


## SOFTWARE RELEASE NOTICE

01. SRN Number: PA-SRN-021		
02. Project Title: PORFLOW - Multifluid Multiphase Model for Simulating Flow, Heat Transfer, and Mass Transport in Fractured Porous Media.		Project No. 20-5702-723
03. SRN Title: PORFLO2.4		
04. Originator/Requester: Thomas J. Ratchford 		Date: 03/22/94
05. Summary of Actions  <input checked="" type="checkbox"/> Release of new code admitted to CM System (G. Wittmeyer)  <input type="checkbox"/> Release of modified code:  <input type="checkbox"/> Enhancements made  <input type="checkbox"/> Corrections made  <input checked="" type="checkbox"/> Change of access code (Robert Baca)		
06. Persons Authorized Access		
Name	RO/RW	A/C/D
07. Element Manager Approval:		Date:
08. Remarks:  A copy of the software package PORFLO2.4, Ver. 1.1 was retained by the Principle Investigator for use in the CNWRA work center; therefore, a new release may not be necessary.		

# SOFTWARE SUMMARY FORM

01. Summary Date: 03/21/94	02. Summary prepared by (Name and Phone) T.J. Ratchford 522-3083	03. Summary Action:  New	
04. Software Date: 8/15/93	05. Short Title: PORFLOW2.4		
06. Software Title: PORFLOW - Multifluid Multiphase Model for Simulating Flow, Heat Transfer, and Mass Transport in Fractured Porous Media.		07. Internal Software ID:  NONE	
08. Software Type:  <input type="checkbox"/> Automated Data System  <input checked="" type="checkbox"/> Computer Program  <input type="checkbox"/> Subroutine/Module	09. Processing Mode:  <input type="checkbox"/> Interactive  <input type="checkbox"/> Batch  <input checked="" type="checkbox"/> Combination	10. APPLICATION AREA A. General: <input checked="" type="checkbox"/> Scientific/Engineering <input type="checkbox"/> Auxiliary Analyses <input type="checkbox"/> Total System PA <input checked="" type="checkbox"/> Subsystem PA <input type="checkbox"/> Other  b. Specific:	
11. Submitting Organization and Address:  CNWRA, SwRI, San Antonio, Texas		12. Technical Contact(s) and Phone:  G. Wittmeyer, (210) 522-5082	
13. Narrative:  Porflow is a software package for solution of multiphase fluid flow, heat transfer, and mass transport problems in variably saturated porous or fractured media.			
14. Computer Platform  CRAY/XMP	15. Computer Operating System:  UNIX	16. Programming Language(s):  FORTRAN	17. Number of Source Program Statements: 12,115 lines of code
18. Computer Memory Requirements: UNKNOWN	19. Tape Drives: NONE	20. Disk/Drum Units: N/A	21. Graphics: UNKNOWN
22. Other Operational Requirements  NONE			
23. Software Availability: <input checked="" type="checkbox"/> Available <input type="checkbox"/> Limited <input type="checkbox"/> In-House ONLY		24. Documentation Availability: <input checked="" type="checkbox"/> Available <input type="checkbox"/> Inadequate <input type="checkbox"/> In-House ONLY	
25. Submission Package Status:  Acceptance Criteria: Met <input checked="" type="checkbox"/> Not Met <input type="checkbox"/> Software QA Assessment: Successful <input checked="" type="checkbox"/> Unsuccessful <input type="checkbox"/>  Code Custodian: <u>T.J. Ratchford</u> Date: <u>3/21/94</u>			

# CRAY LISTING FOR PORFLO2.4

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3/21/99 Y/R

# PORFLO Fortran Program Static and Dynamic Analysis

March 10, 1994

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John E. Tolli  
Scientific Computing Unit  
Idaho National Engineering Laboratory

## 1. Introduction

This analysis was performed on the Cray version of the software as provided by Southwest Research Institute (SwRI).

One sample problem was supplied along with the source code. The program was analyzed using the Craft (Cross Reference Analysis of Fortran) tool, FORWARN, the Fortran 77 analyzer, and PC-Metric. These tools provide static analysis, coverage analysis, and complexity analysis.

Since PORFLO aborts when loaded with a core preset of indefinites, the program was loaded with a core preset of zeros to make the dynamic analysis runs.

## 2. References

- [1] N.H. Marshall and E.S. Marwil, Cross Reference Analysis of Fortran (CRAFT), EG&G-CATT-9198, EG&G Idaho, Inc., July 1991.
- [2] Fortran 77 Analyzer User's Manual, National Bureau of Standards, NBS GCR 81-359, 1981
- [3] FORWARN User's Guide, Quibus Enterprises, Inc., July 1991.
- [4] PC-Metric User's Guide, SET Laboratories, Inc., 1987.

## 3. Functions

The PORFLO program contains 175 Fortran routines.

There are no alternate entry points.

There are 2 extraneous subroutines: "getnam", "xalft".

## 4. Common Block Irregularities

There are 101 common blocks in the PORFLO program.

There are several common blocks which are declared in only one program module:

Block name	Module	Block name	Module
-----	-----	-----	-----
/cadatl/	adata	/cbc/	aflo
/carr1/	porflo	/cbc0/	aflo
/carr11/	porflo	/ciarr/	porflo

/carr2/	porflo	/cmtrx1/	solve
/carrbg/	aflo	/cneprm/	nepcl
/carrf1/	aflo	/coutdg/	outdgn
/carrf2/	aflo	/cplot/	xyplot
/carrm1/	slvext	/cplt2/	histr2
/carrm4/	slvext	/ctblsz/	tblin

Some common block declarations are different from the original declaration:

Block name	Initially Declared in	Different In	At variable
/cnvar/	porflo	aflo	nvar
/cnvar/	porflo	anewp2	nvar
/cutil/	aflo	arrays	nloc
/carr13/	aflo	geom	dxm
/cidpr1/	banner	idfile	pror
/cvpsat/	evptcs	input	cvps
/cpropd/	disper	input1	iprop
/coutpt/	itable	outpt1	nlo
/cnvar/	porflo	prescan	nvar
/ctblbc/	bctime	prescan	ibct
/ctblfl/	flxbl	prescan	iflx
/ctblfx/	fixf	prescan	ifx
/ctblso/	prescan	print1	iso
/ctblst/	prescan	setfin	iset
/cnvar/	porflo	slvgmr	mv4

Block /cnvar/ differs in size in module "slvext" from the initial declaration in module "porflo".

Variable exceptions are noted as follows:

Block name	Variable	Exception
/cadatl/	chr81	defined, unused
/cflmt/	iflmt	defined, unused
/cflmt/	fmin	defined, unused
/cflmt/	fmax	defined, unused
/cfref/	nfmap	undefined, unused
/cfref/	fref	defined, unused
/cgas/	lawgas	undefined, unused
/cgas/	tgas	defined, unused
/cgrav/	gravb	undefined, unused
/cidpr1/	syml	undefined, unused
/cneprm/	nepf	used, undefined
/cneprm/	nepfm	used, undefined
/cneprm/	nepfrq	possibly undefined
/cneprm/	nepfil	used, undefined
/cnvar/	nv1	defined, unused
/cnvar/	nv5	defined, unused
/cnvar/	nv6	defined, unused
/cnvar/	nv9	defined, unused
/cnvar/	nv11	defined, unused

