+19	0.00000E+00	0.00000E+00	6.42090E+18	1.72982E+19	0.00000E+00	1.84851E+16	6.32430E+07
6	5.03662E+18	0.00000E+00	0.00000E+00	1.38551E+18	6.42531E+18	0.00000E+00	0.00000E+00	2.97334E+07
7	1.38296E+18	0.00000E+00	0.00000E+00	0.00000E+00	1.38565E+18	0.00000E+00	0.00000E+00	2.69117E+06
sum	4.85674E+19	0.00000E+00	0.00000E+00	8.31742E+19	8.31742E+19	0.00000E+00	4.85873E+19	5.33300E+08

```
point regular flux interface file rtflux (version  1) has been written on unit number  82

the maximum power density is at plane  29, row  37,  and column  74  and is   4.00274846E+02  watts/cc.


the maximum neutron density is at plane  29, row  37, and column  74  and is   5.24271165E+15  neutrons/cc.

the relative power density traverse left-to-right is
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  5.47597E-01  5.97758E-01  6.67335E-01
  7.16953E-01  7.72393E-01  8.12445E-01  6.58622E-01  6.80035E-01  7.03146E-01  7.24047E-01  7.44067E-01  7.66267E-01
  0.00000E+00  0.00000E+00  0.00000E+00  8.16094E-01  8.32674E-01  8.51512E-01  8.66490E-01  8.80364E-01  8.94132E-01
  9.05144E-01  9.18938E-01  9.29959E-01  9.42786E-01  9.54921E-01  9.69884E-01  9.78753E-01  9.89630E-01  9.95144E-01
  9.99999E-01  1.00000E+00

the relative power density traverse top-to-bottom is
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  5.47597E-01  6.67335E-01  7.72393E-01  6.58622E-01  7.03146E-01  7.44067E-01
  0.00000E+00  0.00000E+00  8.32674E-01  8.66490E-01  8.94132E-01  9.18938E-01  9.42786E-01  9.69884E-01  9.89630E-01
  1.00000E+00

the relative power density traverse front-to-back is
```



```
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  1.65206E-02  1.93800E-02  2.43674E-02  3.15419E-02  4.13684E-02  7.76295E-02  9.92415E-02  1.26530E-01
  4.90629E-01  5.58261E-01  6.29978E-01  7.14335E-01  7.90537E-01  8.56593E-01  9.03591E-01  9.46622E-01  9.77835E-01
  9.96771E-01  1.00000E+00  9.99927E-01  9.96698E-01  9.89916E-01  9.79794E-01  9.54593E-01  9.20779E-01  8.78717E-01
  8.28893E-01  7.81199E-01  7.16334E-01  6.45411E-01  5.70448E-01  4.94999E-01  1.28560E-01  9.76567E-02  6.38269E-02
  5.12865E-02  3.06747E-02  2.38805E-02  1.93831E-02  1.73087E-02  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00

the relative neutron density traverse left-to-right is
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  2.44735E-06  7.35309E-06  1.85103E-05  4.51737E-05  1.09454E-04  2.62855E-04  6.28432E-04  1.49543E-03  3.64637E-03
  1.04057E-02  1.70057E-02  2.46609E-02  3.40589E-02  4.56952E-02  6.04542E-02  7.88643E-02  1.02037E-01  1.30350E-01
  1.64850E-01  2.05015E-01  2.50596E-01  2.84940E-01  3.08257E-01  3.32487E-01  3.74509E-01  4.38019E-01  4.97859E-01
  5.46696E-01  5.90586E-01  6.21533E-01  6.51483E-01  6.73665E-01  6.96822E-01  7.15221E-01  7.32575E-01  7.48945E-01
  7.64526E-01  7.73585E-01  7.82752E-01  7.99521E-01  8.21644E-01  8.42818E-01  8.60575E-01  8.74352E-01  8.88074E-01
  8.97757E-01  9.12083E-01  9.22608E-01  9.39249E-01  9.51634E-01  9.67190E-01  9.77623E-01  9.88753E-01  9.94370E-01
  9.99999E-01  1.00000E+00

the relative neutron density traverse top-to-bottom is
  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00  0.00000E+00
  2.44735E-06  1.85103E-05  1.09454E-04  6.28432E-04  3.64637E-03  1.70057E-02  3.40589E-02  6.04542E-02  1.02037E-01
  1.64850E-01  2.50596E-01  3.08257E-01  3.74509E-01  4.97859E-01  5.90586E-01  6.51483E-01  6.96822E-01  7.32575E-01
  7.64526E-01  7.82752E-01  8.21644E-01  8.60575E-01  8.88074E-01  9.12083E-01  9.39249E-01  9.67190E-01  9.88753E-01
  1.00000E+00

the relative neutron density traverse front-to-back is
  9.18826E-07  7.27019E-06  5.83275E-05  5.01761E-04  4.65036E-03  3.59908E-02  4.33984E-02  5.07336E-02  5.78990E-02
  6.47403E-02  7.44602E-02  9.45879E-02  1.21976E-01  1.57562E-01  2.02570E-01  2.57695E-01  3.23108E-01  3.98584E-01
  4.73495E-01  5.42245E-01  6.20947E-01  7.05237E-01  7.81152E-01  8.46962E-01  9.01511E-01  9.44749E-01  9.76063E-01
  9.95063E-01  1.00000E+00  9.99931E-01  9.96407E-01  9.89560E-01  9.76252E-01  9.50990E-01  9.17128E-01  8.74979E-01
  8.24963E-01  7.67684E-01  7.03254E-01  6.32721E-01  5.57681E-01  4.80577E-01  3.95066E-01  3.09221E-01  2.46250E-01
  2.00284E-01  1.58753E-01  1.23443E-01  9.64487E-02  7.69851E-02  6.06187E-02  3.95025E-02  2.38581E-02  1.37008E-02
  7.50770E-03  4.15873E-03  2.24184E-03  8.80470E-04

dopc use of container arrays, control      11, max data 6669768


total cpu minutes used  0.000    total clock minutes used    0.000    total i/o used      0
```

fbrco 1st cycle boc calculation (full core model)
step no.1-2 cell.(cr na-folower)

mixture region normal flux distribution (n/sec.cm**2)

no.	name	volume	group 1	group 2	group 3	group 4	group 5	group 6
1	incore init	1.435906E+06	4.849260E+13	2.278508E+14	1.614756E+15	1.007593E+15	2.661479E+14	3.979401E+13
2	oucore init	6.926985E+05	3.391175E+13	1.573084E+14	1.006091E+15	5.730563E+14	1.434156E+14	2.783481E+13
3	axbla lower	1.490024E+06	5.420418E+12	2.796908E+13	3.015053E+14	2.866420E+14	1.062120E+14	3.733937E+13
4	na foll2	1.039481E+06	8.615139E+12	4.504354E+13	3.672496E+14	2.664552E+14	9.766046E+13	3.272608E+13
5	gen upplenum	1.445359E+06	3.937838E+12	2.276931E+13	2.112753E+14	1.659763E+14	6.889635E+13	4.882332E+13
6	loplenumcore	2.644269E+06	1.445418E+11	1.201436E+12	3.068058E+13	4.183033E+13	2.367844E+13	2.496769E+13
7	lower shield	2.227134E+06	8.838658E+09	8.859408E+10	2.402783E+12	2.998204E+12	1.129022E+12	8.810370E+11
8	radial b4cshie	1.768330E+07	7.510194E+10	7.064370E+11	1.877160E+13	1.803884E+13	8.821178E+12	8.105902E+12
	total	2.865817E+07	4.102663E+12	2.000869E+13	1.594787E+14	1.124989E+14	3.705666E+13	1.563136E+13

no.	name	volume	group 7
1	incore init	1.435906E+06	2.197613E+11
2	oucore init	6.926985E+05	1.153788E+12
3	axbla lower	1.490024E+06	2.879489E+12
4	na foll2	1.039481E+06	5.375956E+12
5	gen upplenum	1.445359E+06	1.407281E+13
6	loplenumcore	2.644269E+06	1.106188E+13
7	lower shield	2.227134E+06	5.715269E+11
8	radial b4cshie	1.768330E+07	4.317969E+12
	total	5.731633E+07	2.411409E+12

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burnup time (days) 456.00 cpu time (sec) 16035.9

fbrco 1st cycle boc calculation (full core model)
step no.1-2 cell.(cr na-folower)

Wed Apr 9 01:36:09 1997 page 36
burnup time (days) 456.00 cpu time (sec) 16035.9

mixture region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peak position	peak power(w/cc)	peak r.peak
1	incore init	1.435906E+06	3.657480E+02	6.858205E+01	2.547158E+02	(1,29)	4.003981E+02	1.000000
2	oucore init	6.926985E+05	1.446470E+02	2.712302E+01	2.088167E+02	(87,30)	3.043212E+02	1.066932
3	axbla lower	1.490024E+06	2.290490E+01	4.294938E+00	1.537217E+01	(1,43)	5.238102E+01	1.000001
8	radial b4cshie	1.768330E+07	1.765636E-43	3.363116E-44	9.809089E-45	(343,58)	8.155557E-43	0.000000
	total	2.130192E+07	5.333000E+02	1.000000E+02				

region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peak position	peak power(w/cc)	peak r.peak
1	incore init	1.435906E+06	3.657480E+02	6.858205E+01	2.547158E+02	(1,29)	4.003981E+02	1.000000
2	oucore init	6.926985E+05	1.446470E+02	2.712302E+01	2.088167E+02	(87,30)	3.043212E+02	1.066932
3	axbla upper	7.450122E+05	1.120301E+01	2.100696E+00	1.503735E+01	(1,18)	5.162469E+01	1.000002
4	axbla lower	7.450119E+05	1.170189E+01	2.194241E+00	1.570698E+01	(1,43)	5.238102E+01	1.000001
14	radial b4cshie	8.589029E+06	1.765636E-43	3.363116E-44	2.101948E-44	(343,58)	8.155557E-43	0.000000
	total	1.220766E+07	5.333000E+02	1.000000E+02				

breeding ratio by region

no.	name	volume	fertile capture	fissile absorptions	fissile decay	fissile absr.+decay	breeding ratio
1	incore init	1.43591E+06	2.29162E-01	2.39073E-01	4.94497E-03	2.44018E-01	6.41053E-01
2	oucore init	6.92698E+05	6.45921E-02	9.61991E-02	3.65625E-03	9.98553E-02	1.80689E-01
3	axbla upper	7.45012E+05	4.68854E-02	6.58232E-03	8.96556E-07	6.58321E-03	1.31156E-01
4	axbla lower	7.45012E+05	4.79128E-02	7.01921E-03	1.14491E-06	7.02036E-03	1.34030E-01
	total	3.61863E+06	3.88552E-01	3.48874E-01	8.60327E-03	3.57477E-01	1.08693E+00

Micro 1st cycle boc calculation (full core model)
Step no.1-2 cell.(cr na-folower)

Wed Apr 9 01:36:49 1997 page
burnup time (days) 456.00 cpu time (sec) 16073.

fuel inventory (kg) by mixture region

no.	n a m e		1 pu238	2 pu239	3 pu240	4 pu241	5 pu242	6 u235	7 u236	8 u238
1	incore init	b. o. c.	1.4188E+01	4.8490E+02	2.0865E+02	7.6782E+01	3.9226E+01	1.3145E+01	0.0000E+00	4.3684E+03
		e. o. c.	1.1965E+01	4.8617E+02	2.1618E+02	6.1715E+01	3.9843E+01	9.5047E+00	7.9862E-01	4.1537E+03
		g a i n	-2.2227E+00	1.2708E+00	7.5320E+00	-1.5067E+01	6.1702E-01	-3.6401E+00	7.9862E-01	-2.1471E+02
2	oucore init	b. o. c.	9.9430E+00	3.3982E+02	1.4622E+02	5.3809E+01	2.7490E+01	5.7439E+00	0.0000E+00	1.9089E+03
		e. o. c.	8.8887E+00	3.1792E+02	1.4933E+02	4.5631E+01	2.7936E+01	4.6716E+00	2.4580E-01	1.8586E+03
		g a i n	-1.0543E+00	-2.1901E+01	3.1048E+00	-8.1780E+00	4.4613E-01	-1.0722E+00	2.4580E-01	-5.0324E+01
3	axbla lower	b. o. c.	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.7426E+01	0.0000E+00	5.7913E+03
		e. o. c.	5.9419E-03	6.2220E+01	1.3378E+00	2.5478E-02	2.1551E-04	1.5422E+01	5.1952E-01	5.6833E+03
		g a i n	5.9419E-03	6.2220E+01	1.3378E+00	2.5478E-02	2.1551E-04	-2.0041E+00	5.1952E-01	-1.0793E+02
	t o t a l	b. o. c.	2.4131E+01	8.2471E+02	3.5487E+02	1.3059E+02	6.6715E+01	3.6315E+01	0.0000E+00	1.2069E+04
		e. o. c.	2.0860E+01	8.6630E+02	3.6684E+02	1.0737E+02	6.7779E+01	2.9598E+01	1.5639E+00	1.1696E+04
		g a i n	-3.2711E+00	4.1590E+01	1.1975E+01	-2.3220E+01	1.0634E+00	-6.7164E+00	1.5639E+00	-3.7297E+02

no.	n a m e		9 am241	10 am242m	11 am243	12 np237	13 cm242	14 cm243	15 cm244	16 cm245
1	incore init	b. o. c.	1.0850E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	1.1701E+01	4.3788E-01	2.1851E+00	7.3469E-01	7.7353E-01	3.1869E-02	2.3300E-01	5.8733E-03
		g a i n	8.5117E-01	4.3788E-01	2.1851E+00	7.3469E-01	7.7353E-01	3.1869E-02	2.3300E-01	5.8733E-03
2	oucore init	b. o. c.	7.6035E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	9.0358E+00	2.2703E-01	1.0367E+00	2.6311E-01	3.8114E-01	1.0546E-02	7.1203E-02	1.2005E-03
		g a i n	1.4323E+00	2.2703E-01	1.0367E+00	2.6311E-01	3.8114E-01	1.0546E-02	7.1203E-02	1.2005E-03
3	axbla lower	b. o. c.	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	3.8168E-04	1.8826E-06	1.7274E-06	1.0632E-01	4.7684E-06	3.7837E-08	3.7100E-08	2.7577E-10
		g a i n	3.8168E-04	1.8826E-06	1.7274E-06	1.0632E-01	4.7684E-06	3.7837E-08	3.7100E-08	2.7577E-10
	t o t a l	b. o. c.	1.8453E+01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
		e. o. c.	2.0737E+01	6.6491E-01	3.2218E+00	1.1041E+00	1.1547E+00	4.2416E-02	3.0421E-01	7.0738E-03
		g a i n	2.2838E+00	6.6491E-01	3.2218E+00	1.1041E+00	1.1547E+00	4.2416E-02	3.0421E-01	7.0738E-03

no.	n a m e		t o t a l
1	incore init	b. o. c.	5.2162E+03
		e. o. c.	4.9960E+03
		g a i n	-2.2017E+02
2	oucore init	b. o. c.	2.4995E+03
		e. o. c.	2.4242E+03
		g a i n	-7.5309E+01
3	axbla lower	b. o. c.	5.8087E+03
		e. o. c.	5.7630E+03
		g a i n	-4.5723E+01
	t o t a l	b. o. c.	1.3524E+04
		e. o. c.	1.3183E+04
		g a i n	-3.4120E+02

Micro 2nd cycle boc calculation (full core model)
Step no.2-1 cell.(cr na-follower)

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cross section file informations
following cross section set was read

```
set=   1  title=IN  CORE          (1)
         type= -2  nn= 27  ng=  7
xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
xs id =  29  30
set=   2  title=OUT CORE          (2)
         type= -2  nn= 27  ng=  7
xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
xs id =  29  30
set=   3  title=AX  BLANK(UPPER)  (3)
         type= -2  nn=-27  ng=  7
xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
xs id =  29  30
set=   4  title=AX  BLANK(LOWER)  (4)
         type= -2  nn= 27  ng=  7
xs id =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 20 21 22 23 24 25 26 27 28
xs id =  29  30
set=   5  title=NA  FOLLOWER  1   (5)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=   6  title=NA  FOLLOWER  2   (6)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=   7  title=GEM                (7)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=   8  title=UP-PLENUM(CORE     (8)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=   9  title=LO-PLENUM(CORE     (9)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=  10  title=UP  SHIELD (CORE-B4C)(10)
         type= -2  nn=  9  ng=  7
xs id =  17  18  19  21  22  23  24  25  26
set=  11  title=GEM-SHIELD(UPPER)  (11)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=  12  title=LOW SHIELD         (12)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=  13  title=RD  SHIELD(SUS)    (13)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=  14  title=RD  SHIELD(B4C)    (14)
         type= -2  nn=  9  ng=  7
xs id =  17  18  19  21  22  23  24  25  26
set=  15  title=GEM-UPPER-PLENUM   (15)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=  16  title=CR(CCR)            (1)
         type= -2  nn=  9  ng=  7
xs id =  17  18  19  21  22  23  24  25  26
set=  17  title=CR(BCR)            (1)
         type= -2  nn=  9  ng=  7
xs id =  17  18  19  21  22  23  24  25  26
set=  18  title=CR(BCR)            (2)
         type= -2  nn=  6  ng=  7
xs id =  21  22  23  24  25  26
set=  19  title=CR(BCR)            (3)
         type= -2  nn=  9  ng=  7
xs id =  17  18  19  21  22  23  24  25  26
set=  20  title=CR(BCR)            (4)
         type= -2  nn=  9  ng=  7
xs id =  17  18  19  21  22  23  24  25  26
at Rload; no.  1 nload=  2 kload=  2 ires=  0 kflg=  0
```

Brco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)
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edit option list (setup module)

1)	edit option data list print	(0=no,1=yes) .	1	26)	assembly/layer no. plot (0=no,1=asm,2=1+lay) .
2)	general input data list print	(0=no,1=yes) .	1	27)	assembly group no. plot (0=no,1=yes) .
3)	library data list print	(0=no,1=yes) .	1	28)	orifice zone no. plot (0=no,1=yes) .
4)	assembly group - mixture group	(0=no,1=yes) .	1	29)	.....
5)	region - mixture region table	(0=no,1=yes) .	1	30)	.....
6)	axial geometry by groups	(0=no,1=cr,2=all) .	0	31)	.....
7)	assembly no. map print	(0=no,1=yes) .	1	32)	.....
8)	assembly group map print	(0=no,1=yes) .	1	33)	.....
9)	mixture group map print	(0=no,1=yes) .	0	34)	.....
10)	orifice zone map print	(0=no,1=yes) .	0	35)	.....
11)	subchannel temp. cal.assembly map	(0=no,1=yes) .	0	36)	.....
12)	time mesh dep. cal. assembly map	(0=no,1=yes) .	0	37)	.....
13)	control rod draw stroke print	(0=no,1=yes) .	1	38)	.....
14)	.....		0	39)	.....
15)	.....		0	40)	.....
16)	.....		0	41)	.....
17)	.....		0	42)	.....
18)	.....		0	43)	.....
19)	.....		0	44)	.....
20)	.....		0	45)	.....
21)	.....		0	46)	.....
22)	.....		0	47)	.....
23)	.....		0	48)	.....
24)	.....		0	49)	.....
25)	.....		0	50)	.....

general input data list (setup module)

nsym	rotational symmetry (1,2,3,6)	2	tin	operation coolant inlet temp (deg.c)	3.950000E+02
nday	no. of layers (include center block)	19	fpitch	hot/cold of subassembly pitch fraction	1.000000E+00
npln	no. of planes	58	cpitch	cold sub assembly pitch (cm)	1.581000E+01
nazn	no. of axial zones	16	hpitch	hot-op sub assembly pitch (cm)	1.581000E+01
naem	material type no. for axial expansion	1	hxarea	hexagonal area (cm**2)	2.164683E+02
naee	element no. for axial expansion	3	height	core height (cm)	3.889999E+02
naea	sub assembly no. for axial expansion	2	hexvol	subassembly volume (cm**3)	8.420617E+04
naet	temperature no. for axial expansion	4			
nrem	material type no. for radial expansion	1			
nree	element no. for radial expansion	3			
nblc	no. of sub assemblies.....	343			
nbcl	no. of outside assemblies	381			
ngp	no. of assembly groups	8			
nmx	no. of mixture groups	5			
nor	no. of orifice zones	0			
nreg	no. of regions	15			
nmix	no. of mixture regions	8			
ndc	no. of fine mesh depletion cal. assemblies .	0			
ntc	no. of subchannel temp. cal. assemblies	0			

edit of report data list (setup module)

