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TASK COMPLETION REPORT FOR UPDATE FXTPTM

Robert G. Steinke, TSA-10

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FOR UPDATE FXTPTM**

by

Robert G. Steinke

August 29, 1997

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TASK COMPLETION REPORT FOR UPDATE FXTPTM

Robert G. Steinke

ABSTRACT

Update FXTPTM corrects a trip pointer error in subroutine TIMCHK that prevented the trip-initiated, problem-termination feature from functioning in TRAC-P.

1.0. INTRODUCTION

Knolls Atomic Power Laboratory reported that the trip-initiated, problem-termination feature was not functioning in TRAC-P, Version 5.4.15. A listing of the modified input data for the DRAIN standard test problem and the TRCMSG file output was provided that demonstrated that the TRAC-P calculation did not terminate when the problem-termination designated trip's set status was set to ON_{forward}. The assigned task was to investigate and correct this nonfunctioning feature in TRAC-P, Version 5.4.28.

2.0. UPDATE FXTPTM

The cause of the trip-initiated, problem-termination feature not functioning was traced to a misdefined pointer variable in subroutine TIMCHK. When update UNITS programmed TRAC-PF1/MOD2, Version 5.4, to provide SI/English units input/output, all A-array pointer variables for the trip data needed to be shifted to provide additional storage space in the control-parameter data section for control-block and trip-signal, user-defined, units-name labels. The trip pointer variable in subroutine TIMCHK did not have this shift modification done to it by update UNITS, and none of the UNITS test problems exercised this trip-initiated, problem-termination feature. Appendix A shows a listing of update FXTPTM (FiX TriP TerMination) that corrects the definition of this pointer variable in subroutine TIMCHK.

3.0. TESTING

The DRAIN, MARVIK, and ZIONPWR standard test problems were modified to test the trip-initiated, problem-termination feature correction of update FXTPTM. Appendix B shows a listing of portions of their TRACIN files that were modified, and the end portion of their terminal-output listings where the controlling trip, after its set status was set to ON_{forward}, terminated the calculation at the start of the

next timestep. The DRAIN test problem was modified in the same manner as the KAPL test problem. The MARVIK test problem defined two trips where the first trip, when set to ON_{forward} at 10 s, only generated a restart data dump; the second trip, when set to ON_{forward} at 15 s, generated a restart data dump and terminated the calculation. The ZIONPWR test problem used an existing pump-controlling trip to terminate the calculation when the pump trip's set status was set to ON_{forward}. All three of these test problems show that the trip-initiated, restart-dump and problem-termination feature in TRAC-P is now functioning correctly.

4.0. CONCLUSIONS

The trip-initiated, problem-termination feature in TRAC-P, Version 5.4.28 has been fixed by update FXTPTM. The feature was not functioning because update UNITS in TRAC-PF1/MOD2, Version 5.4 did not shift a trip pointer variable in subroutine TIMCHK.

ACKNOWLEDGMENT

The author wishes to thank Richard J. Smith for valuable discussions during the development and testing of this TRAC-P update.

APPENDIX A

Listing of Update FXTPTM

```

*ident fxtptm
*/ -----Update Header Rev. 02-01-96----
*/
*/   File & Update Ident name (must be the same): fxtptm
*/   TSHOOTER identifier:
*/
*/   Code developer: Bob Steinke           Date developed: 6/2/97
*/   Acknowledgements: KAPL reported this error
*/   Update reviewer:           Date reviewed: 6/xx/97
*/
*/   Update to be applied to MOD2 _X_ or other :
*/
*/   CFS file path: /073417
*/
*/   Purpose of update: Update fxtptm (Fix Trip Termination) corrects
*/                       a pointer error in subroutine TIMCHK that
*/                       prevented a trip when set ON from terminating
*/                       a TRAC-P calculation.
*/
*/   Basis for update:  A designated trip for terminating a TRAC-P
*/                       calculation did not terminate the calculation
*/                       when its set status changed from OFF to ON.
*/
*/   Dependencies on other updates: none
*/
*/   Justification of non-ANSI coding: N.A.
*/
*/   Is this a NULL update?  YES___ NO _X_
*/
*/   Does this update generate new unit labels?  YES___ NO _X_
*/   If yes, path and /name of LABNEW file: N.A.
*/
*/   Does the TRAC I/O change because of this update?  YES ___ NO _X_
*/   TRAC I/O includes input, dump, output, and graphics files.  If
*/   yes, then submit the necessary manual changes.
*/
*/   Does this change require that any of the TRAC support codes, e.g.
*/   EXTRACT, GOCNVRT, or EXCON, be changed?  YES ___ NO _X_
*/   If yes, then include a description of the necessary changes.
*/   This description will be passed onto the custodian of the TRAC
*/   support codes.
*/
*/   Does the TRAC User's Guide, Theory Manual, or Programmer's Guide
*/   change because of this update?  YES ___ NO _X_
*/   If yes, then submit the necessary manual changes.
*/
*/   NAME OF
*/   SUBROUTINE
*/   OR COMDECK
*/   CHANGED      DESCRIPTION OF CHANGE
*/
*/   TIMCHK      A pointer variable definition is corrected.
*/ -----
*/
*/   subroutine timchk changes
*/   delete ifrd.628