/cnvar/	nv14	defined, unused
/cnvar/	nv16	defined, unused
/cnvar/	nv17	defined, unused
/cnvar/	nv19	defined, unused
/cnvar/	nv20	defined, unused
/cnvar/	nv22	defined, unused
/cnvar/	nv23	defined, unused
/cnvar/	nv24	defined, unused
/cnvar/	nvar	defined, unused
/cnvar/	mv1	defined, unused
/cnvar/	mv2	defined, unused
/cnvar/	mv3	defined, unused
/cnvar/	mvar	defined, unused
/cnvar1/	neqv	defined, unused
/coutp3/	qft/qvf	defined, unused
/cpi/	deg2r	defined, unused
/cplot/	xs	undefined, unused
/cplot/	ys	undefined, unused
/cplot/	xmn	undefined, unused
/cplot/	ymn	undefined, unused
/cprob/	ifrz	undefined, unused
/cread/	fread	defined, unused
/ctabl2/	n2skip	undefined, unused
/cvpsat/	cvps	undefined, unused

There are several instances of a common block not being used by a module in which it is declared:

Block name	Modules not using
-----	-----
/carrn/	outpt1
/cbc2/	fdsp
/cbc4/	print1
/cdata/	bctime, input
/cdens/	anewf, anewp, anewp2, evpqf, rsdeqn, sflht
/cflmt/	aflow, init
/cfref/	aflow, init
/cgas/	anewp2, evpqf, sflht
/cgrid/	print
/cidusr/	banner
/cmtrx/	sourcs
/cmtrx0/	sflht
/cnum/	aflow, difh, icel, ice2, plalfa, print1, scntrl, sfnew, solve, sourci, sourcs
/cnvar/	sflht
/cnvar1/	sflht, solve
/cnvar2/	anewp, anewp2, anewt
/coutp2/	outpt1
/cphase/	sfhtin
/cpi/	setft
/cprob/	anewp
/cprop2/	anewp, anewp2, plalfa
/cpropz/	input
/csolve/	outmod



/csorce/	aflow
/ctrav2/	track0
/ctref/	evpfc
/cunits/	track
/cvisc/	proper

## 5. Interface Irregularities

Exceptions are noted as follows:

Module	Line#	Exception
-----	-----	-----
prescan	60	constant or expression passed to argument #3 of IOOPEN, which modifies it
prescan	100	constant or expression passed to argument #3 of IOOPEN, which modifies it
slvgmr	71	argument #1 to NOPCNV has the wrong type
slvgmr	71	argument #5 to NOPCNV has the wrong type
slvgmr	71	argument #6 to NOPCNV has the wrong type

## 6. Local Variable Irregularities

The following parameters are not used with consistent values:

l23d, lbc, lbe, lfl, lfld, lfld3, lmax, lmax23, ltf1.

There are several instances of a parameter not being used in a module in which it is declared:

Parameter	Modules not using
-----	-----
l12	aflow, anewf, anewp, anewp2, anewt, area, disper, geom, ice0, icel, ice2, outmod, plalfa, plprf, plprf2, plprp, porflo, print, proper, qheat, rsdeqn, sflhc, sf2alf, sf2hc, sf2kr, sf2p2, sfhtin, solve, vel, xalfa, xalfa2, xalff, xalff2
l13	anewf, anewt, area, disper, ice0, icel, ice2, outmod, plalfa, plprf2, print, proper, qheat, rsdeqn, sflhc, sf2alf, sf2hc, sf2kr, sf2p2, sfhtin, solve, vel, xalfa, xalfa2, xalff, xalff2
lbc	porflo, slvext
lbe	porflo, slvext
lfl	porflo
lfld3	aflow, porflo, slvext
lio	aflow, anewf, anewp, anewp2, anewt, area, disper, geom, ice0, icel, ice2, outmod, plalfa, plprf, plprf2, plprp, porflo, print, proper, qheat, rsdeqn, sflhc, sf2alf, sf2hc, sf2kr, sf2p2, sfhtin, solve, vel, xalfa, xalfa2, xalff, xalff2
lmax10	slvext
lmax23	aflow, porflo, slvext
lmax3	slvext
lmax4	slvext
lmax5	slvext
lmax6	slvext
lmax7	slvext
lmax8	slvext

```

1nz      aflow, anewf, anewp, anewp2, anewt, area, disper, geom, ice0,
        ice1, ice2, outmod, plalfa, plprf, plprf2, plprp, porflo,
        print, proper, qheat, rsdeqn, sflhc, sf2alf, sf2hc, sf2kr,
        sf2p2, sfhtin, solve, vel, xalfa, xalfa2, xalff, xalff2
1ss      aflow, anewf, anewp, anewp2, anewt, area, disper, geom, ice0,
        ice1, ice2, outmod, plalfa, plprf, plprf2, plprp, porflo,
        print, proper, qheat, rsdeqn, sflhc, sf2alf, sf2hc, sf2kr,
        sf2p2, sfhtin, solve, vel, xalfa, xalfa2, xalff, xalff2
1st      aflow, anewf, anewp, anewp2, anewt, area, disper, geom, ice0,
        ice1, ice2, outmod, plalfa, plprf, plprf2, plprp, porflo,
        print, proper, qheat, rsdeqn, sflhc, sf2alf, sf2hc, sf2kr,
        sf2p2, sfhtin, solve, vel, xalfa, xalfa2, xalff, xalff2
1tbl     area, disper, geom, ice0, ice1, ice2, outmod, plalfa, plprf,
        plprf2, plprp, print, proper, qheat, vel, xalfa, xalfa2,
        xalff, xalff2
1zn      anewf, anewt, area, porflo, rsdeqn, solve, vel

```

Local variable exceptions are noted as follows:

Module	Variable	Exception
anewp	zz	possibly undefined
anewp2	zz	possibly undefined
bcuser	zz	possibly undefined
openio	string	defined, unused
outpt1	zz	used but undefined
plprp2	sf	possibly undefined
prescan	zz	possibly undefined
proper	zz	possibly undefined
setfnc	idusr	defined, unused
setfx	nsets	possibly undefined
sourcs	iz	possibly undefined
track0	izz	possibly undefined
track0	zz	possibly undefined

## 7. Fortran Extensions

The following routines contain entity names which are longer than 6 characters:

porflo, getnam, prescan.

A potential overlap in a character assignment statement occurs in each of the following routines:

input1, outdgn, outpt1.

## 8. Optimization

The following table summarizes the performance data gathered from execution of the sample problem. Only those routines exercised by the sample problem are shown (see "Coverage Analysis" for a list of routines not exercised by the sample problem, i.e., coverage = 0%). The table lists all program modules in descending order according to CPU time. To optimize code execution time, emphasis should be placed on those modules which appear highest in the listing.

The performance data show that a high percentage of the overall execution time (90.223%) is spent in the first 21 routines listed. This is due primarily to the following (applies to some or all of the 21 routines):

- 1) a low percentage of floating point operations which are performed in vector mode (%Vflops is small)
- 2) a high overhead factor for calls to the routines (IFact > 1)
- 3) a high level of memory conflicts (MC/MR > 1)
- 4) a high rate of instruction buffer fetches (IBFR > 1).

A detailed optimization analysis effort should focus on these 4 areas.