(1)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(3)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(5)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(6)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(7)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(8)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(9)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(10)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

fbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

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fbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

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cross section library data

nlib	library cross section option	0
nset	no. of cross section sets	20
nnuc	no. of nuclides	30
nrac	no. of reactions	6
nhat	heating cross section option	1
ngrp	no. of energy groups	7
nfgp	group no. for fast flux energy (e>0.1mev) .	3
nfuel	no. of fuel nuclides	16
nfp	no. of fp nuclides	4

-- nuclide -- no.	name	--------- o p t i o n --------- fis	nburn	nanal	klib	- atomic - weight	- fission - energy	- capture - energy	-- decay -- constants
1	pu238	2	3	0	1	2.38050E+02	3.15500E-11	0.00000E+00	0.00000E+00
2	pu239	2	1	0	1	2.39055E+02	3.22200E-11	0.00000E+00	0.00000E+00
3	pu240	2	2	0	1	2.40054E+02	3.24400E-11	0.00000E+00	0.00000E+00
4	pu241	2	1	0	1	2.41057E+02	3.24800E-11	0.00000E+00	1.52600E-09
5	pu242	2	2	0	1	2.42059E+02	3.30100E-11	0.00000E+00	0.00000E+00
6	u235	1	1	0	1	2.35044E+02	3.12700E-11	0.00000E+00	0.00000E+00
7	u236	1	3	0	1	2.36046E+02	3.34000E-11	0.00000E+00	0.00000E+00
8	u238	1	2	0	1	2.38051E+02	3.50000E-11	0.00000E+00	0.00000E+00
9	am241	2	3	0	1	2.41056E+02	3.53800E-11	0.00000E+00	0.00000E+00
10	am242m	2	3	0	1	2.42060E+02	3.44900E-11	0.00000E+00	0.00000E+00
11	am243	2	3	0	1	2.43061E+02	3.44300E-11	0.00000E+00	0.00000E+00
12	np237	1	3	0	1	2.37048E+02	3.33600E-11	0.00000E+00	0.00000E+00
13	cm242	2	3	0	1	2.42059E+02	3.51000E-11	0.00000E+00	4.92182E-08
14	cm243	2	3	0	1	2.43060E+02	3.51600E-11	0.00000E+00	0.00000E+00
15	cm244	2	3	0	1	2.44063E+02	3.40100E-11	0.00000E+00	0.00000E+00
16	cm245	2	3	0	1	2.45066E+02	3.52900E-11	0.00000E+00	0.00000E+00
17	b-10	0	7	0	1	1.00123E+01	0.00000E+00	0.00000E+00	0.00000E+00
18	b-11	0	7	0	1	1.10093E+01	0.00000E+00	0.00000E+00	0.00000E+00
19	c	0	7	0	1	1.20110E+01	0.00000E+00	0.00000E+00	0.00000E+00
20	o	0	5	0	1	1.59990E+01	0.00000E+00	0.00000E+00	0.00000E+00
21	na	0	6	0	1	2.29900E+01	0.00000E+00	0.00000E+00	0.00000E+00
22	fe	0	6	0	1	5.58470E+01	0.00000E+00	0.00000E+00	0.00000E+00
23	cr	0	6	0	1	5.19960E+01	0.00000E+00	0.00000E+00	0.00000E+00
24	ni	0	6	0	1	5.87000E+01	0.00000E+00	0.00000E+00	0.00000E+00
25	mo	0	6	0	1	9.59400E+01	0.00000E+00	0.00000E+00	0.00000E+00
26	mn	0	6	0	1	5.49380E+01	0.00000E+00	0.00000E+00	0.00000E+00
27	u235-fp	-1	4	0	1	2.35044E+02	0.00000E+00	0.00000E+00	0.00000E+00
28	u238-fp	-1	4	0	1	2.38051E+02	0.00000E+00	0.00000E+00	0.00000E+00
29	pu239-fp	-1	4	0	1	2.39055E+02	0.00000E+00	0.00000E+00	0.00000E+00
30	pu241-fp	-1	4	0	1	2.41057E+02	0.00000E+00	0.00000E+00	0.00000E+00

a s s e m b l y g r o u p t a b l e

no.	n a m e		flag	mix.	edit.	attr.	plot.	name	assem
1	incore	init	1	1	1	1	1	icl	67
2	oucore	init	1	2	1	2	2	ocl	32
3	gem	na	1	3	1	4	0	gem	22
4	radial	shisus	1	4	1	4	0	rss	108
5	radial	shib4c	1	4	1	4	0	rsh	102
6	course	rod	2	5	1	4	-1	ccr	6
7	fine	rod	2	5	1	4	-1	fcr	2
8	backup	rod	2	5	1	4	-1	bcr	2
	t o t a l								341

mixture group table

no.	n a m e		assem
1	incore	init	67
2	oucore	init	32
3	gem	na	22
4	radial	shib4c	210
5	backup	rod	10
	t o t a l		341

r e g i o n t a b l e

no.	n a m e		x-sect.	mixture	edit.op.	attr.	plot.rgn	atr.name	volume
1	incore	init	1	1	1	1	1	\icl	1.435906E+06
2	oucore	init	2	2	1	1	1	\ocl	6.926985E+05
3	axbla	upper	3	3	1	2	1	\abu	7.450122E+05
4	axbla	lower	4	3	1	2	1	\abl	7.450119E+05
5	na	foll1	5	4	0	5	0	\nac	6.736494E+05
6	na	foll2	6	4	0	5	0	\nab	3.658314E+05
7	gem	na	7	5	0	5	0	\gem	1.204863E+06
8	upplenumcore		8	6	0	3	0	\upc	4.092332E+05
9	loplenumcore		9	6	0	3	0	\lpc	2.235036E+06
10	upb4c	shield	10	7	0	3	0	\usc	1.426166E+06
11	upgem	shield	11	7	0	3	0	\ugs	3.190743E+05
12	lower	shield	12	7	0	3	0	\lsc	4.818938E+05
13	radial	susshie	13	8	0	5	0	\rsh	9.094266E+06
14	radial	b4cshie	14	8	0	5	0	\rsb	8.589029E+06
15	gem	upplenum	15	5	0	5	0	\gep	2.404963E+05
	t o t a l								2.865817E+07

mixture region table

no.	n a m e		volume
1	incore	init	1.435906E+06
2	oucore	init	6.926985E+05
3	axbla	lower	1.490024E+06
4	na	foll2	1.039481E+06
5	gem	upplenum	1.445359E+06
6	loplenumcore		2.644269E+06
7	lower	shield	2.227134E+06
8	radial	b4cshie	1.768330E+07
	t o t a l		2.865817E+07

assembly no. map

```
274
242 309
212 275
184 243 310
158 213 276
134 185 244 311
112 159 214 277
92 135 186 245 312
74 113 160 215 278
58 93 136 187 246 313
44 75 114 161 216 279
32 59 94 137 188 247 314
22 45 76 115 162 217 280
14 33 60 95 138 189 248 315
8 23 46 77 116 163 218 281
4 15 34 61 96 139 190 249 316
2 9 24 47 78 117 164 219 282
1 5 16 35 62 97 140 191 250 317
3 10 25 48 79 118 165 220 283
6 17 36 63 98 141 192 251 318
7 11 26 49 80 119 166 221 284
12 18 37 64 99 142 193 252 319
13 19 27 50 81 120 167 222 285
20 28 38 65 100 143 194 253 320
21 29 39 51 82 121 168 223 286
30 40 52 66 101 144 195 254 321
31 41 53 67 83 122 169 224 287
42 54 68 84 102 145 196 255 322
43 55 69 85 103 123 170 225 288
56 70 86 104 124 146 197 256 323
57 71 87 105 125 147 171 226 289
72 88 106 126 148 172 198 257 324
73 89 107 127 149 173 199 227 290
90 108 128 150 174 200 228 258 325
91 109 129 151 175 201 229 259 291
110 130 152 176 202 230 260 292
111 131 153 177 203 231 261 293 327
132 154 178 204 232 262 294 328
133 155 179 205 233 263 295 329
156 180 206 234 264 296 330
157 181 207 235 265 297 331
182 208 236 266 298 332
183 209 237 267 299 333
210 238 268 300 334
211 239 269 301 335
240 270 302 336
241 271 303 337
272 304 338
273 305 339
306 340
307 341
342
343
```


assembly group map

```
5
5 5
5 5
4 5 5
4 4 5
4 4 5 5
4 4 4 5
3 4 4 5 5
2 3 4 4 5
1 2 4 4 5 5
1 2 3 4 4 5
7 1 2 4 4 5 5
1 1 2 3 4 4 5
1 1 1 2 4 4 5 5
6 1 1 6 3 4 4 5
1 1 1 1 2 4 4 5 5
1 1 1 1 2 3 4 4 5
1 1 1 8 1 2 4 4 5 5
1 1 1 1 2 3 4 4 5
1 1 1 1 2 4 4 5 5
1 6 1 1 6 3 4 4 5
1 1 1 1 2 4 4 5 5
1 1 1 1 2 3 4 4 5
1 1 7 1 2 4 4 5 5
1 1 1 1 2 3 4 4 5
1 1 1 1 2 4 4 5 5
1 8 1 1 2 3 4 4 5
1 1 1 2 3 4 4 5 5
1 1 1 2 2 4 4 4 5
1 1 6 2 3 4 4 5 5
1 1 2 2 3 4 4 4 5
1 2 2 3 4 4 4 5 5
1 6 2 3 4 4 4 5 5
2 2 3 4 4 4 4 5 5
2 2 3 4 4 4 4 5 5
2 3 4 4 4 4 5 5
2 3 4 4 4 4 5 5 5
3 4 4 4 4 5 5 5
3 4 4 4 4 5 5 5
4 4 4 4 5 5 5
4 4 4 4 5 5 5
4 4 4 5 5 5
4 4 4 5 5 5
4 4 5 5 5
4 4 5 5 5
4 5 5 5
4 5 5 5
5 5 5
5 5 5
5 5
5 5
5
5
```

Brco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

Wed Apr 9 01:37:15 1997 page 45
burnup time (days) 456.00 cpu time (sec) 16093.8

control rod draw stroke (cm)

	389.0	
389.0		389.0
	389.0	
389.0		389.0
	389.0	
389.0		
	389.0	
389.0		

Brco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

Wed Apr 9 01:37:16 1997 page 46
burnup time (days) 456.00 cpu time (sec) 16094.2

edit option list (fuel management module)

1)	edit option data list print	(0=no,1=yes) .	1	26)	loading assembly group map plot	(0=no,1=yes) .	0
2)	general input data list print	(0=no,1=yes) .	1	27)	discharged fuel stay days plot	(0=no,1=yes) .	0
3)	loading assembly groups map	(0=no,1=yes) .	1	28)	refueling pattern map plot	(0=no,n=yes) .	0
4)	stay cycle map	(0=no,1=yes) .	1	29)	dis.exp.plt(core)	(0=no,1=ave,2=1+elm,3=2+pel) .	0
5)	stay days map	(0=no,1=yes) .	1	30)	dis.exp.plt(blkt)	(0=no,1=ave,2=1+elm,3=2+pel) .	0
6)	discharged information (mix.grp)	(0=no,1=yes) .	1	31)	.....		0
7)	discharged information (asm.grp)	(0=no,1=yes) .	1	32)	.....		0
8)	discharged information (orifice)	(0=no,1=yes) .	0	33)	.....		0
9)	discharged information (assembly)	(0=no,1=yes) .	0	34)	.....		0
10)	loading information (mix.grp)	(0=no,1=yes) .	1	35)	.....		0
11)	loading information (asm.grp)	(0=no,1=yes) .	1	36)	.....		0
12)	loading information (orifice)	(0=no,1=yes) .	0	37)	.....		0
13)	loading information (assembly)	(0=no,1=yes) .	0	38)	.....		0
14)	.....		0	39)	.....		0
15)	.....		0	40)	.....		0
16)	.....		0	41)	.....		0
17)	.....		0	42)	.....		0
18)	.....		0	43)	.....		0
19)	.....		0	44)	.....		0
20)	.....		0	45)	.....		0
21)	.....		0	46)	.....		0
22)	.....		0	47)	.....		0
23)	.....		0	48)	.....		0
24)	.....		0	49)	.....		0
25)	.....		0	50)	.....		0

edit of report data list (fuel management module)

(1)	refueling patt. map plot .	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(frst.#, strt.#, end#) ...	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(3)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(5)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(6)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(7)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(8)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(9)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(10)	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	.....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

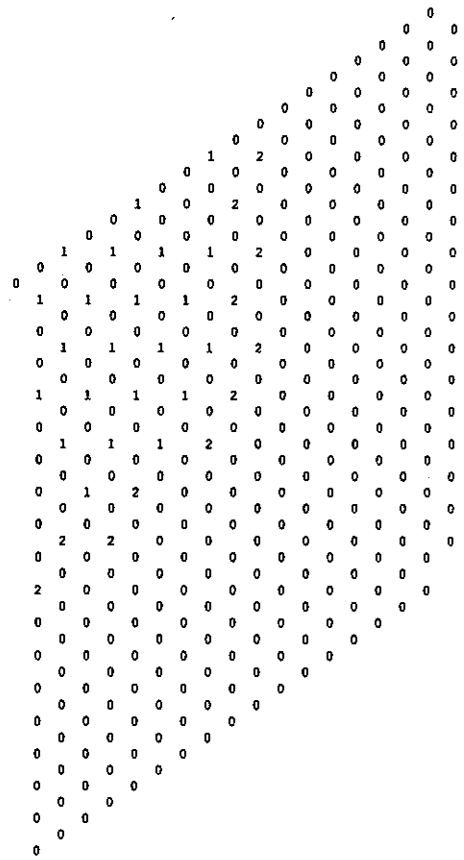
Brco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

general input data list (fuel management module)

nlod	refueling pattern no.	2
nald	no. of loading fuel assemblies	33
nadh	no. of discharged fuel assemblies	33
detim	refueling time (days)	456.0
ncyl	maximum stay cycles	1

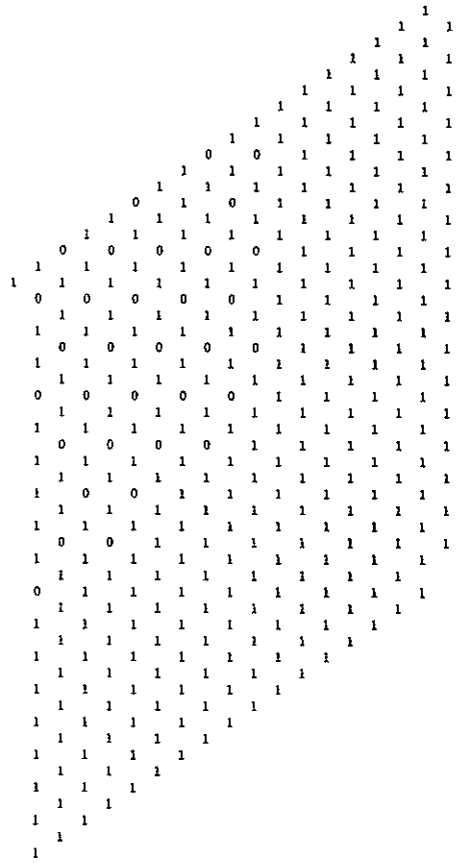
Wed Apr 9 01:37:16 1997 page 4Brco 2nd cycle boc calculation (full core model)
burnup time (days) 456.00 cpu time (sec) 16094.2Zep no.2-1 cell.(cr na-follower)

loading assembly group map



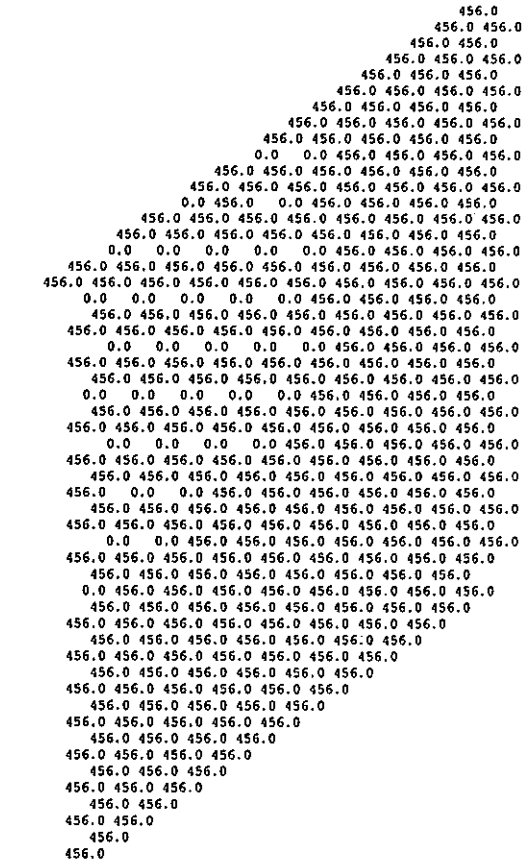
fbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

stay cycle map



Wed Apr 9 01:37:16 1997 page #Brco 2nd cycle boc calculation (full core model)
burnup time (days) 456.00 cpu time (sec) 16094.8Bep no.2-1 cell.(cr na-follower)

stay days map



tbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

Wed Apr 9 01:37:16 1997 page 51
burnup time (days) 456.00 cpu time (sec) 16094.4

discharged fuels information mixture groups

1. no. name	1. incore init	2. oucore init
2. no. of fuels	22 fuels	11 fuels
3. ave. stay day	456 days	456 days

4. exposure(mwd/t)	average	peaking	pos.	average	peaking	pos.
zone 3	4.27692E+02	5.33106E+02	(4,1)	3.37706E+02	4.14339E+02	(79,3)
zone 4	1.53993E+03	1.78407E+03	(4,1)	1.16686E+03	1.40017E+03	(79,3)
zone 5	2.00940E+04	2.35007E+04	(3,4)	1.95633E+04	2.35272E+04	(79,5)
zone 6	2.92410E+04	3.50185E+04	(3,4)	2.81830E+04	3.43835E+04	(79,5)
zone 7	3.81788E+04	4.61880E+04	(3,4)	3.66144E+04	4.49086E+04	(79,5)
zone 8	4.01057E+04	4.85740E+04	(3,4)	3.84553E+04	4.71825E+04	(87,4)
zone 9	3.98026E+04	4.81907E+04	(3,4)	3.81917E+04	4.68424E+04	(79,5)
zone 10	3.62443E+04	4.37399E+04	(3,4)	3.49218E+04	4.27204E+04	(79,5)
zone 11	2.48107E+04	2.93809E+04	(3,4)	2.43073E+04	2.92747E+04	(79,5)
zone 12	1.71205E+03	1.96670E+03	(4,1)	1.32952E+03	1.57107E+03	(79,5)
zone 13	8.29863E+02	1.01370E+03	(4,1)	6.41982E+02	7.86647E+02	(79,3)
zone 14	3.62403E+02	4.58868E+02	(4,1)	2.92428E+02	3.56703E+02	(79,3)
core	3.20079E+04	3.84396E+04	(3,4)	3.08889E+04	3.76784E+04	(79,5)
blanket	8.44498E+02	1.00316E+03	(4,1)	6.54661E+02	7.87560E+02	(79,3)