```

timchk

```
1=lcntl+10+6*ia(lcntl+5)+7*ia(lcntl+1)+17*ia(lcntl+2)+ia(lcntl+3)
1      +6*ia(lcntl+2)+ia(lcntl+4)+5*ia(lcntl+6)-80
*compile timchk
*/ -----
```


APPENDIX B **Portions of the TRACIN File and Terminal Listings** **From the DRAIN, MARVIK, and ZIONPWR Test Problems**

**DRAIN test problem - changed ntrp=0 to 1 on line 74
and added lines 90 to 112 in file DRAININ**

```

71 *          oitmax          sitmax          isolut          ncontr          nccfl
72 *          10             10             0             0             0
73 *          ntsv           ntcb           ntcf           ntrp           ntcp
74 *          1             0             0             1             1
75 *
76 *
77 * component-number data *
78 *
79 *
80 * iorder*          700          701          702e
81 *
82 *
83 * control-parameter data *
84 *
85 *
86 * signal variables
87 *          idsv          isvn          ilcn          icn1          icn2
88 *          1             0             0             0             0
89 *
90 * trips
91 *
92 *          ntse          ntct          ntsf          ntdp          ntsd
93 *          0             0             0             1             0
94 *
95 *          idtp          isrt          iset          itst          idsg
96 *          220          2             0             1             1
97 *          setp(1)      setp(2)
98 *          -1.0000e+00  1.2000e+02
99 *          dtsp(1)      dtsp(2)
100 *          0.0000e+00  0.0000e+00
101 *          ifsp(1)      ifsp(2)
102 *          0             0
103 *
104 *          ndmp          trip id 220 should cause trac-p to terminate
105 *          1
106 *          idmp
107 *          -220
108 *
109 * This input is -abs(220) = - the absolute value of the trip id.  If
110 * the absolute value is made negative, the trip initiates a problem
111 * termination (which we want) after generating a restart dump.
112 *
113 *
114 * component data *
115 *

```

End of terminal output from test problem DRAININ

```

1897  90.268514  0.100000  2
1900  90.568514  0.100000  2          0.1340  0.0000  1  700  6

```

1910	91.568514	0.100000	2	0.2111	0.0000	1	700	6
1920	92.568514	0.100000	2	0.2764	0.0000	1	700	6
1930	93.568514	0.100000	2	0.2843	0.0000	1	700	6
1940	94.568514	0.100000	2	0.2765	0.0000	1	700	6
1947	95.268514	0.100000	2					
1950	95.568514	0.100000	3	0.0334	0.0000	1	700	5
1960	96.568514	0.100000	3	0.0334	0.0000	1	700	5
1970	97.568514	0.100000	3	0.0334	0.0000	1	700	5
1980	98.568514	0.100000	3	0.0334	0.0000	1	700	5
1990	99.568514	0.100000	3	0.0334	0.0000	1	700	5
1997	100.268514	0.100000	2					
2000	100.568514	0.100000	2	0.0334	0.0000	1	700	5
2010	101.568514	0.100000	3	0.0334	0.0000	1	700	5
2020	102.568514	0.100000	2	0.0334	0.0000	1	700	5
2030	103.568514	0.100000	3	0.0334	0.0000	1	700	5
2040	104.568514	0.100000	2	0.0334	0.0000	1	700	5
2047	105.268514	0.100000	3					
2050	105.568514	0.100000	3	0.0225	0.0000	1	700	6
2060	106.568514	0.100000	2	0.0017	0.0000	1	700	6
2070	107.568514	0.100000	3	0.0225	0.0000	1	700	6
2080	108.568514	0.100000	2	0.0017	0.0000	1	700	6
2090	109.568514	0.100000	3	0.0226	0.0000	1	700	6
2097	110.268514	0.100000	2					
2100	110.568514	0.100000	2	0.0051	0.0000	1	700	6
2110	111.568514	0.100000	2	0.0011	0.0000	1	700	2
2120	112.568514	0.100000	2	0.0030	0.0000	1	700	6
2130	113.568514	0.100000	2	0.0042	0.0000	1	700	6
2140	114.568514	0.100000	2	0.0060	0.0000	1	700	6
2147	115.268514	0.100000	2					
2150	115.568514	0.100000	2	0.0081	0.0000	1	700	6
2160	116.568514	0.100000	2	0.0110	0.0000	1	700	6
2170	117.568514	0.100000	2	0.0151	0.0000	1	700	6
2180	118.568514	0.100000	2	0.0215	0.0000	1	700	6
2190	119.568514	0.100000	2	0.0328	0.0000	1	700	6