### PERFORMANCE DATA FOR PORFLO

ROUTINE NAME	Time	%ExTime	%AccumT	%Vflops	IFact	MC/MR	IBFR
VEL	7.650	14.332	14.332	54.28553	0.44	2.148	0.961
BCVAR	6.139	11.501	25.833	0.00000	2.21	1.722	0.033
SF2KR	5.976	11.196	37.028	0.00000	0.14	1.714	0.777
LOCNP	4.522	8.471	45.499	0.00000	4374.90	8.831	0.001
SF1HC	2.074	3.886	49.385	0.00050	0.10	1.873	0.960
INTABL	2.053	3.846	53.232	39.13044	765.48	3.047	0.629
RESDEU	1.869	3.502	56.734	86.80747	4.09	0.411	0.134
SLVADI	1.851	3.468	60.201	89.33334	1.84	0.558	0.130
MEANF	1.823	3.415	63.616	0.00000	1.87	1.736	0.083
SLVPRE	1.753	3.284	66.900	84.32304	1.94	0.434	0.069
DISPER	1.689	3.164	70.064	66.93551	0.50	0.727	0.622
EVPCF	1.636	3.065	73.129	91.46342	0.13	0.340	0.015
FLOW	1.581	2.962	76.091	26.66667	0.54	1.538	0.051
BODYF	1.282	2.403	78.493	65.72772	0.66	2.513	0.999
FDSP	1.107	2.074	80.567	84.04255	0.77	0.500	0.046
FDSL	1.008	1.888	82.455	83.33334	0.84	0.437	0.050
ANERP	0.956	1.792	84.247	0.06993	0.22	1.618	1.208
MODFLX	0.881	1.651	85.898	99.74811	0.96	1.025	0.023
SOLVE	0.800	1.498	87.397	100.00000	4.25	1.546	1.051
DENSTY	0.783	1.466	88.863	0.00000	1.09	1.618	0.083
DIFH	0.726	1.360	90.223	100.00000	1.17	1.287	0.069
SF2ALF	0.687	1.286	91.509	24.84474	1.24	2.303	1.049
SETFT	0.460	0.861	92.370	0.00000	0.46	3.285	2.623
INVERT	0.438	0.821	93.191	0.00000	7.76	6.382	0.183

ANWF	0.395	0.740	93.931	0.22441	2.15	1.605	1.077
BCVAL	0.350	0.656	94.587	0.00000	2.43	1.836	0.000
ANWT	0.350	0.655	95.243	0.53693	0.61	1.457	1.158
AFLOW	0.346	0.648	95.891	0.74377	0.00	1.558	1.174
MODFL	0.202	0.379	96.270	100.00000	85.13	0.972	0.940
MODF	0.189	0.354	96.623	100.00000	91.21	1.207	1.060
EVPTCS	0.167	0.313	96.936	99.70342	5.09	0.575	0.300
EVPQF	0.133	0.250	97.186	99.69525	1.59	0.741	0.375
BCEDGE	0.132	0.247	97.434	0.00000	25.72	3.239	0.757
ADATA	0.112	0.210	97.643	58.03115	0.00	1.877	0.920
XALFA	0.097	0.181	97.825	100.00000	8.78	3.084	0.310
SFNEW	0.087	0.163	97.988	0.07493	9.77	2.212	1.207
ADDATA	0.086	0.161	98.149	0.00000	0.00	2.275	0.553
FLXBL	0.076	0.142	98.291	0.00000	44.85	5.409	1.055
OUTDGN	0.069	0.130	98.421	17.59857	3.07	1.906	1.098
P2HC	0.066	0.124	98.545	99.49749	28.91	0.652	0.605
QHEAT	0.058	0.109	98.654	97.20000	3.64	1.638	0.257
OUTPUT	0.055	0.103	98.757	0.06514	3.96	2.944	1.018
BCTIME	0.052	0.098	98.855	0.00000	65.16	8.033	1.151
SETFLX	0.052	0.097	98.952	0.00000	65.65	4.382	0.773
SOURCE	0.048	0.090	99.042	0.00000	70.87	8.354	0.835
FIXF	0.047	0.088	99.129	0.00000	72.45	7.012	0.853
XALFF	0.040	0.075	99.205	100.00000	5.28	2.931	0.622
PTHRMO	0.040	0.075	99.280	97.63314	5.31	0.717	0.250
STORAG	0.033	0.061	99.341	100.00000	25.91	1.130	0.610
PLALFA	0.030	0.055	99.397	0.00000	64.62	9.896	1.015
CYCLE	0.026	0.050	99.446	0.00000	32.14	6.909	1.135
EVPHL	0.023	0.043	99.489	99.44751	9.29	1.012	0.656
P2H2P	0.021	0.039	99.528	0.00000	10.14	5.966	0.955
OUTVAR	0.020	0.038	99.566	0.00000	0.00	2.268	0.008
PLPRF	0.020	0.037	99.603	0.00000	43.01	11.561	1.013
LOCFIL	0.018	0.033	99.637	98.64889	0.00	0.930	1.009
SCNTRL	0.017	0.032	99.669	100.00000	12.29	5.319	0.870
SORINJ	0.017	0.031	99.701	99.00990	12.70	1.112	0.599
NEPCLC	0.016	0.030	99.730	0.00000	53.65	20.032	0.001
FSURF	0.016	0.030	99.760	0.00000	53.92	19.469	0.001
PLPRP	0.016	0.030	99.789	0.00000	53.94	19.124	0.001
EXIST	0.013	0.023	99.813	0.00000	0.12	2.213	0.066
TRACK	0.012	0.022	99.834	0.00000	18.45	4.863	0.001
ADOUT	0.011	0.021	99.855	99.48148	0.02	1.361	0.730
SOURCS	0.011	0.021	99.876	0.00000	19.05	8.060	0.897
BANNER	0.010	0.019	99.895	98.39120	0.00	1.345	0.562
ADFILE	0.010	0.019	99.914	100.00000	0.04	2.305	0.085
ICE1	0.008	0.015	99.929	0.00000	27.20	20.842	0.002
ICE2	0.008	0.015	99.943	0.00000	27.31	19.100	0.001
TABLE2	0.006	0.010	99.954	58.50307	0.00	0.524	0.930
ITABL2	0.005	0.009	99.962	74.35042	0.00	2.663	0.772
PRESCAN	0.003	0.006	99.968	98.25241	0.00	1.324	0.989
PRINTL	0.003	0.005	99.973	89.63189	0.00	2.075	0.449
PRINT	0.002	0.005	99.978	82.19255	0.00	1.877	0.549
IOOPEN	0.001	0.003	99.981	94.87190	0.00	0.868	0.615
INPUTL	0.001	0.002	99.982	23.65935	0.02	3.226	1.112
OPENIO	0.001	0.002	99.984	93.93941	0.00	0.985	0.569
INPUT	0.001	0.002	99.986	81.08260	0.02	3.448	1.186