5. inventory	--- core --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)	--- core --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)
1 pu238	3.96	0.24	0.00	0.00	3.04	0.37	0.00	0.00
2 pu239	161.31	9.74	15.43	1.20	109.09	13.10	5.77	0.89
3 pu240	71.79	4.33	0.36	0.03	51.33	6.17	0.10	0.02
4 pu241	20.46	1.23	0.01	0.00	15.63	1.88	0.00	0.00
5 pu242	13.22	0.80	0.00	0.00	9.60	1.15	0.00	0.00
6 u235	3.14	0.19	3.41	0.26	1.60	0.19	1.76	0.27
7 u236	0.27	0.02	0.13	0.01	0.09	0.01	0.05	0.01
8 u238	1377.03	83.13	1269.77	98.50	638.33	76.68	637.13	98.81
9 am241	3.87	0.23	0.00	0.00	3.09	0.37	0.00	0.00
10 am242m	0.15	0.01	0.00	0.00	0.08	0.01	0.00	0.00
11 am243	0.73	0.04	0.00	0.00	0.36	0.04	0.00	0.00
12 np237	0.24	0.01	0.03	0.00	0.09	0.01	0.01	0.00
13 cm242	0.26	0.02	0.00	0.00	0.13	0.02	0.00	0.00
14 cm243	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 cm244	0.08	0.00	0.00	0.00	0.03	0.00	0.00	0.00
16 cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
u total	1380.68	83.35	1273.34	98.77	640.10	76.89	638.95	99.09
pu total	275.84	16.65	15.79	1.23	192.39	23.11	5.88	0.91
pu fiss.	181.76	10.97	15.43	1.20	124.71	14.98	5.77	0.90
(u + pu)	1656.52	100.00	1289.13	100.00	832.49	100.00	644.83	100.00
20 o	227.63	12.08	173.68	11.87	114.13	12.06	86.84	11.87
uo2 total	1570.62	83.36	1444.89	98.78	728.00	76.90	725.00	99.09
puo2 total	313.54	16.64	17.91	1.22	218.63	23.10	6.66	0.91
mo2 total	1884.16	100.00	1462.81	100.00	946.62	100.00	731.66	100.00
27 u235-fp	0.90	-----	0.33	-----	0.29	-----	0.13	-----
28 u238-fp	7.66	-----	0.73	-----	2.87	-----	0.29	-----
29 pu239-fp	37.24	-----	0.72	-----	18.02	-----	0.20	-----
30 pu241-fp	11.01	-----	0.00	-----	5.74	-----	0.00	-----
fp total	56.81	-----	1.78	-----	26.92	-----	0.62	-----

tbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

Wed Apr 9 01:37:16 1997 page 52
burnup time (days) 456.00 cpu time (sec) 16094.4

discharged fuels information assembly groups

1. no. name	1. incore init	2. oucore init
2. no. of fuels	22 fuels	11 fuels
3. ave. stay day	456 days	456 days

4. exposure(mwd/t)	average	peaking	pos.	average	peaking	pos.
zone 3	4.27692E+02	5.33106E+02	(4,1)	3.37706E+02	4.14339E+02	(79,3)
zone 4	1.53993E+03	1.78407E+03	(4,1)	1.16686E+03	1.40017E+03	(79,3)
zone 5	2.00940E+04	2.35007E+04	(3,4)	1.95633E+04	2.35272E+04	(79,5)
zone 6	2.92410E+04	3.50185E+04	(3,4)	2.81830E+04	3.43835E+04	(79,5)
zone 7	3.81788E+04	4.61880E+04	(3,4)	3.66144E+04	4.49086E+04	(79,5)
zone 8	4.01057E+04	4.85740E+04	(3,4)	3.84553E+04	4.71825E+04	(87,4)
zone 9	3.98026E+04	4.81907E+04	(3,4)	3.81917E+04	4.68424E+04	(79,5)
zone 10	3.62443E+04	4.37399E+04	(3,4)	3.49218E+04	4.27204E+04	(79,5)
zone 11	2.48107E+04	2.93809E+04	(3,4)	2.43073E+04	2.92747E+04	(79,5)
zone 12	1.71205E+03	1.96670E+03	(4,1)	1.32952E+03	1.57107E+03	(79,5)
zone 13	8.29863E+02	1.01370E+03	(4,1)	6.41982E+02	7.86647E+02	(79,3)
zone 14	3.62403E+02	4.58868E+02	(4,1)	2.92428E+02	3.56703E+02	(79,3)
core	3.20079E+04	3.84396E+04	(3,4)	3.08889E+04	3.76784E+04	(79,5)
blanket	8.44498E+02	1.00316E+03	(4,1)	6.54661E+02	7.87560E+02	(79,3)

5. inventory	--- core --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)	--- core --- (kg)	(w%)	-- a.blanket -- (kg)	(w%)
1 pu238	3.96	0.24	0.00	0.00	3.04	0.37	0.00	0.00
2 pu239	161.31	9.74	15.43	1.20	109.09	13.10	5.77	0.89
3 pu240	71.79	4.33	0.36	0.03	51.33	6.17	0.10	0.02
4 pu241	20.46	1.23	0.01	0.00	15.63	1.88	0.00	0.00
5 pu242	13.22	0.80	0.00	0.00	9.60	1.15	0.00	0.00
6 u235	3.14	0.19	3.41	0.26	1.60	0.19	1.76	0.27
7 u236	0.27	0.02	0.13	0.01	0.09	0.01	0.05	0.01
8 u238	1377.03	83.13	1269.77	98.50	638.33	76.68	637.13	98.81
9 am241	3.87	0.23	0.00	0.00	3.09	0.37	0.00	0.00
10 am242m	0.15	0.01	0.00	0.00	0.08	0.01	0.00	0.00
11 am243	0.73	0.04	0.00	0.00	0.36	0.04	0.00	0.00
12 np237	0.24	0.01	0.03	0.00	0.09	0.01	0.01	0.00
13 cm242	0.26	0.02	0.00	0.00	0.13	0.02	0.00	0.00
14 cm243	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15 cm244	0.08	0.00	0.00	0.00	0.03	0.00	0.00	0.00
16 cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
u total	1380.68	83.35	1273.34	98.77	640.10	76.89	638.95	99.09
pu total	275.84	16.65	15.79	1.23	192.39	23.11	5.88	0.91
pu fiss.	181.76	10.97	15.43	1.20	124.71	14.98	5.77	0.90
(u + pu)	1656.52	100.00	1289.13	100.00	832.49	100.00	644.83	100.00
20 o	227.63	12.08	173.68	11.87	114.13	12.06	86.84	11.87
uo2 total	1570.62	83.36	1444.89	98.78	728.00	76.90	725.00	99.09
puo2 total	313.54	16.64	17.91	1.22	218.63	23.10	6.66	0.91
mo2 total	1884.16	100.00	1462.81	100.00	946.62	100.00	731.66	100.00
27 u235-fp	0.90	-----	0.33	-----	0.29	-----	0.13	-----
28 u238-fp	7.66	-----	0.73	-----	2.87	-----	0.29	-----
29 pu239-fp	37.24	-----	0.72	-----	18.02	-----	0.20	-----
30 pu241-fp	11.01	-----	0.00	-----	5.74	-----	0.00	-----
fp total	56.81	-----	1.78	-----	26.92	-----	0.62	-----

loading fuels information mixture groups

1. no.	name	1. incore init				2. oucore init			
2. no. of fuels		22 fuels				11 fuels			
3. inventory		--- c o r e ---		-- a.blanket --		--- c o r e ---		-- a.blanket --	
		(kg)	(w%)	(kg)	(w%)	(kg)	(w%)	(kg)	(w%)
1	pu238	4.66	0.27	0.00	0.00	3.42	0.40	0.00	0.00
2	pu239	159.22	9.30	0.00	0.00	116.81	13.60	0.00	0.00
3	pu240	68.51	4.00	0.00	0.00	50.26	5.85	0.00	0.00
4	pu241	25.21	1.47	0.00	0.00	18.50	2.15	0.00	0.00
5	pu242	12.88	0.75	0.00	0.00	9.45	1.10	0.00	0.00
6	u235	4.32	0.25	3.87	0.30	1.97	0.23	1.94	0.30
7	u236	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	u238	1434.41	83.75	1286.95	99.70	656.18	76.37	643.47	99.70
9	am241	3.56	0.21	0.00	0.00	2.61	0.30	0.00	0.00
10	am242m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	am243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	np237	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	cm242	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	cm243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	cm244	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	u total	1438.73	84.00	1290.82	100.00	658.15	76.60	645.41	100.00
	pu total	274.04	16.00	0.00	0.00	201.05	23.40	0.00	0.00
	pu fiss.	184.43	10.77	0.00	0.00	135.31	15.75	0.00	0.00
	(u + pu)	1712.77	100.00	1290.82	100.00	859.20	100.00	645.41	100.00
20	o	227.63	11.73	173.68	11.86	114.13	11.73	86.84	11.86
	uo2 total	1630.14	84.01	1464.49	100.00	745.71	76.61	732.25	100.00
	puo2 total	310.26	15.99	0.00	0.00	227.62	23.39	0.00	0.00
	mo2 total	1940.41	100.00	1464.49	100.00	973.34	100.00	732.25	100.00
27	u235-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
28	u238-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
29	pu239-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
30	pu241-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
	fp total	0.00	-----	0.00	-----	0.00	-----	0.00	-----

loading fuels information assembly groups

1. no.	name	1. incore init				2. oucore init			
2. no. of fuels		22 fuels				11 fuels			
3. inventory		--- c o r e ---		-- a.blanket --		--- c o r e ---		-- a.blanket --	
		(kg)	(w%)	(kg)	(w%)	(kg)	(w%)	(kg)	(w%)
1	pu238	4.66	0.27	0.00	0.00	3.42	0.40	0.00	0.00
2	pu239	159.22	9.30	0.00	0.00	116.81	13.60	0.00	0.00
3	pu240	68.51	4.00	0.00	0.00	50.26	5.85	0.00	0.00
4	pu241	25.21	1.47	0.00	0.00	18.50	2.15	0.00	0.00
5	pu242	12.88	0.75	0.00	0.00	9.45	1.10	0.00	0.00
6	u235	4.32	0.25	3.87	0.30	1.97	0.23	1.94	0.30
7	u236	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	u238	1434.41	83.75	1286.95	99.70	656.18	76.37	643.47	99.70
9	am241	3.56	0.21	0.00	0.00	2.61	0.30	0.00	0.00
10	am242m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	am243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	np237	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	cm242	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	cm243	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	cm244	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	cm245	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	u total	1438.73	84.00	1290.82	100.00	658.15	76.60	645.41	100.00
	pu total	274.04	16.00	0.00	0.00	201.05	23.40	0.00	0.00
	pu fiss.	184.43	10.77	0.00	0.00	135.31	15.75	0.00	0.00
	(u + pu)	1712.77	100.00	1290.82	100.00	859.20	100.00	645.41	100.00
20	o	227.63	11.73	173.68	11.86	114.13	11.73	86.84	11.86
	uo2 total	1630.14	84.01	1464.49	100.00	745.71	76.61	732.25	100.00
	puo2 total	310.26	15.99	0.00	0.00	227.62	23.39	0.00	0.00
	mo2 total	1940.41	100.00	1464.49	100.00	973.34	100.00	732.25	100.00
27	u235-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
28	u238-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
29	pu239-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
30	pu241-fp	0.00	-----	0.00	-----	0.00	-----	0.00	-----
	fp total	0.00	-----	0.00	-----	0.00	-----	0.00	-----

fbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

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burnup time (days) 456.00 cpu time (sec) 16094.6

edit option list (diffusion module)

```
 1) edit option data list print       (0=no,1=yes) .    1    26) normal flux distribution map plot (0=no,1=yes)
 2) general input data list print     (0=no,1=yes) .    0    27) adjoint flux distribution map plot(0=no,1=yes)
 3) macro cross section print  (0=no,1=mix,2=reg) .     0    28) power distribution map plot        (0=no,1=yes)
 4) diffusion cal. information (0=no,1=prt,2=all) .     2    29) ..............................................
 5) gross neutron balance             (0=no,1=yes) .    0    30) ..............................................
 6) neutron balance by mixture region(0=no,1=yes) .     0    31) ..............................................
 7) neutron balance by region         (0=no,1=yes) .    0    32) ..............................................
 8) average flux by mixture region    (0=no,1=yes) .    1    33) ..............................................
 9) average flux by region            (0=no,1=yes) .    0    34) ..............................................
10) average power by mixture region   (0=no,1=yes) .    1    35) ..............................................
11) average power by region           (0=no,1=yes) .    1    36) ..............................................
12) normal flux distribution   (0=no,1,2,3,4=prt) .     0    37) ..............................................
13) adjoint flux distribution  (0=no,1,2,3,4=prt) .     0    38) ..............................................
14) power distribution       (0=no,1=ave,2=plane) .     0    39) ..............................................
15) axial power dist.   (0=no,1=peak,2=asm,3=1+2) .     0    40) ..............................................
16) total nuclude reaction rate       (0=no,1=yes) .    0    41) ..............................................
17) reaction rate by mixture region   (0=no,1=yes) .    0    42) ..............................................
18) reaction rate by region           (0=no,1=yes) .    0    43) ..............................................
19) breeding ratio by mixture region  (0=no,1=yes) .    0    44) ..............................................
20) breeding ratio by region          (0=no,1=yes) .    1    45) ..............................................
21) fission inventory print           (0=no,1=yes) .    1    46) ..............................................
22) doubling time print               (0=no,1=yes) .    0    47) ..............................................
23) delta-flux file(unit no.90) write(0=no,1=yes) .     0    48) ..............................................
24) ..............................................     0    49) ..............................................
25) ..............................................     0    50) ..............................................
```

edit of report data list (diffusion module)

(1) axial power dist.	1	2	4	8	6	14	22	32	44	58	74	92	112	134	158	184	212	242	274	0	0	0	0	0
(assembly no.)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(5)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(6)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(7)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(8)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(9)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(10)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
....	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0


```
venture - neutronics module - version 3.1 - fall, 1981 -- quality assurance level 1

run title - fbrco 2nd cycle boc calculation (full core model)
                    step no.2-1 cell.(cr na-follower)

 0
s0orage required for cross section check   98796 words
 0
t0tle of the latest version cross section file
 0
 0
 0
 0        grupxs made  by moses
 0
 0
c0oss section check completed normally
 0
r0ference real time from znatdn interface file =  0.00000E+00 days
 0
 0
s0lution by finite-difference diffusion theory
e0genvalue problem
g0ometry no. 17   3-d triagonal-z
t0iagonal option  0   parallelogram - 120 degree
n0mber of energy groups                              7
n0mber of upscatter groups (max)                     0
n0mber of downscatter groups (max)                   6
n0mber of intervals in dimension 1 (columns)        74
n0mber of intervals in dimension 2 (rows)           37
n0mber of intervals in dimension 3 (planes)         58
number of zones                                   5489
number of regions                                43808
number of black absorber zones                       1
boundary indicators-   left  2  right  4
                        top  2 bottom  4
 0                    front  2   rear  2
 0
 0
 0
 0
 0
 0
 0
 0
 0
```