BCUSER	0.001	0.001	99.987	0.00000	0.00	4.406	0.725
PRNXYZ	0.001	0.001	99.988	59.82910	0.00	1.922	0.771
TABLES	0.001	0.001	99.989	35.79679	0.00	0.458	0.217
PROPER	0.001	0.001	99.991	98.86300	0.00	1.631	0.033
PRNTZN	0.001	0.001	99.992	68.62750	0.00	1.772	0.978
ARRAYS	0.001	0.001	99.993	0.44870	0.00	3.020	0.236
OUTPTL	0.000	0.001	99.994	95.81895	0.04	3.857	1.214
GEOM	0.000	0.001	99.994	0.88810	0.00	2.470	0.761
BCAN	0.000	0.001	99.995	100.00000	0.00	3.645	1.348
PDATUM	0.000	0.001	99.996	0.00000	0.00	3.797	1.125
OUTMOD	0.000	0.000	99.996	0.00000	0.52	34.808	0.984
AREA	0.000	0.000	99.997	0.00000	0.06	4.772	0.861
LOCZN	0.000	0.000	99.997	100.00000	0.03	5.316	0.921
SFHTIN	0.000	0.000	99.997	0.00000	0.00	0.548	1.274
DATTIM	0.000	0.000	99.998	0.00000	0.00	2.398	0.902
LOCFLD	0.000	0.000	99.998	100.00000	0.11	6.660	0.000
WINDOW	0.000	0.000	99.998	83.15566	0.05	3.968	0.437
ZONE	0.000	0.000	99.999	0.00000	0.00	0.417	0.226
ADMSG	0.000	0.000	99.999	0.00000	0.12	16.216	0.884
DOMAIN	0.000	0.000	99.999	79.63637	0.00	1.551	0.752
DOMBND	0.000	0.000	99.999	0.00000	0.00	1.909	0.164
BCINIT	0.000	0.000	99.999	0.00000	0.00	2.432	0.104
TBLIN	0.000	0.000	99.999	62.88661	0.00	0.947	0.667
PROPIN	0.000	0.000	99.999	17.24139	0.00	4.945	0.829
INPXYZ	0.000	0.000	99.999	0.00000	0.00	2.495	1.361
INITL	0.000	0.000	99.999	0.00000	0.00	3.947	0.045
INPUT2	0.000	0.000	100.000	100.00000	0.03	4.806	0.623
GRID	0.000	0.000	100.000	69.93007	0.01	2.146	0.881
INIT	0.000	0.000	100.000	35.00001	0.00	1.391	0.608
INPUT3	0.000	0.000	100.000	80.00002	0.00	3.882	0.871
PROPZN	0.000	0.000	100.000	0.00000	0.03	15.540	0.718
OUTF1	0.000	0.000	100.000	0.00000	0.00	0.966	0.933
OUTF2	0.000	0.000	100.000	100.00000	0.00	2.359	0.525
ERROR	0.000	0.000	100.000	0.00000	0.03	18.958	0.000
ITABLE	0.000	0.000	100.000	62.50000	0.00	3.338	0.824
PORFLO	0.000	0.000	100.000	100.00000	0.00	5.093	0.992
READ10	0.000	0.000	100.000	0.00000	0.03	43.667	0.992
MODIL	0.000	0.000	100.000	0.00000	0.00	0.454	0.000
PORVOL	0.000	0.000	100.000	93.63636	0.00	2.689	0.286
SF2HC	0.000	0.000	100.000	0.00000	0.00	3.607	0.970
HISTRY	0.000	0.000	100.000	0.00000	0.00	3.879	0.853
TRACK0	0.000	0.000	100.000	0.00000	0.00	13.286	0.896
ICE0	0.000	0.000	100.000	0.00000	0.01	147.000	0.000

Totals (All Traced Routines)

53.379 100.000 100.000 52.59741 1154.17 1.457 0.482

Key:

%AccumT = accumulated percentage of total CPU time  
 %ExTime = percentage of total CPU time  
 %Vflops = percentage of floating point operations due  
           to vector floating point operations  
 IBFR = Instruction Buffer Fetch Rate (megafetches/sec)  
 IFact = Inline Factor (total calls to routine /

average time spent in routine for each call)  
 MC = number of memory conflicts  
 MR = number of memory references  
 Time = total CPU time (sec)

## 9. Coverage Analysis

A coverage analysis shows that the sample problem yielded a 42% segment coverage of PORFLO. Sample problems provided with simulation programs typically achieve only 35% to 50% coverage. A statement of software quality cannot be made for routines that have low coverage, i.e., large portions of the code are untested.

Note that 54 routines have 0% coverage. These routines are not tested with the supplied sample problem.

Sixteen routines achieve 1%-19% coverage, 14 routines achieve 20%-39% coverage, 16 routines achieve 40%-59% coverage, 31 routines achieve 60%-79% coverage, 19 routines achieve 80%-99% coverage, and 25 routines achieve 100% coverage.

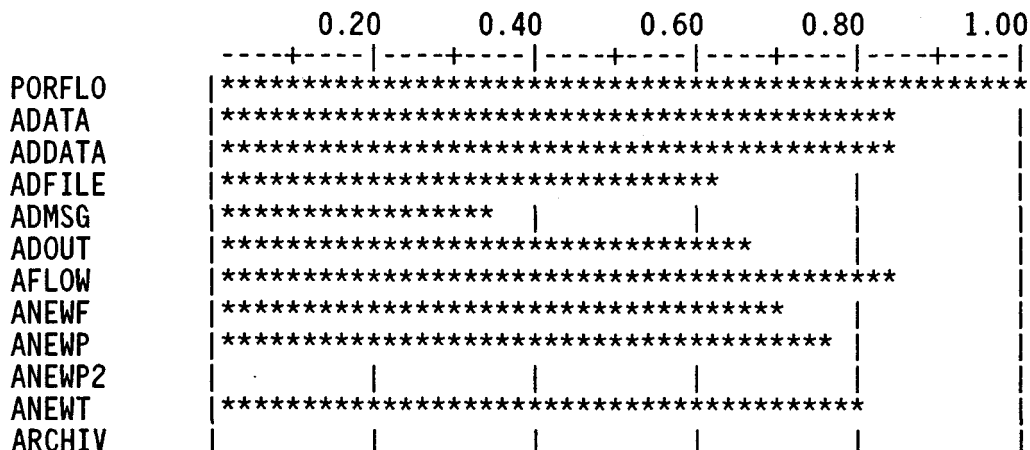
Module Name	Number of Segments in module	Number of Segments Executed	Percent Segment Coverage
PORFLO	2	2	100.0
ADATA	107	89	83.2
ADDATA	18	15	83.3
ADFILE	13	8	61.5
ADMSG	6	2	33.3
ADOUT	9	6	66.7
AFLOW	32	27	84.4
ANWF	20	14	70.0
ANWP	41	31	75.6
ANWP2	28	0	0.0
ANWT	10	8	80.0
ARCHIV	29	0	0.0
AREA	6	5	83.3
ARRAYS	22	14	63.6
BANNER	24	11	45.8
BCAN	8	7	87.5
BCDCAY	6	0	0.0
BCEDGE	10	4	40.0
BCINIT	27	21	77.8
BCTIME	32	3	9.4
BCUSER	49	32	65.3
BCVAL	6	5	83.3
BCVAR	21	16	76.2
BODYF	18	15	83.3
CYCLE	15	5	33.3
DATTIM	1	1	100.0
DENSTY	18	12	66.7
DIFH	19	7	36.8
DISPER	12	8	66.7
DOMAIN	32	31	96.9
DOMBND	8	6	75.0
ERROR	13	2	15.4

EVPFC	12	11	91.7
EVPHL	13	4	30.8
EVPQF	20	18	90.0
EVPTCS	14	10	71.4
EXIST	5	5	100.0
EXPM	8	0	0.0
FDHC	6	0	0.0
FDSL	13	7	53.8
FDSL2	6	0	0.0
FDSP	12	7	58.3
FIXF	22	4	18.2
FIXF2	7	0	0.0
FIXFI	11	0	0.0
FIXNOD	3	0	0.0
FLOW	14	14	100.0
FLXBL	37	9	24.3
FLXBL1	30	0	0.0
FLXBL2	4	0	0.0
FLXBL3	8	0	0.0
FSURF	32	2	6.2
GEOM	64	19	29.7
GETNAM	16	0	0.0
GETROW	5	0	0.0
GRID	30	15	50.0
HISTR2	19	0	0.0
HISTORY	29	5	17.2
ICE0	9	2	22.2
ICE1	23	2	8.7
ICE2	5	2	40.0
IDFILE	14	0	0.0
INIT	76	51	67.1
INITL	14	11	78.6
INPUT	122	75	61.5
INPUT2	5	5	100.0
INPUT3	16	15	93.7
INPUTL	216	107	49.5
INPXYZ	25	17	68.0
INTABL	13	7	53.8
INTANG	6	0	0.0
INVERT	17	6	35.3
IOOPEN	17	9	52.9
ITABL2	21	18	85.7
ITABLE	3	2	66.7
LOCATE	17	0	0.0
LOCFIL	4	4	100.0
LOCFLD	6	6	100.0
LOCNP	1	1	100.0
LOCXYZ	28	0	0.0
LOCZN	6	6	100.0
MEANF	49	28	57.1
MODF	19	10	52.6
MODFL	49	21	42.9
MODFLX	5	5	100.0
MODIL	4	4	100.0

NEPCLC	19	2	10.5
NOPCNV	45	0	0.0
NORM	7	0	0.0
OPENIO	1	1	100.0
OUTDGN	64	49	76.6
OUTF1	13	11	84.6
OUTF2	5	5	100.0
OUTMOD	8	5	62.5
OUTPTL	52	33	63.5
OUTPUT	33	27	81.8
OUTSAV	18	0	0.0
OUTVAR	12	11	91.7
OUTVX	6	0	0.0
P2H2P	12	10	83.3
P2HC	11	7	63.6
PDATUM	3	3	100.0
PLALFA	18	2	11.1
PLAREA	4	0	0.0
PLDEF	1	0	0.0
PLPRF	24	2	8.3
PLPRF2	3	0	0.0
PLPRP	26	2	7.7
PLPRP2	5	0	0.0
PORVOL	3	3	100.0
PRESCAN	77	59	76.6
PRINT	31	23	74.2
PRINTL	69	27	39.1
PRNTZN	5	5	100.0
PRNXYZ	7	5	71.4
PROPER	35	32	91.4
PROPIN	16	14	87.5
PROPZN	11	6	54.5
PTHRMO	5	4	80.0
QHEAT	3	3	100.0
READ10	7	2	28.6
RESDUE	53	42	79.2
ROUND	6	0	0.0
RSDEQN	1	0	0.0
SCNTRL	27	12	44.4
SETFIN	13	0	0.0
SETFLX	25	2	8.0
SETFNC	32	0	0.0
SETFT	43	7	16.3
SETFX	12	0	0.0
SETOPR	7	0	0.0
SETYPE	32	0	0.0
SF1HC	11	8	72.7
SF1HT	7	0	0.0
SF2ALF	15	12	80.0
SF2HC	16	5	31.2
SF2KR	33	15	45.5
SF2P2	7	0	0.0
SFHTIN	123	79	64.2
SFNEW	15	10	66.7



SGMRES	117	0	0.0
SLVADI	37	17	45.9
SLVCHL	47	0	0.0
SLVEXT	6	0	0.0
SLVGMR	21	0	0.0
SLVGSE	53	0	0.0
SLVPRE	14	7	50.0
SLVSOR	6	0	0.0
SOLVE	16	8	50.0
SORINJ	3	3	100.0
SOURCE	44	2	4.5
SOURCF	12	0	0.0
SOURCI	32	0	0.0
SOURCS	15	2	13.3
STORAG	3	3	100.0
TABLE2	10	10	100.0
TABLES	14	14	100.0
TBLIN	25	22	88.0
TIMSTP	7	0	0.0
TRACK	14	2	14.3
TRACK0	45	3	6.7
TRACK1	108	0	0.0
TRACK2	9	0	0.0
VEL	15	15	100.0
VSALFA	11	0	0.0
WINDOW	6	6	100.0
XALFA	3	3	100.0
XALFA2	9	0	0.0
XALFF	3	3	100.0
XALFF2	3	0	0.0
XALFT	7	0	0.0
XNEXT	4	0	0.0
XSIDE	10	0	0.0
XYPLOT	53	0	0.0
ZONE	47	16	34.0
Totals	3858	1632	42.3



AREA	*****			
ARRAYS	*****			
BANNER	*****			
BCAN	*****			
BCDCAY				
BCEDGE	*****			
BCINIT	*****			
BCTIME	*****			
BCUSER	*****			
BCVAL	*****			
BCVAR	*****			
BODYF	*****			
CYCLE	*****			
DATTIM	*****			
DENSTY	*****			
DIFH	*****			
DISPER	*****			
DOMAIN	*****			
DOMBND	*****			
ERROR	*****			
EVPFC	*****			
EVPHL	*****			
EVPQF	*****			
EVPTCS	*****			
EXIST	*****			
EXPM				
FDHC				
FDSL	*****			
FDSL2				
FDSP	*****			
FIXF	*****			
FIXF2				
FIXFI				
FIXNOD				
FLOW	*****			
FLXBL	*****			
FLXBL1				
FLXBL2				
FLXBL3				
FSURF	***			
GEOM	*****			
GETNAM				
GETROW				
GRID	*****			
HISTR2				
HISTORY	*****			
ICE0	*****			
ICE1	****			
ICE2	*****			
IDFILE				
INIT	*****			
INITL	*****			
INPUT	*****			
INPUT2	*****			

INPUT3	*****			
INPUTL	*****			
INPXYZ	*****			
INTABL	*****			
INTANG				
INVERT	*****			
IOOPEN	*****			
ITABL2	*****			
ITABLE	*****			
LOCATE				
LOCFIL	*****			
LOCFLD	*****			
LOCNP	*****			
LOCXYZ				
LOCZN	*****			
MEANF	*****			
MODF	*****			
MODFL	*****			
MODFLX	*****			
MODIL	*****			
NEPCLC	*****			
NOPCNV				
NORM				
OPENIO	*****			
OUTDGN	*****			
OUTF1	*****			
OUTF2	*****			
OUTMOD	*****			
OUTPTL	*****			
OUTPUT	*****			
OUTSAV				
OUTVAR	*****			
OUTVX				
P2H2P	*****			
P2HC	*****			
PDATUM	*****			
PLALFA	*****			
PLAREA				
PLDEF				
PLPRF	****			
PLPRF2				
PLPRP	****			
PLPRP2				
PORVOL	*****			
PRESCAN	*****			
PRINT	*****			
PRINTL	*****			
PRNTZN	*****			
PRNXYZ	*****			
PROPER	*****			
PROPIN	*****			
PROPZN	*****			
PTHRMO	*****			
QHEAT	*****			

READ10	*****			
RESDEU	*****			
ROUND				
RSDEQN				
SCNTRL	*****			
SETFIN				
SETFLX	****			
SETFNC				
SETFT	*****			
SETFX				
SETOPR				
SETYPE				
SF1HC	*****			
SF1HT				
SF2ALF	*****			
SF2HC	*****			
SF2KR	*****			
SF2P2				
SFHTIN	*****			
SFNEW	*****			
SGMRES				
SLVADI	*****			
SLVCHL				
SLVEXT				
SLVGMR				
SLVGSE				
SLVPRE	*****			
SLVSOR				
SOLVE	*****			
SORINJ	*****			
SOURCE	**			
SOURCEF				
SOURCI				
SOURCS	*****			
STORAG	*****			
TABLE2	*****			
TABLES	*****			
TBLIN	*****			
TIMSTP				
TRACK	*****			
TRACK0	***			
TRACK1				
TRACK2				
VEL	*****			
VSALFA				
WINDOW	*****			
XALFA	*****			
XALFA2				
XALFF	*****			
XALFF2				
XALFT				
XNEXT				
XSIDE				
XYPLOT				

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-----+-----+-----+-----+-----

```
coverage = 0.
```

Program coverage for this run =0.42

## 10. Complexity Analysis

Some key metrics are the number of executable statements (sloc), the number of non-blank comments (ncomt), McCabe's extended cyclomatic complexity (vg2), the number of branching statements (cgoto, ugoto, bIF, and lIF), and Halstead's predicted number of errors in (re)writing the code (bhat). Measures are normalized per 100 executable statements for ease of comparison and are listed in the table below.