memory requirements for data storage

	total minimum	total maximum	a	b	c	d
s0orage available	19984626					
m0cro calculation	246989					
e0uation constants calculation						
0 core contained or space stored	1081459	1232049				
0 plane stored	354559	505149				
0 row stored	354559	505149				
0 multi-level plane stored	354559	505149				
i0itial flux						
0 core contained or space stored	408989	565055				
0 other modes	91381	247447				
iterative process						
core contained	10164457		8798454	24882	537924	803197
space stored	2235738		2073629	24882	137227	0
58 planes stored	2090681		1928572	24882	137227	0
1 plane stored	211505		49396	24882	137227	0
37 rows stored	198221		36112	24882	137227	0
1 row stored	162109		0	24882	137227	0
58 multi-level planes stored	2258233		16428	24882	137227	2079696
perturbation calculation	208544					

```
data will be stored for all groups, all space


memory locations reserved for data storage---19984626
max memory locations required for this prob--10164457
memory locations not used------------------- 9820169

     special scratch dataset requirements
     maximum physical record is     32768 words

rite container arrays, control      36 data 9820159
file  92 defaults to core
  # of logical records in file -         7   logical record length (word) =    317608
```

```
  length of the file (word)     =   2223256   start location in core (word)=        1
  remaining core (word)         =   7596903
file  95 defaults to core
  # of logical records in file =         7   logical record length (word) =    317608
  length of the file (word)     =   2223256   start location in core (word)=   2223257
  remaining core (word)         =   5373647
file  96 defaults to core
  # of logical records in file =         7   logical record length (word) =    317608
  length of the file (word)     =   2223256   start location in core (word)=   4446513
  remaining core (word)         =   3150391
direct access file 98  requires          7 records        803196 words in length

*****(watt.sec/fiss) and (watt.sec/capt) are zero on grupxs - defaulting to 3.2e-11


maximum storage used for macroscopic cross section calculation    246988 words

the maximum and minimum diffusion coefficients are  1.79560E+01  0.00000E+00


fine mesh description - point is located at the centroid of the volume element
equilateral triangles - side =   9.1279
distance to point - dimension 3 (front to rear)
    1   6.7000    2  20.1000    3  33.5000    4  46.9000    5  60.3000    6  69.8500    7  75.5500    8  81.2500
    9  86.9500   10  92.6500   11  97.7000   12 102.1000   13 106.5000   14 110.9000   15 115.3000   16 119.6667
   17 124.0000   18 128.3333   19 132.3750   20 136.1250   21 140.5000   22 145.5000   23 150.5000   24 155.5000
   25 160.5000   26 165.5000   27 170.5000   28 175.5000   29 179.3250   30 181.9750   31 184.6000   32 187.2000
   33 190.6000   34 194.8000   35 199.0000   36 203.2000   37 207.4000   38 211.6000   39 215.8000   40 220.0000
   41 224.2000   42 228.4000   43 233.0000   44 238.0000   45 242.3750   46 246.1250   47 250.1875   48 254.5625
   49 258.9375   50 263.3125   51 276.0000   52 297.0000   53 318.0000   54 339.0000   55 360.0000   56 373.5833
   57 379.7500   58 385.9166

determine initial parameters for iterative procedure


reference point for initialization will be at column =    38 row =    30 plane =    39 zone =  3541
  x,xx,y,yy,z,shape(3),neuter=   0.919613   0.791988   0.791988   4.28800
  4.70000    1.00000E-04  43
initial outer iteration eigenvalue        0.919613  option  -99
initial overrelaxation coefficients max.  1.475792  min.  1.293535  inner iterations max.    4  min.    4  option    0
mesh point sweep option    1
outer iteration limit to be used   100  estimated    43

maximum storage used for calculating initial parameters was      806186


initial flux from existing interface
3d,    7 groups, fine mesh is   74 by   37 by   58, iter   65, effk 0.9999647, power  1.5998999E+09


total core required for data storage is******* words
elapsed cpu and clock minutes are       0.00       0.00


initial multiplication factor   9.999646E-01
```



```
a flux - eigenvalue problem follows
     4 inners min,  4 inners max - chebychev  beta on inners
   sigma-1 ordering
procedure=0,1,2,3,4-normal,chebyshev,semex,demex,semexf.   icvr=0,1-yes,no inners convr.   ocvr=0,1-yes,no outers convr.
iter  proc  icvr  ocvr   flux change    mu-bar  other-mu  sem-ind   acceleration parameters   source       k-used     k-calc
   1     0     0     0    7.20159E-01  0.00000  0.00000  1.00000      0.00000    0.00000  4.88848E+19  0.9999646  1.0086432
   2     0     0     0   -1.00280E-01  0.18353  0.00000  1.00000      1.00000    0.00000  4.91057E+19  0.9999646  1.0101677
   3     0     0     0   -8.69496E-02  0.81603  0.00000  1.00000      4.43559    0.00000  4.93441E+19  1.0050403  1.0106674
   4     0     0     0   -7.46688E-02  0.86725  0.00000  1.00000      6.69149   -0.09329  4.94601E+19  1.0106674  1.0104409
   5     0     0     0   -5.51792E-02  0.73622  0.00000  1.00000      0.84886    3.34695  4.94420E+19  1.0104409  1.0104737
   6     0     0     0   -3.65541E-02  0.70103  0.00000  1.00000      3.20993   -0.72185  4.94323E+19  1.0104737  1.0105320
   7     0     0     0   -2.50067E-02  0.70502  0.00000  1.00000      2.12593    0.18268  4.94249E+19  1.0105320  1.0105726
   8     0     0     0   -1.78528E-02  0.71111  0.00000  1.00000    -37.31215   27.46163  4.94177E+19  1.0105726  1.0105921
   9     0     0     0   -1.28184E-02  0.72272  0.00000  1.00000    -10.04732    8.63672  4.94105E+19  1.0105921  1.0105951
  10     0     0     0   -9.34165E-03  0.74912  0.00000  1.00000     -6.06333    5.91749  4.94034E+19  1.0105951  1.0105865
  11     0     0     0   -6.95499E-03  0.78716  0.00000  1.00000    -21.65096   16.11052  4.93966E+19  1.0105865  1.0105705
  12     0     0     0   -5.47506E-03  0.82176  0.00000  1.00000     29.14876  -16.17483  4.93900E+19  1.0105705  1.0105502
new overrelaxation coefficients calculated  1.49950  1.56427  1.67616  1.61790  1.50251  1.60209  1.58957
new inners calculated   4   4   4   4   4   4   4
  13     0     0     1    1.48960E-02  1.00000  0.00000  1.00000      1.00000    4.61055  4.93837E+19  1.0105502  1.0105096
  14     0     0     1    1.68063E-02  1.00000  0.00000  1.00000      1.00000    0.00000  4.93733E+19  1.0105096  1.0104555
  15     0     1     1    2.12112E-02  1.00000  0.00000  1.00000      1.00000    0.00000  4.93640E+19  1.0104555  1.0104114
  16     0     1     1    7.82167E-02  1.00000  0.00000  1.00000      1.00000    0.00000  4.93564E+19  1.0104114  1.0103774
     forced extrapolation lamda         0.87677


 3.70547E+16  4.22627E+16  7.93138E+16  0.00000E+00  8.76770E-01  4.67191E-01  8.76845E-01  9.99308E-01  6.91789E-04
  17     4     1     1    7.37017E-02  0.87677  0.00000  1.00000      3.32388    0.00000  4.93501E+19  1.0103774  1.0103472
  18     1     1     1    1.21770E-01  0.00000  0.00000  1.00000      0.63502    0.00000  4.93050E+19  1.0102404
  19     1     1     1    1.35396E-01  0.00000  0.00000  1.00000      1.40025    0.46803  4.92995E+19  1.0101280
  20     1     1     1    2.94509E-01  1.00000  2.32242  1.00000      1.13453    0.30551  4.92968E+19  1.0100723
  21     1     1     1   -6.29786E-01  0.95084  2.45332  1.00000      1.06470    0.26280  4.93025E+19  1.0101312
  22     1     1     1    3.29181E+00  0.82514  3.58097  1.00000      1.04710    0.25203  4.93041E+19  1.0101636
  23     1     1     1    3.01644E+00  0.71984  2.42457  1.00000      1.04271    0.24935  4.93013E+19  1.0101352
  24     0     1     1    1.39100E+02  0.00000  0.00000  1.00000      1.00000    2.56941  4.93005E+19  1.0101187  1.0101292
  25     1     1     0    2.15690E+00  0.00000  0.00000  1.00000      0.50232    0.00000  4.93008E+19  1.0101292
  26     1     1     0    2.82087E+00  0.00000  0.00000  1.00000      0.70937    0.13782  4.93009E+19  1.0101308
  27     1     1     0    7.97345E-01  0.68133  0.68133  1.00000      0.70937    0.13782  4.93008E+19  1.0101297
  28     1     1     0    1.93906E+00  0.85871  3.40142  1.00000      0.70937    0.13782  4.93006E+19  1.0101280
  29     1     1     1    2.21779E+00  0.86523  2.25264  1.00000      0.70937    0.13782  4.93008E+19  1.0101298
  30     1     1     0    1.32178E+00  0.79275  1.25688  1.00000      0.70937    0.13782  4.93007E+19  1.0101287
  31     1     1     1    4.65371E+00  0.84013  5.84764  1.00000      0.70937    0.13782  4.93007E+19  1.0101291
  32     0     1     1    1.21831E+02  0.00000  0.00000  1.00000      1.00000    5.25504  4.93007E+19  1.0101288  1.0101292
  33     1     1     0    2.62479E+00  0.00000  0.00000  1.00000      0.32533    0.00000  4.93007E+19  1.0101292
  34     1     1     0   -8.15583E-01  0.00000  0.00000  1.00000      0.40319    0.05875  4.93007E+19  1.0101285
  35     1     1     1    4.49363E+00  1.00000  3.26290  1.00000      0.40319    0.05875  4.93007E+19  1.0101290
  36     1     1     0   -8.04002E-01  0.97836  0.58092  1.00000      0.40319    0.05875  4.93007E+19  1.0101288
  37     1     1     0    3.73511E+00  0.99406  2.77809  1.00000      0.40319    0.05875  4.93007E+19  1.0101288
  38     1     0     0   -6.64995E-01  1.00000  0.51054  1.00000      0.40319    0.05875  4.93007E+19  1.0101288
  39     1     0     0    1.60219E+00  1.00000  1.60823  1.00000      0.40319    0.05875  4.93007E+19  1.0101287
  40     1     0     0   -4.53829E-01  1.00000  0.51017  1.00000      0.40319    0.05875  4.93007E+19  1.0101288
  41     1     0     0    5.63634E-01  1.00000  0.96014  1.00000      0.40319    0.05875  4.93007E+19  1.0101287
  42     1     0     0   -2.24540E-01  1.00000  0.51065  1.00000      0.40319    0.05875  4.93007E+19  1.0101286
  43     1     0     0    1.61224E-01  1.00000  0.63741  1.00000      0.40319    0.05875  4.93007E+19  1.0101288
  44     1     0     0   -1.24407E-01  1.00000  0.83385  1.00000      0.40319    0.05875  4.93007E+19  1.0101286
  45     0     0     1    2.98018E-01  0.00000  0.00000  1.00000      1.00000    0.00000  4.93007E+19  1.0101287
     forced extrapolation lamda         0.69960

 2.43782E+14  3.48458E+14  3.04940E+14  7.9313BE+16  6.99601E-01  7.99443E-01  3.98612E+00 -1.74465E+00  2.74465E+00
  46     0     0     0   -2.39430E-02  0.37709  0.00000  1.00000      0.60538    0.00000  4.93007E+19  1.0101288
  47     0     0     0    3.56160E-02  0.37563  0.00000  1.00000      0.60538   -0.00142  4.93007E+19  1.0101286
     forced extrapolation lamda         0.59734

 1.38767E+14  3.04940E+14  6.74584E-01  2.07299E+00
  48     4     0     0   -9.30573E-03  0.67458  0.00000  1.00000      0.83508    0.00000  4.93007E+19  1.0101287
  49     0     0     0   -1.98709E-02  0.00000  0.00000  1.00000      0.00000    0.00000  4.93007E+19  1.0101288  1.0101287
  50     1     0     0    3.62802E-03  0.00000  0.00000  1.00000      0.37703    0.00000  4.93007E+19  1.0101287
  51     1     0     0   -4.03366E-03  0.00000  0.00000  1.00000      0.58731    0.15271  4.93007E+19  1.0101287
  52     1     0     1    4.80104E-03  1.00000  1.18784  1.00000      0.49086    0.08266  4.93007E+19  1.0101286
  53     1     0     1   -5.90595E-03  1.00000  1.23309  1.00000      0.48341    0.07725  4.93007E+19  1.0101287
  54     1     0     1   -6.86644E-03  1.00000  1.15920  1.00000      0.48284    0.07684  4.93007E+19  1.0101287
  55     1     0     1   -9.10448E-03  1.00000  1.32139  1.00000      0.48280    0.07681  4.93007E+19  1.0101286
  56     1     0     1   -1.00529E-02  1.00000  1.09915  1.00000      0.48279    0.07680  4.93007E+19  1.0101287
  57     0     0     1   -4.00005E-02  0.00000  0.00000  1.00000      1.00000    0.00000  4.93007E+19  1.0101287  1.0101288
  58     1     1     0    6.69718E-03  0.00000  0.00000  1.00000      0.23893    0.00000  4.93007E+19  1.0101288
  59     1     0     0   -6.93127E-03  0.00000  0.00000  1.00000      0.28263    0.03527  4.93007E+19  1.0101287
  60     1     0     0   -5.72031E-03  0.80132  0.80132  1.00000      0.28263    0.03527  4.93007E+19  1.0101286
```

61	1	0	0	6.20865E-03	1.00000	1.08227	1.00000	0.28263	0.03527	4.93007E+19	1.0101287	
62	1	0	1	6.14152E-03	0.92722	0.94559	1.00000	0.28263	0.03527	4.93007E+19	1.0101287	
63	1	1	1	6.32795E-03	0.93106	1.03352	1.00000	0.28263	0.03527	4.93007E+19	1.0101286	
64	1	1	0	-5.22654E-03	1.00000	0.87755	1.00000	0.28263	0.03527	4.93007E+19	1.0101287	
65	1	1	0	-5.63633E-03	1.00000	1.07559	1.00000	0.28263	0.03527	4.93007E+19	1.0101287	
66	1	0	1	-5.76291E-03	0.93115	1.01958	1.00000	0.28263	0.03527	4.93007E+19	1.0101286	
67	0	0	1	-1.89878E-02	0.00000	0.00000	1.00000	1.00000	13.52466	4.93007E+19	1.0101287	1.0101287
68	1	0	0	3.12714E-03	0.00000	0.00000	1.00000	0.15226	0.00000	4.93007E+19	1.0101287	
69	1	0	0	2.46940E-03	0.00000	0.00000	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
70	1	0	0	-2.28541E-03	0.92664	0.92664	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
71	1	0	0	-1.64251E-03	0.91422	0.69138	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
72	1	0	0	1.54262E-03	0.89308	0.93841	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
73	1	0	0	1.35942E-03	0.80267	0.82237	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
74	1	0	0	1.15090E-03	0.83606	0.82868	1.00000	0.17364	0.01856	4.93007E+19	1.0101286	
75	1	0	0	-9.02182E-04	0.92855	0.81882	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
76	1	0	0	-7.73793E-04	0.85732	0.84516	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
77	1	0	0	-7.02068E-04	0.79112	0.94788	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
78	1	0	0	-5.01540E-04	0.87445	0.71807	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
79	1	0	0	4.72354E-04	0.90599	0.93649	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
80	0	0	1	1.48005E-03	0.00000	0.00000	1.00000	1.00000	9.63721	4.93007E+19	1.0101287	1.0101287
81	1	0	0	-2.64190E-04	0.00000	0.00000	1.00000	0.15226	0.00000	4.93007E+19	1.0101287	
82	1	0	0	1.97658E-04	0.00000	0.00000	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
83	1	0	0	1.75694E-04	0.87290	0.87290	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
84	1	0	0	1.58874E-04	0.77753	0.91738	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
85	1	0	0	1.17784E-04	0.84529	0.73300	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
86	1	0	0	-1.07053E-04	0.90459	0.90895	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
87	1	0	0	-8.55687E-05	0.81751	0.83219	1.00000	0.17364	0.01856	4.93007E+19	1.0101287	
											1.0101287	

estimated absolute point flux relative error 4.90315E-05

multiplication reliability estimators
neutron balance keffective---------- 1.0101287
by the sum of the squares of the residues---------- 1.0101287
upper and lower bounds estimates by max rel flux change---------- 1.0102151 1.0100422
upper and lower bounds estimates over all significant points------- 1.0379901 0.9839185

number of inner iterations, outer iteration error eigenvalue, and overrelaxation coefficients 4 3.64275E-01
1.45011 1.46576 1.67616 1.56927 1.50251 1.60209 1.58957

cpu and clock minutes required for this eigenvalue problem are 0.000 0.000
dopc file closing data - unit, arrays 92 21 6669769
dopc file closing data - unit, arrays 96 16 6669769

leakage 1.81715E+16 total losses 4.80929E+19 total productions 4.85801E+19 reactor power(watts) 1.59990E+09

boundary neutron leakage

group	left	right	top	bottom	front	back
1	0.00000E+00	5.79637E+17	0.00000E+00	-5.79637E+17	5.48885E+11	4.21844E+11
2	0.00000E+00	2.32262E+18	0.00000E+00	-2.32262E+18	5.63079E+12	1.80397E+13
3	0.00000E+00	1.06646E+19	0.00000E+00	-1.06646E+19	6.83217E+14	4.36558E+15
4	0.00000E+00	5.04113E+18	0.00000E+00	-5.04113E+18	5.49159E+14	5.14358E+15
5	0.00000E+00	9.65593E+17	0.00000E+00	-9.65593E+17	1.41482E+14	1.82791E+15
6	0.00000E+00	4.92738E+17	0.00000E+00	-4.92738E+17	1.51878E+14	2.78383E+15
7	0.00000E+00	1.15038E+17	0.00000E+00	-1.15038E+17	9.67789E+13	2.40346E+15
sum	0.00000E+00	2.01814E+19	0.00000E+00	-2.01814E+19	1.62870E+15	1.65428E+16

overall neutron balance

group	absorptions	b**2 losses	1/v loss	out-scatter	in-scatter	p1 in-scatter	source	power(watts)
1	9.92367E+17	0.00000E+00	0.00000E+00	6.32220E+18	0.00000E+00	0.00000E+00	7.31458E+18	2.38510E+07
2	3.38493E+18	0.00000E+00	0.00000E+00	2.07423E+19	3.27973E+18	0.00000E+00	2.08476E+19	9.70157E+07
3	1.16667E+19	0.00000E+00	0.00000E+00	3.04280E+19	2.27052E+19	0.00000E+00	1.93947E+19	1.93839E+08
4	1.49181E+19	0.00000E+00	0.00000E+00	1.69704E+19	3.13764E+19	0.00000E+00	5.17777E+17	1.23141E+08
5	1.07379E+19	0.00000E+00	0.00000E+00	6.37554E+18	1.70971E+19	0.00000E+00	1.82971E+16	6.33151E+07
6	4.98555E+18	0.00000E+00	0.00000E+00	1.39144E+18	6.37992E+18	0.00000E+00	0.00000E+00	2.95198E+07
7	1.38907E+18	0.00000E+00	0.00000E+00	0.00000E+00	1.39157E+18	0.00000E+00	0.00000E+00	2.55824E+06
sum	4.80746E+19	0.00000E+00	0.00000E+00	8.22299E+19	8.22299E+19	0.00000E+00	4.80929E+19	5.33300E+08

point regular flux interface file rtflux (version 1) has been written on unit number 82

the maximum power density is at plane 29, row 36, and column 73 and is 4.03790116E+02 watts/cc.

the maximum neutron density is at plane 29, row 37, and column 74 and is 5.09731563E+15 neutrons/cc.

the relative power density traverse left-to-right is

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
7.60404E-01	8.04829E-01	6.64497E-01	6.94295E-01	7.13388E-01	7.12409E-01	7.27496E-01	7.45518E-01	7.82944E-01	
8.00773E-01	8.10628E-01	7.96470E-01	8.11450E-01	8.27434E-01	8.69144E-01	8.83023E-01	8.92606E-01	8.72052E-01	
8.82244E-01	8.93557E-01	9.35463E-01	9.53178E-01	9.62598E-01	9.39099E-01	9.43754E-01	9.54787E-01	9.94689E-01	
1.00000E+00	9.94681E-01								

the relative power density traverse top-to-bottom is

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	6.03902E-01	8.03126E-01	9.05793E-01	6.78366E-01	7.40418E-01	7.78844E-01	
0.00000E+00	8.25648E-01	8.57356E-01	8.53600E-01	9.09623E-01	9.33065E-01	9.21800E-01	9.84236E-01	1.00000E+00	
9.63599E-01									

the relative power density traverse front-to-back is

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	6.12638E-03	7.79409E-03	1.03984E-02	1.42330E-02	1.98289E-02	2.79615E-02	3.97035E-02	5.73361E-02	
4.69589E-01	5.36035E-01	6.14282E-01	6.99081E-01	7.75973E-01	8.43010E-01	8.98967E-01	9.43306E-01	9.75440E-01	
9.94937E-01	1.00000E+00	9.99891E-01	9.96204E-01	9.89083E-01	9.75252E-01	9.49192E-01	9.14381E-01	8.71167E-01	
8.20012E-01	7.61487E-01	6.96173E-01	6.25246E-01	5.50714E-01	4.76300E-01	5.58617E-02	3.67403E-02	2.61160E-02	
1.95674E-02	1.44069E-02	1.06067E-02	8.07509E-03	6.55482E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00						

the relative neutron density traverse left-to-right is

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2.56680E-06	7.71479E-06	1.94142E-05	4.73985E-05	1.14805E-04	2.75817E-04	6.59186E-04	1.56925E-03	3.82485E-03	
1.09166E-02	1.78317E-02	2.58721E-02	3.57163E-02	4.79468E-02	6.34051E-02	8.27657E-02	1.07033E-01	1.36826E-01	
1.72947E-01	2.15246E-01	2.62954E-01	2.99229E-01	3.23522E-01	3.49448E-01	3.93296E-01	4.60636E-01	5.22532E-01	
5.72760E-01	6.17913E-01	6.47190E-01	6.76034E-01	6.96109E-01	7.17047E-01	7.33004E-01	7.48860E-01	7.62851E-01	
7.77412E-01	7.85740E-01	7.94057E-01	8.08960E-01	8.30014E-01	8.49312E-01	8.66069E-01	8.79351E-01	8.91932E-01	
9.00951E-01	9.15150E-01	9.24660E-01	9.40653E-01	9.53067E-01	9.67645E-01	9.77700E-01	9.89102E-01	9.93977E-01	
9.99427E-01	1.00000E+00								

the relative neutron density traverse top-to-bottom is

0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2.56409E-06	1.93937E-05	1.14680E-04	6.58440E-04	3.82013E-03	1.78136E-02	3.56782E-02	6.33320E-02	1.06899E-01	
1.72700E-01	2.62476E-01	3.22900E-01	3.92463E-01	5.22927E-01	6.20449E-01	6.77205E-01	7.17895E-01	7.50606E-01	
7.77809E-01	7.94507E-01	8.31918E-01	8.66690E-01	8.92626E-01	9.17254E-01	9.41227E-01	9.68331E-01	9.91422E-01	
1.00000E+00									

the relative neutron density traverse front-to-back is

7.91549E-07	6.34842E-06	5.16302E-05	4.49646E-04	4.22009E-03	3.33451E-02	4.02269E-02	4.70365E-02	5.36817E-02	
6.00177E-02	6.89913E-02	8.79369E-02	1.14059E-01	1.48369E-01	1.92186E-01	2.46351E-01	3.11234E-01	3.86730E-01	
4.62132E-01	5.31657E-01	6.11536E-01	6.97364E-01	7.74917E-01	8.42391E-01	8.98539E-01	9.43094E-01	9.75373E-01	
9.94945E-01	1.00000E+00	9.99884E-01	9.96186E-01	9.89046E-01	9.75205E-01	9.49040E-01	9.14056E-01	8.70601E-01	
8.19129E-01	7.60304E-01	6.94403E-01	6.22549E-01	5.46389E-01	4.68430E-01	3.82370E-01	2.96641E-01	2.34409E-01	
1.89354E-01	1.49000E-01	1.15030E-01	8.93446E-02	7.10697E-02	5.60051E-02	3.65033E-02	2.20474E-02	1.26606E-02	
6.93439E-03	3.83114E-03	2.06099E-03	8.07992E-04						

dopc use of container arrays, control 11, max data 6669768

total cpu minutes used 0.000 total clock minutes used 0.000 total i/o used 0

fbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

Wed Apr 9 04:38:49 1997 page 56
burnup time (days) 456.00 cpu time (sec) 26839.5

fbrco 2nd cycle boc calculation (full core model)
step no.2-1 cell.(cr na-follower)