The branching measures for this code indicate few unconditional GO TO statements and logical IFs for most program modules. There are, however, some notable exceptions (e.g. NORM, SETYPE). This code appears to be fairly well structured.

Some routines have a good ratio of non-blank comments to source code. However, most have low to moderate ratios, and some have no comments at all (e.g. ADMSG, ADOUT).

McCabe's extended cyclomatic complexity (vg2), normalized per 100 lines of source code, indicates high values. Generally, the routines with the highest complexity are those most likely to have defects. As a guideline, normalized measures of 15 or greater should be considered complex. A software maintenance program should focus on those routines with the highest measures.

## Complexity Report by Subprogram for PORFLO

Name	loc	sloc	cmnt	ncomt	ncomt /sloc	vg2 /sloc	cgoto	cgoto /sloc	ugoto	ugoto /sloc	bIF	bif /sloc	lIF	lif /sloc	Bhat
PORFLO	87	11	73	69	627.3	9.1	0	0.0	1	9.1	0	0.0	0	0.0	0
ADATA	209	199	10	10	5.0	30.7	0	0.0	11	5.5	17	8.5	15	7.5	2
ADDATA	37	28	9	9	32.1	42.9	0	0.0	1	3.6	2	7.1	5	17.9	0
ADFILE	35	21	9	9	42.9	33.3	0	0.0	1	4.8	3	14.3	1	4.8	0
ADMSG	20	10	0	0	0.0	40.0	0	0.0	0	0.0	2	20.0	0	0.0	0
ADOUT	21	13	0	0	0.0	30.8	0	0.0	0	0.0	2	15.4	0	0.0	0
AFLOW	168	97	14	10	10.3	16.5	0	0.0	4	4.1	4	4.1	8	8.2	2
ANWF	69	43	12	10	23.3	23.3	0	0.0	1	2.3	2	4.7	6	14.0	1
ANWFP	141	96	12	10	10.4	18.8	0	0.0	3	3.1	8	8.3	3	3.1	2
ANWFP2	133	82	12	10	12.2	15.9	0	0.0	3	3.7	6	7.3	1	1.2	2
ANWT	61	31	12	10	32.3	19.4	0	0.0	2	6.5	0	0.0	4	12.9	1
ARCHIV	65	47	9	9	19.1	23.4	0	0.0	0	0.0	8	17.0	1	2.1	1
AREA	28	9	12	10	111.1	33.3	0	0.0	0	0.0	1	11.1	0	0.0	0
ARRAYS	67	54	9	9	16.7	24.1	0	0.0	0	0.0	3	5.6	3	5.6	1
BANNER	106	56	9	9	16.1	25.0	0	0.0	0	0.0	2	3.6	7	12.5	1
BCAN	29	18	7	7	38.9	22.2	0	0.0	0	0.0	2	11.1	0	0.0	0
BCDCAY	19	9	7	7	77.8	44.4	0	0.0	0	0.0	1	11.1	1	11.1	0
BCEDGE	41	31	7	7	22.6	19.4	0	0.0	0	0.0	1	3.2	0	0.0	1
BCINIT	54	45	7	7	15.6	31.1	0	0.0	0	0.0	4	8.9	4	8.9	0
BCTIME	84	68	9	9	13.2	25.0	0	0.0	0	0.0	7	10.3	0	0.0	1
BCUSER	103	97	9	9	9.3	26.8	0	0.0	1	1.0	9	9.3	12	12.4	1
BCVAL	19	9	7	7	77.8	33.3	0	0.0	0	0.0	0	0.0	1	11.1	0
BCVAR	78	60	9	9	15.0	15.0	0	0.0	0	0.0	4	6.7	0	0.0	1
BODYF	45	32	7	7	21.9	25.0	0	0.0	0	0.0	2	6.3	2	6.3	1
CYCLE	34	22	11	10	45.5	40.9	0	0.0	0	0.0	3	13.6	1	4.5	0
DATTIM	17	5	10	6	120.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0	0
DENSTY	59	46	7	7	15.2	23.9	0	0.0	0	0.0	1	2.2	0	0.0	0
DIFH	54	41	7	7	17.1	31.7	0	0.0	0	0.0	2	4.9	0	0.0	1
DISPER	60	34	12	10	29.4	20.6	0	0.0	0	0.0	1	2.9	0	0.0	0
DOMAIN	131	109	9	9	8.3	15.6	0	0.0	0	0.0	2	1.8	0	0.0	2
DOMBND	36	24	9	9	37.5	20.8	0	0.0	0	0.0	1	4.2	0	0.0	0
ERROR	36	20	9	9	45.0	45.0	0	0.0	0	0.0	2	10.0	1	5.0	0
EVPFC	31	19	7	7	36.8	31.6	0	0.0	0	0.0	1	5.3	0	0.0	0
EVPHL	47	36	7	7	19.4	25.0	0	0.0	0	0.0	1	2.8	3	8.3	0
EVPQF	59	45	7	7	15.6	26.7	0	0.0	0	0.0	4	8.9	4	8.9	1
EVPTCS	45	28	10	10	35.7	32.1	0	0.0	0	0.0	2	7.1	1	3.6	0

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EXIST	18	6	9	9	150.0	50.0	0	0.0	0	0.0	0	0.0	1	16.7	0
EXPM	22	11	10	10	90.9	36.4	0	0.0	0	0.0	1	9.1	0	0.0	0
FDHC	24	11	7	7	63.6	27.3	0	0.0	0	0.0	0	0.0	0	0.0	0
FDSL	75	59	10	10	16.9	11.9	0	0.0	0	0.0	1	1.7	0	0.0	1
FDSL2	32	19	9	9	47.4	15.8	0	0.0	0	0.0	0	0.0	0	0.0	0
FDSP	50	33	7	7	21.2	18.2	0	0.0	0	0.0	1	3.0	0	0.0	0
FIXF	54	38	9	9	23.7	28.9	0	0.0	0	0.0	5	13.2	0	0.0	0
FIXF2	21	11	9	9	81.8	36.4	0	0.0	0	0.0	1	9.1	1	9.1	0
FIXFI	36	22	9	9	40.9	22.7	0	0.0	0	0.0	2	9.1	1	4.5	0
FIXNOD	21	8	9	9	112.5	25.0	0	0.0	0	0.0	0	0.0	0	0.0	0
FLOW	41	27	6	6	22.2	25.9	0	0.0	0	0.0	2	7.4	0	0.0	0
FLXBL	123	75	9	9	12.0	29.3	0	0.0	1	1.3	5	6.7	4	5.3	1
FLXBL1	81	64	9	9	14.1	29.7	0	0.0	0	0.0	5	7.8	1	1.6	1
FLXBL2	22	11	9	9	81.8	18.2	0	0.0	0	0.0	1	9.1	0	0.0	0
FLXBL3	26	15	9	9	60.0	33.3	0	0.0	0	0.0	0	0.0	1	6.7	0
FSURF	69	58	8	8	13.8	27.6	0	0.0	0	0.0	6	10.3	3	5.2	1
GEOM	183	154	15	12	7.8	22.7	0	0.0	0	0.0	9	5.8	1	0.6	3
GETNAM	44	29	16	4	13.8	31.0	0	0.0	3	10.3	2	6.9	2	6.9	0
GETROW	33	9	21	16	177.8	33.3	0	0.0	0	0.0	0	0.0	0	0.0	0
GRID	72	64	9	9	14.1	26.6	0	0.0	0	0.0	4	6.3	5	7.8	1
HISTR2	69	43	9	9	20.9	23.3	0	0.0	1	2.3	1	2.3	2	4.7	1
HISTRY	71	58	9	9	15.5	24.1	0	0.0	1	1.7	4	6.9	3	5.2	1
ICE0	44	19	13	11	57.9	21.1	0	0.0	0	0.0	1	5.3	1	5.3	0
ICE1	71	47	13	11	23.4	25.5	0	0.0	0	0.0	4	8.5	4	8.5	1
ICE2	47	21	13	11	52.4	14.3	0	0.0	0	0.0	0	0.0	1	4.8	0
IDFILE	78	46	9	9	19.6	15.2	0	0.0	0	0.0	3	6.5	3	6.5	1
INIT	182	166	7	7	-4.2	25.3	0	0.0	0	0.0	12	7.2	11	6.6	2
INITL	31	20	9	9	45.0	45.0	0	0.0	0	0.0	2	10.0	3	15.0	0
INPUT	186	175	7	7	4.0	41.7	0	0.0	0	0.0	18	10.3	21	12.0	2
INPUT2	15	5	9	9	180.0	60.0	0	0.0	0	0.0	0	0.0	1	20.0	0
INPUT3	34	23	9	9	39.1	34.8	0	0.0	0	0.0	4	17.4	1	4.3	0
INPUTL	304	315	10	10	3.2	37.8	0	0.0	1	0.3	21	6.7	57	18.1	4
INPXYZ	34	31	9	9	29.0	64.5	0	0.0	0	0.0	2	6.5	9	29.0	0
INTABL	33	25	9	9	36.0	28.0	0	0.0	2	8.0	1	4.0	3	12.0	0
INTANG	20	10	9	9	90.0	30.0	0	0.0	0	0.0	2	20.0	0	0.0	0
INVERT	61	50	9	9	18.0	18.0	0	0.0	0	0.0	2	4.0	0	0.0	1
IOOPEN	50	35	9	9	25.7	25.7	0	0.0	0	0.0	5	14.3	3	8.6	0
ITABL2	56	44	9	9	20.5	20.5	0	0.0	1	2.3	1	2.3	2	4.5	1
ITABLE	29	14	9	9	64.3	14.3	0	0.0	0	0.0	0	0.0	1	7.1	0
LOCATE	44	31	9	9	29.0	32.3	0	0.0	0	0.0	2	6.5	4	12.9	0
LOCFIL	16	6	9	9	150.0	33.3	0	0.0	1	16.7	0	0.0	1	16.7	0
LOCFLD	24	11	10	10	90.9	27.3	0	0.0	0	0.0	0	0.0	1	9.1	0



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LOCNP	16	5	9	9	180.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0	0
LOCXYZ	55	45	9	9	20.0	37.8	0	0.0	5	11.1	2	4.4	6	13.3	0
LOCZN	27	16	9	9	56.3	25.0	0	0.0	0	0.0	2	12.5	0	0.0	0
MEANF	103	89	7	7	7.9	30.3	0	0.0	0	0.0	4	4.5	0	0.0	1
MODF	41	31	7	7	22.6	41.9	0	0.0	0	0.0	1	3.2	0	0.0	0
MODFL	85	73	9	9	12.3	43.8	0	0.0	0	0.0	1	1.4	0	0.0	1
MODFLX	18	8	7	7	87.5	37.5	0	0.0	0	0.0	0	0.0	0	0.0	0
MODIL	18	7	9	9	128.6	42.9	0	0.0	0	0.0	1	14.3	0	0.0	0
NEPCLC	41	30	11	8	26.7	33.3	0	0.0	0	0.0	4	13.3	1	3.3	0
NOPCNV	162	92	72	41	44.6	22.8	0	0.0	1	1.1	3	3.3	5	5.4	1
NORM	21	11	40	25	227.3	27.3	0	0.0	2	18.2	2	18.2	0	0.0	0
OPENIO	15	6	7	2	33.3	16.7	0	0.0	0	0.0	0	0.0	0	0.0	0
OUTDGN	161	129	9	9	7.0	25.6	0	0.0	1	0.8	14	10.9	5	3.9	1
OUTF1	31	20	9	9	45.0	35.0	0	0.0	0	0.0	2	10.0	2	10.0	0
OUTF2	18	7	9	9	128.6	42.9	0	0.0	0	0.0	1	14.3	0	0.0	0
OUTMOD	40	13	13	11	84.6	38.5	0	0.0	0	0.0	2	15.4	0	0.0	0
OUTPTL	131	104	15	15	14.4	30.8	0	0.0	0	0.0	6	5.8	8	7.7	1
OUTPUT	88	57	13	13	22.8	35.1	0	0.0	0	0.0	7	12.3	7	12.3	1
OUTSAV	68	43	9	9	20.9	20.9	0	0.0	1	2.3	4	9.3	2	4.7	1
OUTVAR	29	17	9	9	52.9	41.2	0	0.0	0	0.0	1	5.9	2	11.8	0
OUTVX	21	9	11	11	122.2	33.3	0	0.0	1	11.1	0	0.0	1	11.1	0
P2H2P	38	25	8	8	32.0	28.0	0	0.0	0	0.0	3	12.0	0	0.0	0
P2HC	34	21	8	8	38.1	33.3	0	0.0	0	0.0	3	14.3	0	0.0	0
PDATUM	20	7	8	8	114.3	28.6	0	0.0	0	0.0	0	0.0	0	0.0	0
PLALFA	71	42	12	10	23.8	28.6	0	0.0	0	0.0	1	2.4	0	0.0	1
PLAREA	8	6	0	0	0.0	33.3	0	0.0	0	0.0	1	16.7	0	0.0	0
PLDEF	18	7	6	6	85.7	14.3	0	0.0	0	0.0	0	0.0	0	0.0	0
PLPRF	83	52	12	10	19.2	34.6	0	0.0	0	0.0	4	7.7	0	0.0	1
PLPRF2	36	12	12	10	83.3	16.7	0	0.0	0	0.0	0	0.0	0	0.0	0
PLPRP	82	57	12	10	17.5	33.3	0	0.0	0	0.0	4	7.0	1	1.8	1
PLPRP2	18	9	6	6	66.7	33.3	0	0.0	0	0.0	0	0.0	1	11.1	0
PORVOL	18	8	7	7	87.5	25.0	0	0.0	0	0.0	0	0.0	0	0.0	0
PRESCAN	298	250	9	9	3.6	17.6	0	0.0	1	0.4	11	4.4	6	2.4	2
PRINT	153	60	12	10	16.7	26.7	0	0.0	0	0.0	9	15.0	2	3.3	2
PRINTL	192	134	9	9	6.7	26.9	0	0.0	2	1.5	11	8.2	10	7.5	2
PRNTZN	16	5	7	7	140.0	60.0	0	0.0	0	0.0	0	0.0	1	20.0	0
PRNXYZ	22	13	9	9	69.2	30.8	0	0.0	0	0.0	0	0.0	3	23.1	0
PROPER	109	78	13	11	14.1	17.9	0	0.0	0	0.0	4	5.1	2	2.6	1
PROPIN	29	22	7	7	31.8	36.4	0	0.0	0	0.0	1	4.5	4	18.2	0
PROPZN	36	25	8	8	32.0	24.0	0	0.0	0	0.0	3	12.0	1	4.0	0
PTHRMO	22	11	7	7	63.6	36.4	0	0.0	0	0.0	0	0.0	1	9.1	0
QHEAT	33	10	12	10	100.0	20.0	0	0.0	0	0.0	0	0.0	0	0.0	0