Wed Apr 9 04:38:50 1997 page 57
burnup time (days) 456.00 cpu time (sec) 26839.5

mixture region normal flux distribution (n/sec.cm**2)

no.	name	volume	group 1	group 2	group 3	group 4	group 5	group 6
1	incore init	1.435906E+06	4.783509E+13	2.242057E+14	1.588484E+15	9.922228E+14	2.628526E+14	3.973772E+13
2	oucore init	6.926985E+05	3.505353E+13	1.620543E+14	1.027208E+15	5.814572E+14	1.449838E+14	2.817949E+13
3	axbla lower	1.490024E+06	4.885469E+12	2.552330E+13	2.864555E+14	2.763116E+14	1.035597E+14	3.747536E+13
4	na foll2	1.039481E+06	8.515051E+12	4.436887E+13	3.610442E+14	2.616990E+14	9.598336E+13	3.226060E+13
5	gen upplenum	1.445359E+06	4.039436E+12	2.331502E+13	2.151173E+14	1.682669E+14	6.970662E+13	4.931564E+13
6	loplenumcore	2.644269E+06	1.159332E+11	9.951854E+11	2.798141E+13	3.897742E+13	2.221135E+13	2.364886E+13
7	lower shield	2.227134E+06	7.444062E+09	7.692397E+10	2.264093E+12	2.844350E+12	1.078390E+12	8.438433E+11
8	radial b4cshie	1.768330E+07	7.700157E+10	7.231601E+11	1.911933E+13	1.833176E+13	8.958319E+12	8.224994E+12
	total	2.865817E+07	4.069421E+12	1.980704E+13	1.578130E+14	1.112433E+14	3.671690E+13	1.560079E+13

no.	name	volume	group 7
1	incore init	1.435906E+06	2.290348E+11
2	oucore init	6.926985E+05	1.181802E+12
3	axbla lower	1.490024E+06	3.090222E+12
4	na foll2	1.039481E+06	5.270972E+12
5	gen upplenum	1.445359E+06	1.419739E+13
6	loplenumcore	2.644269E+06	1.051780E+13
7	lower shield	2.227134E+06	5.447757E+11
8	radial b4cshie	1.768330E+07	4.380013E+12
	total	5.731633E+07	2.411698E+12

mixture region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peak position	peak power(w/cc)	peaking r.peak
1	incore init	1.435906E+06	3.636329E+02	6.818543E+01	2.532428E+02	(3,29)	3.996974E+02	1.010686
2	oucore init	6.926985E+05	1.515844E+02	2.842385E+01	2.188317E+02	(79,30)	3.464250E+02	1.062998
3	axbla lower	1.490024E+06	1.808268E+01	3.390714E+00	1.213583E+01	(1,43)	4.908465E+01	1.000584
8	radial b4cshie	1.768330E+07	1.765636E-43	3.363116E-44	9.809089E-45	(343,58)	8.155557E-43	0.000000
	total	2.130192E+07	5.333000E+02	1.000000E+02				

region average power distribution

no.	name	volume	power(mw)	power(%)	power(w/cc)	peak position	peak power(w/cc)	peaking r.peak
1	incore init	1.435906E+06	3.636329E+02	6.818543E+01	2.532428E+02	(3,29)	3.996974E+02	1.010686
2	oucore init	6.926985E+05	1.515844E+02	2.842385E+01	2.188317E+02	(79,30)	3.464250E+02	1.062998
3	axbla upper	7.450122E+05	8.870522E+00	1.663327E+00	1.190654E+01	(1,18)	4.847633E+01	1.000617
4	axbla lower	7.450119E+05	9.212158E+00	1.727388E+00	1.236512E+01	(1,43)	4.908465E+01	1.000584
14	radial b4cshie	8.589029E+06	1.765636E-43	3.363116E-44	2.101948E-44	(343,58)	8.155557E-43	0.000000
	total	1.220766E+07	5.333000E+02	1.000000E+02				

breeding ratio by region

no.	name	volume	fertile capture	fissile absorptions	fissile decay	fissile absr.+decay	breeding ratio
1	incore init	1.43591E+06	2.28647E-01	2.38009E-01	5.32621E-03	2.43336E-01	6.38628E-01
2	oucore init	6.92698E+05	6.60684E-02	1.01139E-01	3.88645E-03	1.05026E-01	1.84534E-01
3	axbla upper	7.45012E+05	4.59679E-02	4.68270E-03	5.83094E-07	4.68328E-03	1.28392E-01
4	axbla lower	7.45012E+05	4.69002E-02	4.98270E-03	7.46172E-07	4.98345E-03	1.30996E-01
	total	3.61863E+06	3.87583E-01	3.48814E-01	9.21399E-03	3.58028E-01	1.08255E+00

--- this problem ended ---

付録３　ＭＯＳＥＳコードプログラム情報

以下にコモン参照関係、プログラムツリー構造およびパラメータ設定値を示す。

1.	ADNCOM	IATDEN,KFILE	BLOCKDAT DIF STUPI	DREDT	RLOAD	SHUFFL
2.	ADRCOM	IIGY,ICHI,INKZON,INKPLN,INGMAP,INSMAP,INOMAP,INBMA P,INDMAP,IINDX1,IZ,IHZ,ICZ,ICVOL,IVVOL,IZVOL,INATR G,INORGG,INREGG,IVOLFG,IDLEK,ILGMAP,ILKPLN,IRBND,I ABND,IADR01,IADR02,IADR03,IADR04,IADR05,IADR06,IAD R07,IADR08,IADR09,IADR10,IADR11,IADR12,IADR13,IADR 14,IADR15,IADR16,IADR17,IADR18,MADR01,MADR02,MADR0 3,MADR04,MADR05,MADR06,MADR07,MADR08,MADR09,MADR10 ,MADR11,MADR12,MADR13,MADR14,LDAD01,LDAD02,LDAD03, LDAD04,LDAD05,LDAD06,LDAD07,LDAD08,LDAD09,LDAD10,L DAD11,LDAD12,LDAD13,LDAD14,LDAD15,LDAD16,LDAD17,LD AD18,LDAD19,LDAD20,LDAD21,LDAD22,IADR21,IADR22,IAD R23,LDAD23,LAST	DADSET DMDIF	DCALC STUPI	DFEDT	DHDIF	DIF
3.	ADRES	LAD(1),L1,L2,L3,L4,L5,L6,L7,L8,L9,L10,L11,L12,L13, L14,L15,L16,L17,L18,L19,L20,L21,L22,L23,L24,L25,L2 6,L27,L28,L29,L30,L31,L32,L33,L34,L35,L36,L37,L38, L39,L40,L41,L42,L43,L44,L45,L46,L47,L48,L49,L50,L5 1,L52,L53,L54,L55,L56,L57,L58,L59,L60,L61,L62,L63, L64,L65,L66,L67,L68,L69,L70,L71,L72,L73,L74,L75,L7 6,L77,L78,L79,L80	DIFF LCAL SSOR	EDIT NBAL	FLUX OUTR	FSOR PROS	INRX RBL1
4.	AFLUY	1: BFLUY8(1),XLAMD8,BETTX,IVX,KBVX,JVX,JVXM1,JVXP1,I, KB,K,KM1KBI,INRB,NDIM,NGEM,NGEMM,ITRI,IGOGM,ISYM1, ISYM2,N90D,INNER,KBIX,KS1,KS2,IEP,IEXTR,IADJ,IROD, KR1,KR2,NSCD,KXMUP,ISHR,IO1,IO2,IO3,IO4,IO8,IO9,IO 10,IO11,IO12,IO13,IO14,IO15	ATED OUTR	BALC XTRP	CHBF	DOIN	EDIT
		2: BFLUY8(1),XLAMD8,BETTX,IUX,KBUX,JUX,JVXM1,JUXP1,I, KB,K,KM1KBI,INRB,NDIM,NGEM,NGEMM,ITRI,IGOGM,ISYM1, ISYM2,N90D,INNER,KBIX,KS1,KS2,IEP,IEXTR,IADJ,IROD, KR1,KR2,NSCD,KXMUP,ISHR,IO1,IO2,IO3,IO4,IO8,IO9,IO 10,IO11,IO12,IO13,IO14,IO15	DIFF				
		3: BFLUY8(1),XLAMD8,BETTX,IUY,KBUY,JUY,JVXM1,JVXP1,I, KB,K,KM1KBI,INRB,NDIM,NGEM,NGEMM,ITRI,IGOGM,ISYM1, ISYM2,N90D,INNER,KBIX,KS1,KS2,IEP,IEXTR,IADJ,IROD, KR1,KR2,NSCD,KXMUP,ISHR,IO1,IO2,IO3,IO4,IO8,IO9,IO 10,IO11,IO12,IO13,IO14,IO15	ETR1 SOBL	ETR2	MUEX	NBAL	PNDN
		4: BFLUY8(1),XLAMD8,BETTX,IVX,KBVX,JVX,JVXM1,JVXP1,I, KB,L,KM1KBI,INRB,NDIM,NGEM,NGEMM,ITRI,IGOGM,ISYM1, ISYM2,N90D,INNER,KBIX,KS1,KS2,IEP,IEXTR,IADJ,IROD,	FLUX				

		KR1,KR2,NSCD,KXMUP,ISHR,IO1,IO2,IO3,IO4,IO8,IO9,IO 10,IO11,IO12,IO13,IO14,IO15				
		5: BFLUY8(1),XLAMD8,BETTX,IMX,KBMX,JMX,JVXM1,JMXP1,I, KB,K,KM1KBI,INRB,NDIM,NGEM,NGEMM,ITRI,IGOGM,ISYM1, ISYM2,N90D,INNER,KBIX,KS1,KS2,IEP,IEXTR,IADJ,IROD, KR1,KR2,NSCD,KXMUP,ISHR,IO1,IO2,IO3,IO4,IO8,IO9,IO 10,IO11,IO12,IO13,IO14,IO15	FLXW INRX	INR2 LOU2	INR3 LOU3	INR4 LOU4	INR5 RELX
		6: BFLUY8(1),XLAMD8,BETTX,IVX,KBVX,JMX,JVXM1,JMXP1,I, KB,K,KM1KBI,INRB,NDIM,NGEM,NGEMM,ITRI,IGOGM,ISYM1, ISYM2,N90D,INNER,KBIX,KS1,KS2,IEP,IEXTR,IADJ,IROD, KR1,KR2,NSCD,KXMUP,ISHR,IO1,IO2,IO3,IO4,IO8,IO9,IO 10,IO11,IO12,IO13,IO14,IO15	INR1	LOU1	LOUX		
		7: BFLUY8(1),XLAMD8,BETTX,IVX,KBVX,JMX,JVXM1,JMXP1,II ,KB,K,KM1KBI,INRB,NDIM,NGEM,NGEMM,ITRI,IGOGM,ISYM1 ,ISYM2,N90D,INNER,KBIX,KS1,KS2,IEP,IEXTR,IADJ,IROD ,KR1,KR2,NSCD,KXMUP,ISHR,IO1,IO2,IO3,IO4,IO8,IO9,I O10,IO11,IO12,IO13,IO14,IO15	LOU5				
5.	AOSUB	BSUB8(1),XT18,XT28,XT38,XT48,EXFC1,EXFC2,RMX,RMN,V RG1,VRG2,VOG1,VOG2,NIT,NIIT,NI3,VRGP1,VRGP2,VRGK1, XKEF1,XKEF2,IEXRI,EPI2,SP89	ATED ETR2 OUTR	CHBF FLUX RBL1	DIFF FSOR XTRP	DOIN JUSB	ETR1 MUEX
6.	ARYCOH	MBLC,MBC1,MPLN,MPN1,MPN2,MPN3,MPL2,MAZN,MZN1,MGRP, MGP1,MGP6,MDEN,MACT,MYER,MNUC	DADSET DMDIF	DCALC STUPI	DFEDT	DHDIF	DIF
7.	BADRCM	JD01,JD02,JD03,JD04,JD05,JD06,JD07,JD08,JD09,JD10, JD11,JD12,JD13,JD14,JAD15,JAD16,JAD17,JAD18,JAD19, JEND1,JDD01,JDD02,JDD03,JDD04,JDD05,JPAOD,JDAOD,JK HNU,JSAOD,JYD,JNICT,JNOC,JAA,JAT,JBT,JEND2	BADRS	DIF	DOEX	STUPI	
8.	BCHECK	ICNTB	BCALC	MESA	MESB		
9.	BURNDM	METHOD,IRLOC(5)	BCALC	DOEX	LIBRD	STUPD	
10.	BURNR	NNS,NMATXE,NISOE,NACT,NFSLR,NFPR,NYER,NAOD,NSNUC,N YFFP,NFS,ISTRT,NYFFPE,LBEXCH,LSEXCH,LNICTX,IOUT	BADRS	BCALC	LIBRD	STUPX	
11.	CARDC	CTEST,CCARD(80)	CONVER DREDT LIBRD STUPX	CPBYTE FMEDT NEXT VALUE	DFPRT FMINV RARRAY	DIF IARRAY SCAN	DMDIF IXARAY STUPI
12.	CARDI	IPOINT	CONVER	CPBYTE	DFPRT	DIF	DHDIF

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	:	DREDT	FHEDT	FMINV	IARRAY	IXARAY
	:	LIBRD	NEXT	RARRAY	SCAN	STUPI
	:	STUPX	VALUE			
13. CARDL	: CONTUF,NRFLAG	CONVER	CPBYTE	DFPRT	DIF	DMDIF
	:	DREDT	FHEDT	FMINV	IARRAY	IXARAY
	:	LIBRD	NEXT	RARRAY	SCAN	STUPI
	:	STUPX	VALUE			
14. CARDR	: RDUMCA	CONVER	CPBYTE	DFPRT	DIF	DMDIF
	:	DREDT	FHEDT	FMINV	IARRAY	IXARAY
	:	LIBRD	NEXT	RARRAY	SCAN	STUPI
	:	STUPX	VALUE			
15. CHEBE	: CHEBE1,CHEBE2,CHEBE3,CHEBE4,CHEBE5,CHEBE6,CHEBE7,I	ATED	CHEV	FOU1	FOU2	FOU3
	: CHEB1,ICHEB2,ICHEB3,ICHEB4,ICHEB5,ICHEB6,ICHEB7,IC	FOU4	FOU5	FOUX	MUEX	OUTR
	: HEB8,ICHEB9					
16. CNTRL	: SHARE8(100),SHARE(100),LX(200)	ATED	BALC	BATG	BHAV	BSQS
	:	CHBF	CHEV	COMC	CON1	CON3
	:	CORE	CORR	DASU	DDSP	DIFF
	:	DOIN	DTDIF	EDIT	ETR1	ETR2
	:	FEFS	FLRD	FLUX	FLXR	FLXW
	:	FOU1	FOU2	FOU3	FOU4	FOU5
	:	FOUX	FSOR	GRXP	INR1	INR2
	:	INR3	INR4	INR5	INRX	IONO
	:	JUSB	LCAL	LEK1	LEK2	LEK5
	:	LEKX	LOU1	LOU2	LOU3	LOU4
	:	LOU5	LOUX	MAC1	MUEX	NBAL
	:	NEWB	ORLX	OUTR	PAN1	PAN2
	:	PHIA	PND1	PND2	PND3	PND4
	:	PND5	PNDN	POUT	PROS	PTVL
	:	QOUT	RBL1	RBLA	RDAB	RDUE
	:	SAV1	SGX0	SOBL	SOU1	SOU2
	:	SOU3	SOU4	SOU5	SOUX	SOUY
	:	SOUZ	SSOR	VENT	XTRP	ZIO3
17. COMSAM	: LTRACK,NOTEP,KKSTA,KBER	DASU	DOPC	RITE	SEEK	
18. CORRT	: HSTAR8,H8,C8,INDCOR,ISCRW,ISCRR,ISMA,IVOL,IDF,IDA	ATED	CHBF	CHEV	CON1	CORR
	:	DIFF	DOIN	ETR1	ETR2	FLXW
	:	FOU1	FOU2	FOU3	FOU4	FOU5
	:	FOUX	FSOR	NBAL	OUTR	VENT
	:	XTRP				
19. CRC96	: PWRAT(15),BRRAT(15)	DFPRT	DREDT	EDCPT		

20. DEASU	: IDFULT,KBSAM,MSAM,KSAM,MEXT,KEXT,MAD2,MAD5,MAD6,MT	DASU	DIFF	RITE		
	: OTS,MFISS,NTSS,LTSS,MTSS,KTSM,NFSS,LFSS,MFSS,KFSM					
21. DIFCMX	: NRMX,KRMX,IRMX,MRMN,KRMN,IRMN,FMX,FMN,NFMX,KFMX,NF	DEXTR	DHDIF	DHFLX	DMDIF	DMFLX
	: MN,KFMN,VFGP1,VFG1,IEPP					
22. DIFCOM	1: LIT,LIIT,LIIIT,IEP,NII3,VRGP1,VRGP2,VRG1,VRGK1,VRG	DEXTR				
	: K2,RMN,RMX,XKEF1,XKEF2,XLAMDA,EXFC1,EXFC2,VRGABS,B					
	: ETTA,IX(18),SP(15)					
	2: LIT,LIIT,LIIIT,IEP,NI3,VRGP1,VRGP2,VRG1,VRGK1,VRGK	DHADJ	DHDIF	DHFLX	DHINT	DHSRC
	: 2,RMN,RMX,XKEF1,XKEF2,XLAMDA,EXFC1,EXFC2,VRGABS,BE	DMADJ	DMDIF	DMFLX	DMINT	DMSRC
	: TTA,IX(18),SPARE(15)					
	3: D1,D2,D3,D4,D5,D6,D7,D8,D9,D10,D11,D12,XKEF1	EDCPT				
23. EQUXE	: YT8,XLZE8,ICD69,NISOXE	BALC	CORE	CORP	INR1	INR2
	:	INR3	INR4	INR5	INRX	LCAL
	:	MAC1	MAC2	NBAL	PROS	SGX3
	:	VENT				
24. FILRD	: LBFLG(3)	LIBRD	STUPX			
25. FSWAP	: LSWAP(3),NSWAP1,NSWAP2,NSWAP3,JFR,JFW,JFX	DIFF	DOIN	ETR1	ETR2	FLXR
	:	FOU1	FOU3	FOU4	FOU5	FOUX
	:	INR1	INR2	INR3	INR4	INR5
	:	INRX	LOU1	LOU5	LOUX	MUEX
	:	OUTR	RBL1	SOU1	SOU3	SOU4
	:	SOU5	SOUY			
26. IOUNIT	: ILOADI,IDCHGI,IDCHGW,IDEPLI,IDEPLW,IIDPIN,IKEFFC,I	BCALC	BFEDT	BFPLT	BLOCKDAT	CRPAT
	: RPEAK,IPOFLX,IPPOWR,IPPEAK,IAJFLX,ITCFUL,ITSFUL,IT	DBCSET	DCALC	DFPLT	DFPRT	DGEDT
	: ICLD,ITOCLD,ITWRAP,ITPCOL,ITACOL,IP13PW,IP6FLX,IP6	DHADJ	DHDIF	DHFLX	DHINT	DHNRM
	: DEN,IDLEAK,IPLNTC,IAFLUX,IAPOWR,IP6POW,IAEXPO,IA6E	DHSRC	DIEDT	DIF	DMACR	DMADJ
	: XP,IWEGT,IAVTMP,IHTFUL,ITHCLD,IADENS,ITDEPN,IFLUX,	DMDIF	DMFLX	DMINT	DMNRM	DMSRC
	: IFTAU,ISOURC,IPTSAE,IDLEK1,IFTFLX,IP6HTX,IPINPW,IG	DPOWS	DREDT	DTNRM	EDCPT	FHEDT
	: FACT,IPFACT,IAFACT,ISBCOL,ISBATP,ISBHTP,IAZTMP,IPK	FMPLT	LIBRD	MKGEOD	MKGRUP	MKNDXS
	: TMP,ITMPCN,ICLDTP,ICOM7,IBNDCN,IBNDMP,ICRCON,ICRMA	MKZNAT	RLOAD	SHUFFL	STEDT	STPLT
	: P,ICONDC,ICONDM,ICONDT,IMCRXS,IMICXS,IWKFIL,IPHI,I	STUPD	STUPI	STUPX	XINTCM	XREDC3
	: WKFL0	XTRMCM	XWRTC1			
27. IOUNT	: IOU(1),IOIN,IOUT,ITRL,IGRU,IGEO,INDX,IZNA,ISEA,IFI	COMC	DIFF	DOIN	DRIV	DTDIF
	: X,IRTF,IATF,IRZF,IPWD,ISIGS,ISIGMA,ICNSTS,IFLUX,IF	EDIT	FLXR	FLXW	GRXP	INR3
	: XSO,IPERT,ITCH1,ITCH2,ITCH3,ITCH4,ITCH5,ITCH6,ITCH	INR4	INR5	INRX	IONO	LCAL
	: 7,ITCH8,ITCH9,ITCH10,ITCH11,ITCH12,ITCH13,ITCH14,I	NBAL	OUTR	PNDN	PROS	RBL1