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READ10	27	12	9	9	75.0	33.3	0	0.0	0	0.0	2	16.7	0	0.0	0
RESDEU	100	88	11	11	12.5	33.0	0	0.0	0	0.0	7	8.0	6	6.8	1
ROUND	23	14	9	9	64.3	21.4	0	0.0	0	0.0	1	7.1	1	7.1	0
RSDEQN	32	8	12	10	125.0	12.5	0	0.0	0	0.0	0	0.0	0	0.0	0
SCNTRL	60	50	9	9	18.0	28.0	0	0.0	4	8.0	6	12.0	6	12.0	0
SETFIN	41	31	7	7	22.6	22.6	0	0.0	0	0.0	1	3.2	2	6.5	0
SETFLX	55	43	8	8	18.6	32.6	0	0.0	2	4.7	4	9.3	3	7.0	0
SETFNC	58	46	10	10	21.7	37.0	0	0.0	0	0.0	3	6.5	1	2.2	1
SETFT	118	101	10	10	9.9	23.8	0	0.0	3	3.0	6	5.9	2	2.0	1
SETFX	35	25	8	8	32.0	28.0	0	0.0	0	0.0	0	0.0	3	12.0	0
SETOPR	15	8	6	6	75.0	50.0	0	0.0	0	0.0	1	12.5	0	0.0	0
SETYPE	33	36	7	7	19.4	66.7	0	0.0	0	0.0	1	2.8	13	36.1	0
SF1HC	58	34	13	11	32.4	14.7	0	0.0	0	0.0	2	5.9	0	0.0	1
SF1HT	44	26	8	8	30.8	11.5	0	0.0	0	0.0	1	3.8	0	0.0	0
SF2ALF	65	40	13	11	27.5	20.0	0	0.0	0	0.0	3	7.5	0	0.0	1
SF2HC	63	37	13	11	29.7	24.3	0	0.0	0	0.0	3	8.1	0	0.0	1
SF2KR	89	64	13	11	17.2	23.4	0	0.0	0	0.0	6	9.4	2	3.1	1
SF2P2	43	19	13	11	57.9	15.8	0	0.0	0	0.0	1	5.3	0	0.0	0
SFHTIN	221	212	13	11	5.2	32.1	0	0.0	0	0.0	19	9.0	23	10.8	2
SFNEW	34	21	12	9	42.9	42.9	0	0.0	0	0.0	1	4.8	3	14.3	0
SGMRES	481	281	195	110	39.1	18.9	0	0.0	3	1.1	2	0.7	2	0.7	3
SLVADI	92	76	13	10	13.2	26.3	0	0.0	0	0.0	3	3.9	0	0.0	2
SLVCHL	155	100	59	26	26.0	25.0	0	0.0	0	0.0	6	6.0	5	5.0	2
SLVEXT	72	12	46	29	241.7	25.0	0	0.0	0	0.0	1	8.3	0	0.0	0
SLVGMR	100	50	46	27	54.0	18.0	0	0.0	0	0.0	3	6.0	0	0.0	1
SLVGSE	183	120	66	28	23.3	26.7	0	0.0	2	1.7	9	7.5	8	6.7	2
SLVPRE	59	44	9	9	20.5	15.9	0	0.0	0	0.0	2	4.5	0	0.0	1
SLVSOR	27	14	9	9	64.3	21.4	0	0.0	0	0.0	0	0.0	0	0.0	0
SOLVE	75	37	13	11	29.7	24.3	0	0.0	1	2.7	3	8.1	2	5.4	1
SORINJ	16	6	7	7	116.7	33.3	0	0.0	0	0.0	0	0.0	0	0.0	0
SOURCE	97	84	9	9	10.7	29.8	0	0.0	3	3.6	8	9.5	6	7.1	1
SOURCEF	40	25	9	9	36.0	28.0	0	0.0	0	0.0	2	8.0	0	0.0	0
SOURCI	77	68	9	9	13.2	25.0	0	0.0	0	0.0	5	7.4	7	10.3	1
SOURCS	61	34	9	9	26.5	23.5	0	0.0	2	5.9	2	5.9	2	5.9	1
STORAG	15	5	7	7	140.0	40.0	0	0.0	0	0.0	0	0.0	0	0.0	0
TABLE2	50	34	9	9	26.5	14.7	0	0.0	1	2.9	0	0.0	1	2.9	0
TABLES	73	52	10	10	19.2	13.5	0	0.0	0	0.0	3	5.8	1	1.9	1
TBLIN	67	54	10	10	18.5	22.2	0	0.0	0	0.0	4	7.4	2	3.7	1
TIMSTP	17	12	3	3	25.0	33.3	0	0.0	0	0.0	2	16.7	0	0.0	0
TRACK	36	19	9	9	47.4	42.1	0	0.0	0	0.0	3	15.8	3	15.8	0
TRACK0	100	73	9	9	12.3	32.9	0	0.0	0	0.0	3	4.1	14	19.2	1
TRACK1	218	188	8	8	4.3	29.3	0	0.0	17	9.0	26	13.8	6	3.2	3

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TRACK2	19	17	0	0	0.0	29.4	0	0.0	0	0.0	3	17.6	0	0.0	0
VEL	60	39	12	10	25.6	23.1	0	0.0	0	0.0	1	2.6	0	0.0	0
VSALFA	37	23	8	8	34.8	30.4	0	0.0	0	0.0	3	13.0	1	4.3	0
WINDOW	29	16	9	9	56.3	31.3	0	0.0	0	0.0	1	6.3	0	0.0	0
XALFA	30	7	13	11	157.1	28.6	0	0.0	0	0.0	0	0.0	0	0.0	0
XALFA2	54	26	13	11	42.3	15.4	0	0.0	0	0.0	1	3.8	1	3.8	0
XALFF	30	7	13	11	157.1	28.6	0	0.0	0	0.0	0	0.0	0	0.0	0
XALFF2	30	7	13	11	157.1	28.6	0	0.0	0	0.0	0	0.0	0	0.0	0
XALFT	20	10	7	7	70.0	40.0	0	0.0	0	0.0	1	10.0	1	10.0	0
XNEXT	9	6	2	2	33.3	33.3	0	0.0	0	0.0	1	16.7	0	0.0	0
XSIDE	24	15	8	8	53.3	33.3	0	0.0	0	0.0	3	20.0	1	6.7	0
XYPLOT	144	119	9	9	7.6	21.8	0	0.0	4	3.4	7	5.9	4	3.4	1
ZONE	105	95	8	8	8.4	28.4	0	0.0	0	0.0	7	7.4	6	6.3	2

## Legend of Metrics in Report

loc -- lines of code  
 sloc -- number of executable statements  
 cmnt -- total number of comments  
 ncomt -- number of non-blank COMMENT statements  
 $100 \times \text{ncomt} / \text{sloc}$  -- percent, nonblank comments to number of executable statements  
 $100 \times \text{vg2} / \text{sloc}$  -- percent, extended complexity of number of executable statements  
 cgoto -- number of COMPUTED GO TO statements  
 $100 \times \text{cgoto} / \text{sloc}$  -- percent, computed GOTO's to number of executable statements  
 ugoto -- number of UNCONDITIONAL GO TO statements  
 $100 \times \text{ugoto} / \text{sloc}$  -- percent, unconditional GOTO's to number of executable statements  
 bIF -- number of BLOCK IF statements  
 $100 \times \text{bif} / \text{sloc}$  -- percent, Block IF statements to number of executable statements  
 lIF -- number of LOGICAL IF statements  
 $100 \times \text{lif} / \text{sloc}$  -- percent, logical IF statements to number of executable statements  
 Bhat -- Halstead's predicted number of errors in writing code