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PROGRAM  UTILITY  ANALYZER/F77  1.04   : COMMON  SPECIFICATION  OF  PROGRAM   ( BRIEF  LIST )        :   DATE:          PAGE  000

                            : TCH15,ITCH16,ITCH17,ITCH18,ITCH19,ITCH20,ITCH21,IT :  SOBL
                            : CH22,ITCH23,ITCH24,ITCH25,ITCH26,ITCH27,ITCH28,ITC :
                            : H29,ITCH30                                         :
-------------------------------------------------------------------------------------------------------------------
      28.  LIMTS            : LTD(1),MTOT,JDX,IDX,KBDX,KDX,MDX,KMDX,JDXP1,IDXP1, :  DIFF      DOIN      EDIT      FLUX      LCAL
                            : KBDXP1,NQDX,NRDX,NQQDX,NQQQDX,MP1,MP2,MP3,KBI,KBIP :  MUEX      OUTR      RBL1
                            : 1,KBP1I                                            :
-------------------------------------------------------------------------------------------------------------------
      29.  MACHNC           : ODUMCH                                             :  CONVER    CPBYTE    DFPRT     DIF       DMDIF
                            :                                                    :  DREDT     FMEDT     FMINV     LIBRD     NEXT
                            :                                                    :  SCAN      STUPI     STUPX     VALUE
-------------------------------------------------------------------------------------------------------------------
      30.  MACHNI           : KBYTE,KBIT,IVER,IMACH(16)                          :  CONVER    CPBYTE    DFPRT     DIF       DMDIF
                            :                                                    :  DREDT     FMEDT     FMINV     LIBRD     NEXT
                            :                                                    :  SCAN      STUPI     STUPX     VALUE
-------------------------------------------------------------------------------------------------------------------
      31.  MACHNL           : CDC,CRAY,IBM                                       :  CONVER    CPBYTE    DFPRT     DIF       DMDIF
                            :                                                    :  DREDT     FMEDT     FMINV     LIBRD     NEXT
                            :                                                    :  SCAN      STUPI     STUPX     VALUE
-------------------------------------------------------------------------------------------------------------------
      32.  MACHNR           : RMACH(6),AMINEX,AMAXEX                             :  CONVER    CPBYTE    DFPRT     DIF       DMDIF
                            :                                                    :  DREDT     FMEDT     FMINV     LIBRD     NEXT
                            :                                                    :  SCAN      STUPI     STUPX     VALUE
-------------------------------------------------------------------------------------------------------------------
      33.  MACRO            : XMAC(10),NGROUP,NISO,MAXUP,MAXDN,MAXORD,ICHIST,NPS :  CORE      MAC1      SGX1      SGX3
                            : CS,NSTRPD,NCHIN,NICHI,NSCMAX,NSBLOK,NRG,NRH,NON,NS :
                            : N,NNS,NAN,NZONE,NSZ,INDX,IGRU,IGR1,IZNT,NSBR(2),NR :
                            : IP(2),MXJB(2),IRSUM,IRTYP(7),IOPPN,NIP,NSBFR,IOPTC :
                            : ,NZT,IOPSZ,IMACR(16)                               :
-------------------------------------------------------------------------------------------------------------------
      34.  MGMTIO           : HONOR(100),NVERS(100),NEDUM(100),IMODD(100),NDF,NI :  DASU      DOPC      RITE      SEEK
                            : O,INPT,IOUT,JOUT,IAV(11),IEMA,NNNREC(100),MAXPRL   :
-------------------------------------------------------------------------------------------------------------------
      35.  MRI2             : KK(600)                                            :  DASU      DOPC      RITE      SEEK
-------------------------------------------------------------------------------------------------------------------
      36.  PDFIX            : PD888,ICD64,ICD65,ICD66,ICD67,ICDXX,ICDXJ,ICDXI,IC :  EDIT      PNDS      PNDN
                            : DXK                                                :
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      37.  PNC            1: MEMORY,DA(10000000)                                 :  ALLOC
                          . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                          2: MEMORY,DA(1)                                        :  DADSET    DCALC     DFEDT     DHDIF     DIF
                            :                                                    :  DMDIF     STUPI
                          . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                          3: MEM,X(1)                                            :  RITE
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      38.  REBAL          1: REVRG,REBAL1,REBAL2,REBAL3,REBAL4,REBAL5,REBAL6,RE  :  CORE      LCAL      RBLA      VENT
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PROGRAM  UTILITY  ANALYZER/F77  1.04   : COMMON  SPECIFICATION  OF  PROGRAM   ( BRIEF  LIST )        :   DATE:          PAGE  0002

                            : BAL7,REBAL8,REBAL9,NREMAX,NBLJ,NBLI,NBLK,NPTJ,NPTI :
                            : ,NPTK,NBDX,NDDX,NREIO,LREIO,IREBL1,IREBL2,IREBL3,I :
                            : REBL4,IREBL5,IREBL6,IREBL7,IREBL8,IREBL9           :
                          . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .
                          2: REVRG,REBAL1,REBAL2,REBAL3,REBAL4,REBAL5,REBAL6,RE  :  RBL1
                            : BAL7,REBAL8,REBAL9,NREMAX,NBLJ,NBLI,NBLK,NPTJ,NPTI :
                            : ,NPTK,NBDX,NDDX,NREIO,LREIO,IREBL1,IREBL2,IREBL3,I :
                            : REBL4,IREBL5,IREBL6,IREBL7,IREBL8,IREBL9,ICHIZ     :
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      39.  RESIOU           : IAEXPR,IA6EXR,IADNSR,IRES,KLOAD                    :  DIF       RLOAD     SHUFFL    STUPI
-------------------------------------------------------------------------------------------------------------------
      40.  RRTCL            : CONVG,AMAXTL,AJUSTM,ATEQU,CLB,AGRWT,IRCD38,IEQUIL, :  BLOCKDAT  JAGY      JUCY      MEIT      OPSET
                            : METHME,NTERM,NSTEPI,NSTEPL,NICEL,ISTEP,IOPED,IGLOB :  STUPD
                            : (28)                                               :
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      41.  SAVED            : MU,NGO,ITRAP,ICUT,NCYL,NMUEX                       :  FLUX      OUTR
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      42.  SCLCOM           : NDIMA,NDIMB,NDIMC,NDIMD,NDIME,NDIMF,NDIMG,NDIMH,ND :  BCALC     BFEDT     BFPLT     BIEDT     CRPAT
                            : IMI,NDIMJ,NDIMK,NDIML,NDIMM,NDIMN,NDIMO,NDIMP,NDIM :  DADSET    DBCSET    DCALC     DFEDT     DFPLT
                            : Q,NDIMR,NDIMS,NDIMT,NDIMU,NDIMV,NDIMW,NDIMX,NDIMY, :  DFPRT     DGEDT     DHADJ     DHDIF     DHFLX
                            : NDIMZ,NDIM0,NOU,NREGZ,NLINM,LINES,NPAGE,NYEAR,NMON :  DHINT     DHNRM     DHSRC     DIEDT     DIF
                            : T,NDAYS,NNAME(5),NTITL(40),NCAS,NINT,NPLT,NLIB,NSE :  DMACR     DMADJ     DMDIF     DMFLX     DMINT
                            : T,NNUC,NRAC,NHAT,NGRP,NFGP,NGP1,NFUEL,NFUEL1,NFP,N :  DMNRM     DMSRC     DPOWS     DREDT     DTNRM
                            : DEN,NDEN1,NFOR,NCHAIN,NSYM,NLAY,NPLN,NAZN,NAEM,NAE :  EDCPT     ERR       FMEDT     FMINV     FMPLT
                            : E,NAEA,NAET,NREM,NREE,NBLC,NBC1,NPN1,NPN2,NPN3,NAG :  INIT      LIBRD     MKGEOD    MKGRUP    MKNDXS
                            : P,NAMX,NAOR,NREG,NMIX,NLOAD,NCYL,NMES,NCAL,NITR,NI :  MKZNAT    PLOPN     PRNTH     RLOAD     SHUFFL
                            : IT,NTIM,NBACH,NTOP,NNUM,NTCL,NTPW,NSMALL,DETIM,CPO :  STEDT     STPLT     STUPD     STUPI     STUPX
                            : WER,TIN,FLOWP,FPITCH,CPITCH,HPITCH,H,HH2,HXAREA,HE :
                            : IGHT,HEXVOL,EPSRMD,EPSPHI,EPSMIN,EPSMAX,XOUTCR,RLO :
                            : SS,REACT,XWACH1,XWACH2,DELDAY,EPSERR,EPSEXP,TNOW,C :
                            : OREXP,TSOUR,IC004(50,6),IC005(50,10,6),NBSTEP      :
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      43.  SHRCOM           : IDNUC(2,50),NOEL(51),NCAP(10),NN2NN(10),KFIS(30),N :  BCALC     BFEDT     BFPLT     BIEDT     CRPAT
                            : ANAL(10),NBURN(50),ATMW(50),EFIS(50),ECAP(50),DECA :  DBCSET    DCALC     DFEDT     DFPLT     DFPRT
                            : Y(50),YIELD(10,10),NCFLG(5),NSPLT(6),NGFLG(40),NGM :  DGEDT     DHADJ     DHDIF     DHFLX     DHINT
                            : IX(40),NGEDT(40),NGATR(40),NGPLT(40),NGNM4(40),NGN :  DHNRM     DHSRC     DIEDT     DMACR     DMADJ
                            : AM(5,40),NRSET(60),NRMIX(60),NREDT(60),NRATR(60),N :  DMDIF     DMFLX     DMINT     DMNRM     DMSRC
                            : RPLT(60),NRNM4(60),NRNAM(5,60),NUNAM(5,15),NXNAM(5 :  DPOWS     DREDT     DTNRM     EDCPT     FMEDT
                            : ,15),NONAM(5,15),GVOL(3,40),NAGRP(40),NAMIX(15),NA :  FMINV     FMPLT     LIBRD     MKGEOD    MKGRUP
                            : ORI(15),VOLR(60),VOLX(15),NTYPG(61,40),VLFRG(61,40 :  MKNDXS    MKZNAT    PLOPN     PTMAN     RLOAD
                            : ),VLFRN(61,40),NPLNG(62,40),STDAY(60)              :  SHUFFL    STEDT     STPLT     STUPD     STUPI
                            :                                                    :  STUPX
-------------------------------------------------------------------------------------------------------------------
      44.  TAPEC            : ODUMTP                                             :  CONVER    CPBYTE    DFPRT     DIF       DMDIF
                            :                                                    :  DREDT     FMEDT     FMINV     LIBRD     NEXT
                            :                                                    :  SCAN      STUPI     STUPX     VALUE
```

45.	TAPEI	NIN,NOUT,NDSK,N11,N12,N13,N14,N15,N16,ND1,ND2,NERR ,NATAP,NSUHM,NUSERO	CONVER DREDT SCAN	CPBYTE FMEDT STUPI	DFPRT FMINV STUPX	DIF LIBRD VALUE	DMDIF NEXT
46.	TAPEL	TRACE1,TRACE2,TRACE3,TRACE4,TRACE5	CONVER DREDT SCAN	CPBYTE FMEDT STUPI	DFPRT FMINV STUPX	DIF LIBRD VALUE	DMDIF NEXT
47.	TAPER	RDUNTP	CONVER DREDT SCAN	CPBYTE FMEDT STUPI	DFPRT FMINV STUPX	DIF LIBRD VALUE	DMDIF NEXT
48.	TRIMOS	1: I$GUES,II$TRI,JJ$RI,VOL$BL 2: I$GUES,II$TRI,JJ$TRI,VOL$BL,LTADRS 3: I$GUES,II$TRI,JJ$TRI,VOL$BL	BLOCKDAT DCALC MKNDXS	 RITE SEEK			
49.	USRID	XNAME8,DATE8	FLXW	NBAL	PND5	PNDN	VENT
50.	VCTRL	HNCTL,RCD(100),ICD(100)	FLUX FOU5 VENT	FOU1 FOUX	FOU2 PNDN	FOU3 SAV1	FOU4 SGX0
51.	XDEPLI	IF8PLI,RD8PLI	DGEDT STUPD XWRTC1	DIF STUPX XWRTCM	LIBRD XINTCM	SHUFFL XREDC1	STEDT XREDCM
52.	XDEPLM	IF8PLM,RD8PLM	DGEDT STUPD XWRTC1	DIF STUPX XWRTCM	LIBRD XINTCM	SHUFFL XREDC1	STEDT XREDCM
53.	XDLEAK	RD8LEK	DGEDT STUPD XWRTC1	DIF STUPX XWRTCM	LIBRD XINTCM	SHUFFL XREDC1	STEDT XREDCM
54.	XLDGCM	ICPU00,ICPUST,ICPUEN,IELP00,IELPST,IELPEN,IALLDB,I UNTDB,IUNTTM,IPRGTB,CPRGNM,IPRGNO	LDGENT	LDGINT	LDGRTN	LDGTIM	LDGTRM
55.	XLOADI	IF8LOD	DGEDT STUPD XWRTC1	DIF STUPX XWRTCM	LIBRD XINTCM	SHUFFL XREDC1	STEDT XREDCM
56.	XMICXS	IW8CMF,IM8NUM,IM8CX1,RM8CX2,IX8NU1,RX8NU2,IH8NUC,I M8TXE,IF8SLR,IF8PR,NS8XCH,NS8XCH,RY8FFP,RM8CXS	DGEDT STUPD	DIF STUPX	LIBRD XINTCM	SHUFFL XREDC1	STEDT XREDCM

			XWRTC1	XWRTCM			
57.	XSHUF1	IS8HWK	RLOAD	SHUFFL	STUPD		
58.	XSHUFL	NS8HFL,IS8HFG,IS8HFP	DGEDT STUPD XWRTC1	DIF STUPX XWRTCM	LIBRD XINTCM	SHUFFL XREDC1	STEDT XREDCM
59.	XWKFIL	IW8FLF,IL8OAD,RG8EOM,RC8PA1,RC8PA2,RA8XIS,IA8SYG,I R8REG,IC8017,IC8018,RA8TDN,RC8020,RC8034,RB8OND,ID 8BNP,IA8SRC,RF8SRC,IC8039,RE8FUL,IR8MAP,RP8LAN,RC8 RPS	DGEDT STUPD XWRTC1	DIF STUPX XWRTCM	LIBRD XINTCM	SHUFFL XREDC1	STEDT XREDCM

```
PROGRAM UTILITY ANALYZER/F77 1.04  : TREE STRUCTURE OF PROGRAM ( ENTRY IS ARCOS    )    :  DATE:        PAGE 0001
                NOTATION       S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

S.ARCOS
```



```
PROGRAM UTILITY ANALYZER/F77 1.04  : TREE STRUCTURE OF PROGRAM ( ENTRY IS ERR      )    :  DATE:        PAGE 0002
                NOTATION       S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

S.ERR
```

プログラムツリー

```
PROGRAM UTILITY ANALYZER/F77 1.04   : TREE STRUCTURE OF PROGRAM ( ENTRY IS FLAGR     )      :  DATE:          PAGE 0001
                NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

F.FLAGR -----*F.MIN0
```



```
PROGRAM UTILITY ANALYZER/F77 1.04   : TREE STRUCTURE OF PROGRAM ( ENTRY IS IXARAY    )      :  DATE:          PAGE 0002
                NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

S.IXARAY---+- S.NEXT  ----- S.SCAN
           +- S.CONVER---+- S.CPBYTE
                         +- S.NEXT  ----- S.SCAN
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  LDGTIM    )      :   DATE:
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

S.LDGTIM----- S.CPUST -----*F.ETIME
```



```
PAGE  0002ROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :   DATE:          PAGE  0003
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

P.MAIN  ---+- S.ALLOC
           +- S.DIF    ---+- S.LDGINT----- S.CPUST -----*F.ETIME
                          +- S.LDGENT----- S.CPUST -----*F.ETIME
                          +- S.XINTCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
                          |             +- S.CLEAR
                          |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
                          |
                          +- S.INIT
                          +- S.CLEAR
                          +- S.PRNTH ---+- S.CPUST -----*F.ETIME
                          |             +-*S.FDATE
                          |
                          +- S.NEXT  ----- S.SCAN
                          +- S.IARRAY---+- F.VALUE ---+- S.NEXT  ----- S.SCAN
                          |             |             +- S.CONVER---+- S.CPBYTE
                          |             |             |             +- S.NEXT  ----- S.SCAN
                          |             |             |
                          |             |             +-*S.EXIT
                          |             |             +-*F.IFIX
                          |             |
                          |             +-*F.IFIX
                          |
                          +- S.STUPI ---+- S.LDGENT----- S.CPUST -----*F.ETIME
                          |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
                          |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
                          |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
                          |             |             |
                          |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
                          |             |
                          |             +- S.NEXT  ----- S.SCAN
                          |             +- F.VALUE ---+- S.NEXT  ----- S.SCAN
                          |             |             +- S.CONVER---+- S.CPBYTE
                          |             |             |             +- S.NEXT  ----- S.SCAN
                          |             |             |
                          |             |             +-*S.EXIT
                          |             |             +-*F.IFIX
                          |             |
                          |             +- S.IARRAY---+- F.VALUE ---+- S.NEXT  ----- S.SCAN
                          |             |             |             +- S.CONVER---+- S.CPBYTE
                          |             |             |             |             +- S.NEXT  ----- S.SCAN
                          |             |             |             |
                          |             |             |             +-*S.EXIT
                          |             |             |             +-*F.IFIX
                          |             |             |
                          |             |             +-*F.IFIX
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )     :   DATE:            PAGE  000
                  NOTATION         S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|         |
|         +- S.RARRAY----- F.VALUE ---+- S.NEXT  ----- S.SCAN
|         |                           +- S.CONVER---+- S.CPBYTE
|         |                           |             +- S.NEXT  ----- S.SCAN
|         |                           |
|         |                           +-*S.EXIT
|         |                           +-*F.IFIX
|         |
|         +-*F.MOD
|         +-*F.MAX0
|         +- S.DADSET---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             +- S.MEMCHK
|         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             +-*F.MOD
|         |
|         +- S.BADRS
|         +- S.STUPX ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             +- S.CLEAR
|         |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             |             |
|         |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             |
|         |             +- S.NEXT  ----- S.SCAN
|         |             +- S.CONVER---+- S.CPBYTE
|         |             |             +- S.NEXT  ----- S.SCAN
|         |             |
|         |             +-*F.IFIX
|         |             +- S.IARRAY---+- F.VALUE ---+- S.NEXT  ----- S.SCAN
|         |             |             |             +- S.CONVER---+- S.CPBYTE
|         |             |             |             |             +- S.NEXT  ----- S.SCAN
|         |             |             |             |
|         |             |             |             +-*S.EXIT
|         |             |             |             +-*F.IFIX
|         |             |             |
|         |             |             +-*F.IFIX
|         |             |
|         |             +- S.RARRAY----- F.VALUE ---+- S.NEXT  ----- S.SCAN
|         |             |                           +- S.CONVER---+- S.CPBYTE
|         |             |                           |             +- S.NEXT  ----- S.SCAN
|         |             |                           |
|         |             |                           +-*S.EXIT
|         |             |                           +-*F.IFIX
|         |             |
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )     :   DATE:            PAGE  0003
                  NOTATION         S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|         |             +- F.VALUE ---+- S.NEXT  ----- S.SCAN
|         |             |             +- S.CONVER---+- S.CPBYTE
|         |             |             |             +- S.NEXT  ----- S.SCAN
|         |             |             |
|         |             |             +-*S.EXIT
|         |             |             +-*F.IFIX
|         |             |
|         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             +- S.XWRTCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             |             |
|         |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             |
|         |             +- S.XTRMCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |                           +-*F.RG8EOM
|         |                           +-*F.RC8PA1
|         |                           +-*F.RC8PA2
|         |                           +-*F.RA8XIS
|         |                           +-*F.IA8SYG
|         |                           +-*F.IR8REG
|         |                           +-*F.IC8017
|         |                           +-*F.IC8018
|         |                           +-*F.RA8TDN
|         |                           +-*F.RC8020
|         |                           +-*F.RC8034
|         |                           +-*F.RB8OND
|         |                           +-*F.ID8BNP
|         |                           +-*F.IA8SRC
|         |                           +-*F.RF8SRC
|         |                           +-*F.IC8039
|         |                           +-*F.RE8FUL
|         |                           +-*F.IR8MAP
|         |                           +-*F.RP8LAN
|         |                           +-*F.RC8RPS
|         |                           +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |
|         +- S.STUPD ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             |             |
|         |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |             |
|         |             +- S.CRPAT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )     :  DATE:          PAGE  000
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|         |         |         +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +-*F.ABS
|         |         |         +-*F.AMIN1
|         |         |         +-*F.AMAX1
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |
|         |         +-*F.MAX0
|         |         +- S.OPSET
|         |         +- S.LIBRD ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +-*F.INT
|         |         |         +-*F.MOD
|         |         |         +- S.XWRTCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.CLEAR
|         |         |         +- S.XWRTC1---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |
|         |         +- S.RLOAD ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.CLEAR
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )     :  DATE:          PAGE  0003
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|         |         |         +- S.XWRTCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.XREDC1---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.XREFCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +-*F.IS8HFG
|         |         |         |             +-*F.IS8HFP
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +-*F.MIN0
|         |         |         +-*F.MAX0
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |
|         |         +- S.SHUFFL---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.CLEAR
|         |         |         +- S.XWRTCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|         |         |         |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|         |         |         |             |
|         |         |         |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +-*F.MAX0
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |
|         |         +-*F.FLOAT
|         |         +- S.INDXH -----*F.MOD
|         |         +- S.STEDT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.PRNTH ---+- S.CPUST -----*F.ETIME
|         |         |         |             +-*S.FDATE
|         |         |         |
|         |         |         +-*F.MAX0
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  000PROGRAM
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|             |             |             +-*F.MIN0
|             |             |             +- S.CORMP
|             |             |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             |             |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
|             |             |             |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
|             |             |             |             |
|             |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |             |
|             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |
|             |             +- S.PLOPN ---+- S.PLOTS
|             |             |             +- S.PLOT
|             |             |
|             |             +- S.STPLT ----- S.PTMAN ---+-*F.MAX0
|             |             |                           +-*F.IABS
|             |             |                           +-*F.MOD
|             |             |                           +- S.BITA  ----- S.MOVEB
|             |             |                           +- S.PTCTL ---+- S.PTINT ---+-*F.AMIN1
|             |             |                                         |             +-*F.AMAX1
|             |             |                                         |
|             |             |                                         +- S.PTGNR
|             |             |                                         +- S.PTHEX ---+-*F.COS
|             |             |                                         |             +-*F.SIN
|             |             |                                         |             +- S.NEWPEN
|             |             |                                         |             +- S.PLOT
|             |             |                                         |             +-*F.MIN0
|             |             |                                         |             +-*F.IABS
|             |             |                                         |             +- S.SYMBOL
|             |             |                                         |             +-*F.ABS
|             |             |                                         |             +-*F.ALOG10
|             |             |                                         |             +-*F.MAX0
|             |             |                                         |             +- S.NUMBER
|             |             |                                         |             +- S.CIRCL
|             |             |                                         |
|             |             |                                         +-*F.COS
|             |             |                                         +-*F.SIN
|             |             |                                         +- S.PTTIT ====> *(TO BE CONTINUED)*
|             |             |
|             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |
|             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|
+- S.LDGRTN----- S.CPUST -----*F.ETIME
+- S.LDGTRM---+- S.CPUST -----*F.ETIME
|             +-*F.FLOAT
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  0003
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|
+- S.BADRS
+- S.KSEDIT
+- S.PLOPN ---+- S.PLOTS
|             +- S.PLOT
|
+- S.FMEDT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |
|             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |
|             +- S.PRNTH ---+- S.CPUST -----*F.ETIME
|             |             +-*S.FDATE
|             |
|             +- S.XREDC1---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |
|             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |
|             +- S.CORMP
|             +-*F.MIN0
|             +- S.FMINV
|             +- S.FMPLT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |             |
|             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |
|             |             +- S.PTMAN ---+-*F.MAX0
|             |             |             +-*F.IABS
|             |             |             +-*F.MOD
|             |             |             +- S.BITA  ----- S.MOVEB
|             |             |             +- S.PTCTL ---+- S.PTINT ---+-*F.AMIN1
|             |             |                           |             +-*F.AMAX1
|             |             |                           |
|             |             |                           +- S.PTGNR
|             |             |                           +- S.PTHEX ---+-*F.COS
|             |             |                           |             +-*F.SIN
|             |             |                           |             +- S.NEWPEN
|             |             |                           |             +- S.PLOT
|             |             |                           |             +-*F.MIN0
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  000
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|         |         |                   |         +-*F.IABS
|         |         |                   |         +- S.SYMBOL
|         |         |                   |         +-*F.ABS
|         |         |                   |         +-*F.ALOG10
|         |         |                   |         +-*F.MAX0
|         |         |                   |         +- S.NUMBER
|         |         |                   |         +- S.CIRCL
|         |         |                   |
|         |         |                   +-*F.COS
|         |         |                   +-*F.SIN
|         |         |                   +- S.PTTIT ---+- S.SYMBOL
|         |         |                             +- S.PTHEX ---+-*F.COS
|         |         |                             |         +-*F.SIN
|         |         |                             |         +- S.NEWPEN
|         |         |                             |         +- S.PLOT
|         |         |                             |         +-*F.MIN0
|         |         |                             |         +-*F.IABS
|         |         |                             |         +- S.SYMBOL
|         |         |                             |         +-*F.ABS
|         |         |                             |         +-*F.ALOG10
|         |         |                             |         +-*F.MAX0
|         |         |                             |         +- S.NUMBER
|         |         |                             |         +- S.CIRCL
|         |         |                             |
|         |         |                             +- S.NEWPEN
|         |         |                             +-*F.AMIN1
|         |         |                             +- S.NUMBER
|         |         |                             +- S.PLOT
|         |         |
|         |         +-*F.AMAX1
|         |         +- S.PSCLE ---+-*F.ABS
|         |         |         +-*F.AMAX1
|         |         |         +-*F.ALOG10
|         |         |         +-*F.IFIX
|         |         |         +-*F.FLOAT
|         |         |
|         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |
|         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|
+- S.DCALC ---+-*F.MOD
|         +- S.DADSET---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         +- S.MEMCHK
|         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         +-*F.MOD
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  0003
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|         |
|         +- S.DIEDT ----- S.PRNTH ---+- S.CPUST -----*F.ETIME
|         |                          +-*S.FDATE
|         |
|         +- S.DMACR ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         +- S.CLEAR
|         |         +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |
|         |         +-*F.FLOAT
|         |         +-*F.ALOG10
|         |         +- S.XREDC3---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +-*F.IM8CXS
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |
|         |         +- S.PRNTH ---+- S.CPUST -----*F.ETIME
|         |         |         +-*S.FDATE
|         |         |
|         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |
|         +-*S.FDATE
|         +- S.MKGRUP----- S.CLEAR
|         +- S.DBCSET---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         +-*F.MOD
|         |         +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         |
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |
|         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |
|         +- S.DHDIF ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         +- S.CPUST -----*F.ETIME
|         |         +- S.DADSET---+- S.LDGENT----- S.CPUST -----*F.ETIME
|         |         |         +- S.MEMCHK
|         |         |         +- S.LDGRTN----- S.CPUST -----*F.ETIME
|         |         |         +-*F.MOD
|         |         |
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  000
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY
        |               |               +- S.DHINT ---+-*F.COS
        |               |               |             +-*F.AMAX1
        |               |               |             +-*F.SQRT
        |               |               |
        |               |               +- S.PRNTH ---+- S.CPUST -----*F.ETIME
        |               |               |             +-*S.FDATE
        |               |               |
        |               |               +- S.DHFLX ---+-*F.SQRT
        |               |               |             +-*F.AMAX1
        |               |               |             +-*F.AMIN1
        |               |               |             +-*F.FLOAT
        |               |               |             +-*F.ABS
        |               |               |             +-*F.MOD
        |               |               |
        |               |               +-*F.DABS
        |               |               +- S.DEXTR ---+-*F.AMIN1
        |               |               |             +-*F.ABS
        |               |               |             +-*F.AMAX1
        |               |               |
        |               |               +-*F.ABS
        |               |               +- S.DHNRM ---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |               |               |             +- S.XREDCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |               |               |             |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
        |               |               |             |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
        |               |               |             |             |
        |               |               |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |               |             |
        |               |               |             +-*F.FLOAT
        |               |               |             +-*F.SNGL
        |               |               |             +-*F.AMAX1
        |               |               |             +-*F.MIN
        |               |               |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |               |
        |               |               +- S.DHADJ ---+-*F.SQRT
        |               |               |             +-*F.AMAX1
        |               |               |             +-*F.AMIN1
        |               |               |
        |               |               +- S.DHSRC ---+-*F.SQRT
        |               |               |             +-*F.AMAX1
        |               |               |             +-*F.AMIN1
        |               |               |             +-*F.FLOAT
        |               |               |
        |               |               +-*F.FLOAT
        |               |               +- S.XWRTCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |               |               |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  0004
NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY
        |               |               |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |               |             |
        |               |               |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |               |
        |               |               +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |
        |               +- S.DHDIF ---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |               |             +- S.CPUST -----*F.ETIME
        |               |             +- S.DADSET---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |               |             |             +- S.MEMCHK
        |               |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |             |             +-*F.MOD
        |               |             |
        |               |             +- S.DHINT ---+-*F.COS
        |               |             |             +-*F.AMAX1
        |               |             |             +-*F.SQRT
        |               |             |
        |               |             +- S.PRNTH ---+- S.CPUST -----*F.ETIME
        |               |             |             +-*S.FDATE
        |               |             |
        |               |             +- S.DHFLX ---+-*F.ABS
        |               |             |             +-*F.AMAX1
        |               |             |             +-*F.AMIN1
        |               |             |             +-*F.FLOAT
        |               |             |             +-*F.MOD
        |               |             |
        |               |             +-*F.DABS
        |               |             +- S.DEXTR ---+-*F.AMIN1
        |               |             |             +-*F.ABS
        |               |             |             +-*F.AMAX1
        |               |             |
        |               |             +-*F.ABS
        |               |             +- S.DMNRM ---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |               |             |             +- S.XREDCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |               |             |             |             +- S.XBLKTR---+- S.LDGENT====> *(TO BE CONTINUED)*
        |               |             |             |             |             +- S.LDGRTN====> *(TO BE CONTINUED)*
        |               |             |             |             |
        |               |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |             |             |
        |               |             |             +-*F.FLOAT
        |               |             |             +-*F.SNGL
        |               |             |             +-*F.AMAX1
        |               |             |             +-*F.MIN
        |               |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |               |             |
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  000
                  NOTATION       S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

        |             |             +- S.DMADJ ---+-*F.SQRT
        |             |             |             +-*F.ABS
        |             |             |             +-*F.AMAX1
        |             |             |             +-*F.AMIN1
        |             |             |
        |             |             +- S.DMSRC ---+-*F.ABS
        |             |             |             +-*F.AMAX1
        |             |             |             +-*F.AMIN1
        |             |             |             +-*F.FLOAT
        |             |             |
        |             |             +-*F.FLOAT
        |             |             +- S.XWRTCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |             |             |
        |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |             |
        |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |
        |             +- S.MKCONT---+- S.DCLEAR
        |             |             +- S.CLEAR
        |             |
        |             +- S.MKZNAT----- S.CLEAR
        |             +- S.MKNDXS---+- S.INDXT ---+- S.HEX6  -----*F.ANINT
        |             |             |             +- S.RHESH2
        |             |             |             +- S.HEX3  -----*F.ANINT
        |             |             |             +- S.HEX2  -----*F.ANINT
        |             |             |             +- S.RMESH1
        |             |             |             +- S.HEX1
        |             |             |             +- S.RHESH
        |             |             |
        |             |             +-*F.MAX
        |             |             +-*F.MIN
        |             |
        |             +- S.MKGEOD---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             +-*F.SQRT
        |             |             +- S.CLEAR
        |             |             +- S.XREDC2---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |             |             |
        |             |             |             +-*F.IB8OND
        |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |             |
        |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
```



```
0PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:          PAGE  0004
                  NOTATION       S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

        |             |
        |             +- S.DTDIF ---+- S.TIMER ---+- S.CPUST -----*F.ETIME
        |             |             |             +-*F.FLOAT
        |             |             |             +- S.IDAY  -----*S.FDATE
        |             |             |             +- S.JOBNUM
        |             |             |             +- S.IOLEFT
        |             |             |             +- S.HTIME ----- S.TIME  -----*S.FDATE
        |             |             |             +- F.MODEL
        |             |             |
        |             |             +- S.DOPC  ---+- S.SEEK  ---+-*F.MAX0
        |             |             |             |             +-*F.MIN0
        |             |             |             |
        |             |             |             +-%S.REED  ---+- S.CRIT
        |             |             |             |             +-%S.CRED
        |             |             |             |             +- S.FERR  ----- S.SEEK  ---+-*F.MAX0
        |             |             |             |                                         +-*F.MIN0
        |             |             |             |
        |             |             |             +-*F.MAX0
        |             |             |             +-*F.MIN0
        |             |             |             +- S.FERR  ----- S.SEEK  ---+-*F.MAX0
        |             |             |                                         +-*F.MIN0
        |             |             |
        |             |             +- S.IONO
        |             |             +- S.VENT  ---+- S.SEEK  ---+-*F.MAX0
        |             |             |             |             +-*F.MIN0
        |             |             |             |
        |             |             |             +-%S.REED  ---+- S.CRIT
        |             |             |             |             +-%S.CRED
        |             |             |             |             +- S.FERR  ----- S.SEEK  ---+-*F.MAX0
        |             |             |             |                                         +-*F.MIN0
        |             |             |             |
        |             |             |             +- S.SKER  ----- S.SEEK  ---+-*F.MAX0
        |             |             |             |                           +-*F.MIN0
        |             |             |             |
        |             |             |             +- S.FERR  ----- S.SEEK  ---+-*F.MAX0
        |             |             |                                         +-*F.MIN0
        |             |             |
        |             |             +- S.DRIV  ---+- S.DIFF  ---+- S.SGX0  ---+- S.SGX1  ====> *(TO BE CONTINUED)*
        |             |                           |             |             +- S.FERR  ====> *(TO BE CONTINUED)*
        |             |                           |             |             +- S.PASS
        |             |                           |             |
        |             |                           |             +- S.CORE  ---+- S.CORI  ====> *(TO BE CONTINUED)*
        |             |                           |             |             +- S.RBLA  ====> *(TO BE CONTINUED)*
        |             |                           |             |             +-*F.MIN0
        |             |                           |             |             +-*F.MAX0
```

```
PROGRAM UTILITY ANALYZER/F77 1.04 : TREE STRUCTURE OF PROGRAM ( ENTRY IS MAIN ) : DATE: PAGE 000
        NOTATION      S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY
   |      |      |      |      +-*F.IABS
   |      |      |      |      +- S.CORP
   |      |      |      |      +- S.GNAM
   |      |      |      |      +- S.CORD
   |      |      |      |      +- S.CORB
   |      |      |      |      +- S.JPRT   ---+-*F.IABS
   |      |      |      |      |             +-*F.MAX0
   |      |      |      |      |
   |      |      |      |      +- S.DASU   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.DDSP   -----*F.MAX0
   |      |      |      |      +- S.PASS
   |      |      |      |      +- S.FERR   ====> *(TO BE CONTINUED)*
   |      |      |      |
   |      |      |      +- S.MAC1  ---+- S.SEEK   ---+-*F.MAX0
   |      |      |      |      |             +-*F.MIN0
   |      |      |      |      |
   |      |      |      |      +- S.SERM
   |      |      |      |      +-%S.REED   ====> *(TO BE CONTINUED)*
   |      |      |      |      +-*F.MAX0
   |      |      |      |      +- S.VZT2
   |      |      |      |      +-*F.MIN0
   |      |      |      |      +- S.MACA   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.MACB
   |      |      |      |      +- S.MAC2   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.MAC3   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.MAC5
   |      |      |      |      +- S.CHDM
   |      |      |      |      +- S.MAC4
   |      |      |      |      +- S.MAC6   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.PASS
   |      |      |      |      +- S.FERR   ====> *(TO BE CONTINUED)*
   |      |      |      |
   |      |      |      +- S.CON1  ---+-%S.ENTER
   |      |      |      |      +- S.SEEK   ---+-*F.MAX0
   |      |      |      |      |             +-*F.MIN0
   |      |      |      |      |
   |      |      |      |      +- S.SKER   ====> *(TO BE CONTINUED)*
   |      |      |      |      +-%S.REED   ====> *(TO BE CONTINUED)*
   |      |      |      |      +-*F.MAX0
   |      |      |      |      +- S.MSH0
   |      |      |      |      +- S.PASS
   |      |      |      |      +- S.RITE   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.NRCF   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.MSH1   ---+-*F.DFLOAT
   |      |      |      |      |             +-*F.SQRT
```



```
PROGRAM UTILITY ANALYZER/F77 1.04 : TREE STRUCTURE OF PROGRAM ( ENTRY IS MAIN ) : DATE: PAGE 0004
        NOTATION      S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY
   |      |      |      |      |
   |      |      |      |      +- S.STOR
   |      |      |      |      +- S.CON2
   |      |      |      |      +- S.GEOQ   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.CON3   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.MSH3
   |      |      |      |      +- S.CKCT
   |      |      |      |      +- S.CON4
   |      |      |      |      +- S.CON5   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.CON7
   |      |      |      |      +- S.CON9   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.FERR   ====> *(TO BE CONTINUED)*
   |      |      |      |
   |      |      |      +- S.ORLX  ---+-%S.REED   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.RCOV
   |      |      |      |      +-*F.MAX0
   |      |      |      |      +- S.ORLA   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.ORLB   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.ORLC   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.ORLD   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.ORLE   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.ORLF   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.RITE   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.BATG   ---+-*F.MAX0
   |      |      |      |      |             +-*F.COS
   |      |      |      |      |             +-*F.FLOAT
   |      |      |      |      |             +- F.LUCK
   |      |      |      |      |             +-*F.AMAX1
   |      |      |      |      |             +-*F.SQRT
   |      |      |      |      |             +-*F.ACOS
   |      |      |      |      |             +-*F.AMIN1
   |      |      |      |      |             +-*F.IFIX
   |      |      |      |      |             +-*F.ALOG
   |      |      |      |      |             +-*F.MIN0
   |      |      |      |      |
   |      |      |      |      +- S.ORLR   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.CON6   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.PASS
   |      |      |      |      +- S.FERR   ====> *(TO BE CONTINUED)*
   |      |      |      |
   |      |      |      +- S.PHIA  ---+-%S.REED   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.PHI1   ====> *(TO BE CONTINUED)*
   |      |      |      |      +- S.PHI7   ====> *(TO BE CONTINUED)*
   |      |      |      |      +-*F.MAX0
   |      |      |      |      +- S.PHI2   ====> *(TO BE CONTINUED)*
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :   DATE:          PAGE  000
                  NOTATION         S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

      |         |                  |         |            +- S.PHI3  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.PASS
      |         |                  |         |            +- S.FERR  ====> *(TO BE CONTINUED)*
      |         |                  |         |
      |         |                  |         +- S.COMC
      |         |                  |         +- S.CORR  ---+- S.SEEK  ---+-*F.MAX0
      |         |                  |         |            |             +-*F.MIN0
      |         |                  |         |            |
      |         |                  |         |            +- S.FERR  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +-%S.REED  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.IFTD  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.ONES  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.TWOS  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.TRES  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.HST1  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.HST2  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.HST3  ====> *(TO BE CONTINUED)*
      |         |                  |         |
      |         |                  |         +- S.LCAL  ---+-*F.MAX0
      |         |                  |         |            +- S.FERR  ====> *(TO BE CONTINUED)*
      |         |                  |         |
      |         |                  |         +- S.FLXR  -----%S.REED  ====> *(TO BE CONTINUED)*
      |         |                  |         +- S.FX5R
      |         |                  |         +- S.BSQV
      |         |                  |         +- S.AJNT
      |         |                  |         +- S.PROS  ---+-%S.REED  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.ZIO3  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.RITE  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.FEFS  ====> *(TO BE CONTINUED)*
      |         |                  |         |
      |         |                  |         +- S.TIMER ---+- S.CPUST -----*F.ETIME
      |         |                  |         |            +-*F.FLOAT
      |         |                  |         |            +- S.IDAY  -----*S.FDATE
      |         |                  |         |            +- S.JOBNUM
      |         |                  |         |            +- S.IOLEFT
      |         |                  |         |            +- S.HTIME ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- F.MODEL
      |         |                  |         |
      |         |                  |         +- S.DOPC  ---+- S.SEEK  ---+-*F.MAX0
      |         |                  |         |            |             +-*F.MIN0
      |         |                  |         |            |
      |         |                  |         |            +-%S.REED  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +-*F.MAX0
      |         |                  |         |            +-*F.MIN0
      |         |                  |         |            +- S.FERR  ====> *(TO BE CONTINUED)*
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :   DATE:          PAGE  0004
                  NOTATION         S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

      |         |                  |         |
      |         |                  |         +- S.OUTR  ---+- S.SGDA
      |         |                  |         |            +- S.PREC
      |         |                  |         |            +-%S.REED  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.DOIN  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.RRES
      |         |                  |         |            +- S.TIMER ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.WRES
      |         |                  |         |            +- S.FERR  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.RBL1  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +-*F.AMAX1
      |         |                  |         |            +- S.FSOR  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +-*F.ABS
      |         |                  |         |            +- S.CHBF  ---+-*F.MAX0
      |         |                  |         |            |             +-*F.ABS
      |         |                  |         |            |             +-*F.SQRT
      |         |                  |         |            |             +-*F.ALOG
      |         |                  |         |            |             +-*F.AMAX1
      |         |                  |         |            |             +-*F.DMIN1
      |         |                  |         |            |             +-*F.DMAX1
      |         |                  |         |            |
      |         |                  |         |            +- S.SSOR  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.PSOR
      |         |                  |         |            +- S.FLUX  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +-*F.DMAX1
      |         |                  |         |            +-*F.SQRT
      |         |                  |         |            +- S.BALC  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.ZINS
      |         |                  |         |            +- S.XTRP  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +-*F.IABS
      |         |                  |         |            +- S.MUEX  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.JUSB  ---+-*F.MAX0
      |         |                  |         |            |             +-*F.MAX1
      |         |                  |         |            |             +-*F.AMIN1
      |         |                  |         |            |             +-*F.ALOG
      |         |                  |         |            |             +-*F.SQRT
      |         |                  |         |            |             +-*F.AMAX1
      |         |                  |         |            |             +-*F.DMAX1
      |         |                  |         |            |
      |         |                  |         |            +- S.ETR1  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.ETR2  ====> *(TO BE CONTINUED)*
      |         |                  |         |            +- S.ATED  -----*F.ABS
      |         |                  |         |            +- S.RITE  ====> *(TO BE CONTINUED)*
      |         |                  |         |
      |         |                  |         +- S.ADN1
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )       :   DATE:          PAGE  000
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|            |                          |            +- S.DCID
|            |                          |            +- S.DSDF
|            |                          |            +- S.DIM5
|            |                          |            +- S.FLRD  ---+- S.SEEK  ---+-*F.MAX0
|            |                          |            |            |             +-*F.MIN0
|            |                          |            |            |
|            |                          |            |            +- S.SKER  ====> *(TO BE CONTINUED)*
|            |                          |            |            +-%S.REED  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.FLMH  ---+-*F.DFLOAT
|            |                          |            |                          +-*F.SQRT
|            |                          |            |
|            |                          |            +- S.AJDS
|            |                          |            +- S.EDIT  ---+- S.JINT
|            |                          |            |            +- S.NBAL  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.FIS5
|            |                          |            |            +- S.BSQ5  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.FLXW  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.PNDN  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.PTVL  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.PT2F
|            |                          |            |            +- S.PND5  ====> *(TO BE CONTINUED)*
|            |                          |            |
|            |                          |            +- S.SAV1  ---+- S.SEEK  ---+-*F.MAX0
|            |                          |            |            |             +-*F.MIN0
|            |                          |            |            |
|            |                          |            |            +-%S.REED  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.SAV2  ====> *(TO BE CONTINUED)*
|            |                          |            |            +- S.SAV4
|            |                          |            |            +- S.SAV6  ====> *(TO BE CONTINUED)*
|            |                          |            |
|            |                          |            +- S.EASU
|            |                          |            +- S.JERT
|            |                          |            +- S.PERT
|            |                          |
|            |                          +- S.DOPC  ---+- S.SEEK  ---+-*F.MAX0
|            |                                        |             +-*F.MIN0
|            |                                        |
|            |                                        +-%S.REED  ---+- S.CRIT
|            |                                        |             +-%S.CRED
|            |                                        |             +- S.FERR  ====> *(TO BE CONTINUED)*
|            |                                        |
|            |                                        +-*F.MAX0
|            |                                        +-*F.MIN0
|            |                                        +- S.FERR  ----- S.SEEK  ---+-*F.MAX0
|            |                                                                    +-*F.MIN0
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )       :   DATE:          PAGE  0004
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|            |
|            +- S.DTNRM ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                          +- S.INDXT ---+- S.HEX6  -----*F.ANINT
|                          |             +- S.RMESH2
|                          |             +- S.HEX3  -----*F.ANINT
|                          |             +- S.HEX2  -----*F.ANINT
|                          |             +- S.RMESH1
|                          |             +- S.HEX1
|                          |             +- S.RMESH
|                          |
|                          +- S.CLEAR
|                          +-*F.FLOAT
|                          +-*F.SNGL
|                          +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                          |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                          |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|                          |             |
|                          |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|                          |
|                          +-*F.AMAX1
|                          +-*F.MIN
|                          +- S.LDGRTN----- S.CPUST -----*F.ETIME
|
+- S.DFEDT ---+- S.DADSET---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             +- S.MEMCHK
|             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             +-*F.MOD
|             |
|             +- S.DGEDT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |             |
|             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |             |
|             |             +-*F.FLOAT
|             |             +- S.PRNTH ---+- S.CPUST -----*F.ETIME
|             |             |             +-*S.FDATE
|             |             |
|             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |
|             +- S.DFPRT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             |             +-*F.FLOAT
|             |             +- S.PRNTH ---+- S.CPUST -----*F.ETIME
|             |             |             +-*S.FDATE
```

```
PROGRAM UTILITY ANALYZER/F77 1.04 : TREE STRUCTURE OF PROGRAM ( ENTRY IS MAIN ) : DATE: PAGE 000
                NOTATION   S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|             |             |
|             |             +- S.PSCLE ---+-*F.ABS
|             |             |             +-*F.AMAX1
|             |             |             +-*F.ALOG10
|             |             |             +-*F.IFIX
|             |             |             +-*F.FLOAT
|             |             |
|             |             +- S.CORMP
|             |             +-*F.AMAX1
|             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             |
|             +- S.DREDT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                           +- S.XREDCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                           |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                           |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|                           |             |
|                           |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|                           |
|                           +- S.XREDC3---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                           |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
|                           |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|                           |             |
|                           |             +-*F.IM8CXS
|                           |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|                           |
|                           +-*F.FLOAT
|                           +- S.PRNTH ---+- S.CPUST -----*F.ETIME
|                           |             +-*S.FDATE
|                           |
|                           +-*F.ABS
|                           +-*F.MOD
|                           +- S.LDGRTN----- S.CPUST -----*F.ETIME
|
+- S.DADSET---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             +- S.MEMCHK
|             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|             +-*F.MOD
|
+- S.DFPLT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             +- S.PSCLE ---+-*F.ABS
|             |             +-*F.AMAX1
|             |             +-*F.ALOG10
|             |             +-*F.IFIX
|             |             +-*F.FLOAT
|             |
```



```
PROGRAM UTILITY ANALYZER/F77 1.04 : TREE STRUCTURE OF PROGRAM ( ENTRY IS MAIN ) : DATE: PAGE 0005
                NOTATION   S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|             +- S.PTMAN ---+-*F.MAX0
|             |             +-*F.IABS
|             |             +-*F.MOD
|             |             +- S.BITA  ----- S.MOVEB
|             |             +- S.PTCTL ---+- S.PTINT ---+-*F.AMIN1
|             |                           |             +-*F.AMAX1
|             |                           |
|             |                           +- S.PTGNR
|             |                           +- S.PTHEX ---+-*F.COS
|             |                           |             +-*F.SIN
|             |                           |             +- S.NEWPEN
|             |                           |             +- S.PLOT
|             |                           |             +-*F.MIN0
|             |                           |             +-*F.IABS
|             |                           |             +- S.SYMBOL
|             |                           |             +-*F.ABS
|             |                           |             +-*F.ALOG10
|             |                           |             +-*F.MAX0
|             |                           |             +- S.NUMBER
|             |                           |             +- S.CIRCL
|             |                           |
|             |                           +-*F.COS
|             |                           +-*F.SIN
|             |                           +- S.PTTIT ---+- S.SYMBOL
|             |                                         +- S.PTHEX ---+-*F.COS
|             |                                         |             +-*F.SIN
|             |                                         |             +- S.NEWPEN
|             |                                         |             +- S.PLOT
|             |                                         |             +-*F.MIN0
|             |                                         |             +-*F.IABS
|             |                                         |             +- S.SYMBOL
|             |                                         |             +-*F.ABS
|             |                                         |             +-*F.ALOG10
|             |                                         |             +-*F.MAX0
|             |                                         |             +- S.NUMBER
|             |                                         |             +- S.CIRCL
|             |                                         |
|             |                                         +- S.NEWPEN
|             |                                         +-*F.AMIN1
|             |                                         +- S.NUMBER
|             |                                         +- S.PLOT
|             |
|             +-*F.MIN
|             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :   DATE:
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

        +- S.DPOWS ---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |             |
        |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |
        |             +-*F.MIN
        |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |
        +- S.BCALC ---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             +- S.BIEDT ---+- S.PRNTH ---+- S.CPUST -----*F.ETIME
        |             |             |             +-*S.FDATE
        |             |             |
        |             |             +- S.CORMP
        |             |             +-*F.ABS
        |             |
        |             +- S.XREDCM---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |             |
        |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |
        |             +- S.SKNU
        |             +- S.ZUCZ  -----*F.MAX0
        |             +- S.CLEAR
        |             +- S.XREDC3---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |             |
        |             |             +-*F.IMBCXS
        |             |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             |
        |             +- S.DOEX  ---+- S.BADRS
        |             |             +- S.MEMCHK
        |             |             +- S.JEMY  ---+- S.JAOD  -----*F.FLOAT
        |             |             |             +- S.MEIT  ---+-*F.ABS
        |             |             |                           +- S.METS
        |             |             |                           +-*F.FLOAT
        |             |             |                           +- S.MEMA
        |             |             |                           +-*F.MAX0
        |             |             |                           +-*F.MIN0
        |             |             |                           +-*F.EXP
        |             |             |                           +- S.ANOR  ---+-*F.ABS
        |             |             |                                        +-*F.DMAX1
```



```
PAGE  0008PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :   DATE:          PAGE  0005
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

        |             |             |                           |             +-*F.DMIN1
        |             |             |                           |
        |             |             |                           +-*F.IFIX
        |             |             |                           +- S.MESA  ---+-*F.DFLOAT
        |             |             |                           |             +-*F.ABS
        |             |             |                           |
        |             |             |                           +- S.MESB  ---+-*F.DFLOAT
        |             |             |                           |             +-*F.ABS
        |             |             |                           |
        |             |             |                           +- S.PRTD
        |             |             |                           +- S.MEPA  ---+-*F.ABS
        |             |             |                                         +-*F.EXP
        |             |             |                                         +-*F.DMAX1
        |             |             |
        |             |             +- S.JUCY  ---+-*F.IABS
        |             |             |             +-*F.DFLOAT
        |             |             |             +-*F.ABS
        |             |             |             +-*F.EXP
        |             |             |             +-*F.MAX
        |             |             |
        |             |             +- S.JAGY  ---+-*F.DMAX1
        |             |                           +-*F.ABS
        |             |                           +-*F.IFIX
        |             |                           +-*F.MAX0
        |             |                           +-*F.MIN0
        |             |                           +-*F.FLOAT
        |             |                           +-*F.EXP
        |             |                           +- S.JAOD  -----*F.FLOAT
        |             |
        |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |             +- S.XWRTCH---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |                           +- S.XBLKTR---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |                           |             +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |                           |
        |                           +- S.LDGRTN----- S.CPUST -----*F.ETIME
        |
        +- S.BFEDT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
        |             +- S.PRNTH ---+- S.CPUST -----*F.ETIME
        |             |             +-*S.FDATE
        |             |
        |             +-*F.MIN0
        |             +-*F.MAX0
        |             +- S.PSCLE ---+-*F.ABS
        |             |             +-*F.AMAX1
        |             |             +-*F.ALOG10
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:            PAGE  0004
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|             |             +-*F.IFIX
|             |             +-*F.FLOAT
|             |
|             +- S.CORMP
|             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|
+- S.BFPLT ---+- S.LDGENT----- S.CPUST -----*F.ETIME
|             +-*F.ABS
|             +- S.PTMAN ---+-*F.MAX0
|             |             +-*F.IABS
|             |             +-*F.MOD
|             |             +- S.BITA  ----- S.MOVEB
|             |             +- S.PTCTL ---+- S.PTINT ---+-*F.AMIN1
|             |                           |             +-*F.AMAX1
|             |                           |
|             |                           +- S.PTGNR
|             |                           +- S.PTHEX ---+-*F.COS
|             |                           |             +-*F.SIN
|             |                           |             +- S.NEWPEN
|             |                           |             +- S.PLOT
|             |                           |             +-*F.MIN0
|             |                           |             +-*F.IABS
|             |                           |             +- S.SYMBOL
|             |                           |             +-*F.ABS
|             |                           |             +-*F.ALOG10
|             |                           |             +-*F.MAX0
|             |                           |             +- S.NUMBER
|             |                           |             +- S.CIRCL
|             |                           |
|             |                           +-*F.COS
|             |                           +-*F.SIN
|             |                           +- S.PTTIT ---+- S.SYMBOL
|             |                                         +- S.PTHEX ---+-*F.COS
|             |                                         |             +-*F.SIN
|             |                                         |             +- S.NEWPEN
|             |                                         |             +- S.PLOT
|             |                                         |             +-*F.MIN0
|             |                                         |             +-*F.IABS
|             |                                         |             +- S.SYMBOL
|             |                                         |             +-*F.ABS
|             |                                         |             +-*F.ALOG10
|             |                                         |             +-*F.MAX0
|             |                                         |             +- S.NUMBER
|             |                                         |             +- S.CIRCL
|             |                                         |
```



```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MAIN      )      :  DATE:            PAGE  0005
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

|             |                                         +- S.NEWPEN
|             |                                         +-*F.AMIN1
|             |                                         +- S.NUMBER
|             |                                         +- S.PLOT
|             |
|             +-*F.AMAX1
|             +- S.PSCLE ---+-*F.ABS
|             |             +-*F.AMAX1
|             |             +-*F.ALOG10
|             |             +-*F.IFIX
|             |             +-*F.FLOAT
|             |
|             +- S.LDGRTN----- S.CPUST -----*F.ETIME
|
+- S.EDCPT
+-%S.PLCLS ---+- S.PLOTS
              +- S.PLOT
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  MESSAG    )      :   DATE:
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

S.MESSAG
```



```
PAGE  000BROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  PBND      )      :   DATE:
                                         NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

F.PBND
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  PC3D      )      :  DATE:
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

F.PC3D  ----- F.PC2D
```



```
PAGE  000PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  PRT2DE    )      :  DATE:          PAGE  0005
                           NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

S.PRT2DE-----*F.MIN
```

```
PROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  PRTR      )      :   DATE:
                  NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

S.PRTR
```



```
PAGE  0008ROGRAM  UTILITY  ANALYZER/F77  1.04   : TREE  STRUCTURE  OF  PROGRAM  (  ENTRY  IS  QOUT      )      :   DATE:
                           NOTATION        S(SUBROUTINE) , F(FUNCTION) , P(MAIN), *:LIBRARY , %:SUB ENTRY

                                                                                                                  PAGE  0006
S.QOUT
```

022PROGRAM UTILITY ANALYZER/F77 1.04 : PARAMETERS (CONSTANT NAMES) OF PROGRAM : DATE: PAGE 0022

1. JCCARD	: 81	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: IARRAY	IXARAY	LIBRD	NEXT	RARRAY	SCAN	STUPI	STUPX
	:	: VALUE							
2. JCMACH	: 1	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
3. JCTAPE	: 1	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
4. JICARD	: 1	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: IARRAY	IXARAY	LIBRD	NEXT	RARRAY	SCAN	STUPI	STUPX
	:	: VALUE							
5. JIMACH	: 19	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
6. JITAPE	: 15	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
7. JLCARD	: 2	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: IARRAY	IXARAY	LIBRD	NEXT	RARRAY	SCAN	STUPI	STUPX
	:	: VALUE							
8. JLMACH	: 3	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
9. JLTAPE	: 5	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
10. JRCARD	: 1	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: IARRAY	IXARAY	LIBRD	NEXT	RARRAY	SCAN	STUPI	STUPX
	:	: VALUE							
11. JRMACH	: 8	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
12. JRTAPE	: 1	: CONVER	CPBYTE	DFPRT	DIF	DMDIF	DREDT	FMEDT	FMINV
	:	: LIBRD	NEXT	SCAN	STUPI	STUPX	VALUE		
13. MAZN8	: 30	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
14. MBEXC8	: 100	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				

パラメータ設定

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15. MBLC8	: 1027	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
16. MDIMN8	: 50	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
17. MFPR8	: 10	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
18. MFSLR8	: 30	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
19. MGRP8	: 7	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
20. MMATX8	: 100	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
21. MNUC8	: 50	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
22. MPLN8	: 80	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
23. MPRGNM	: 50	: LDGENT	LDGINT	LDGRTN	LDGTIM	LDGTRM			
24. MSEXC8	: 100	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
25. MSHFL1	: 10	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
26. MSHFL2	: 20	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				
27. MYFFP8	: 100	: DGEDT	DIF	LIBRD	SHUFFL	STEDT	STUPD	STUPX	XINTCM
	:	: XREDC1	XREDCM	XWRTC1	XWRTCM				