at 120.000000 s, the trip 220 signal crossed setpoint s2 = 1.200000E+02 *
at 120.068514 s, the trip 220 signal is 1.200685E+02 *

at 120.068514 s, trip 220 is reset from 0 to 1 with a set status of on-forward

restart dump generated at problem time 120.168514 s after 2196 time steps

time-step number	problem time (s)	time-step size (s)	outer-it. number	it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp
2196	120.168514	0.100000	2						cell

end of problem

computative timing statistics
cpu time is s

Note: IEEE floating-point exception traps enabled:
overflow; division by zero; invalid operation;
See the Numerical Computation Guide, ieee_handler(3M)

castor:/export/castor1/rgs/trac> mv trcout drainout

MARVIK test problem - changed ntsv=0 to 1 and ntrp=0 to 2 on line 91
and added lines 99 to 137 in file MARVIKIN

```

88 *      oitmax      sitmax      isolut      ncontr      nccfl
89      30          80          0          0          0
90 *      ntsv      ntcbl      ntcfl      ntrp      ntcp
91      1          0          0          2          0
92 *
93 *****
94 * component-number data *
95 *****
96 *
97 * iorder*          1          2          3          4e
98 *
99 *****
100 * signal variable *
101 *****
102 *
103 *      idsv      isvn      ilcn      icn12      icn2
104      1          0          0          0          0
105 *
106 *****
107 * trips *
108 *****
109 *
110 *      ntse      ntct      ntsf      ntdp      ntsd
111      0          0          0          2          0
112 *
113 *      idtp      isrt      iset      itst      idsg
114      1          2          0          1          1
115 *      setp(1)      setp(2)
116      0.0000e+00      1.0000e+01
117 *      dtsp(1)      dtsp(2)
118      0.0000e+00      0.0000e+00
119 *      ifsp(1)      ifsp(2)
120      0          0
121 *
122 *      idtp      isrt      iset      itst      idsg
123      2          2          0          1          1
124 *      setp(1)      setp(2)
125      0.0000e+00      1.5000e+01
126 *      dtsp(1)      dtsp(2)
127      0.0000e+00      0.0000e+00
128 *      ifsp(1)      ifsp(2)
129      0          0
130 *
131 *
132 *      two trips - trip id 1 is set on at 10 s to generate a
133 *      restart data dump and trip id 2 is set on at 15 s to
134 *      generate a restart data dump and terminate the calc.
135 *      ndmp
136      2
137 *      idmp(1)      idmp(2)
138      1          -2
139 *
140 *****
141 * component data *
142 *****

```

End of terminal output from test problem MARVIKIN

input data is being processed

h2o properties are used

restart dump generated at problem time 0.000000 s after 0 time steps

minimum		maximum		time domain data to be used		
time	time	time	long	graphics	dump	short
step (s)	step (s)	end (s)	edit	edit	edit	edit
1.000E-03	1.000E+00	1.000E-01	1.000E-01	1.000E-01	1.000E-01	1.000E-01

convective energy-error controller is 1.0000E+20 w

time-step	problem	time-step	outer-it.	cpu
number	time (s)	size (s)	number	time (s)
1	0.001000	0.001000	3	
2	0.002050	0.001050	3	
3	0.003153	0.001103	2	
4	0.004310	0.001158	2	
5	0.005526	0.001216	3	

restart dump generated at problem time 0.101200 s after 38 time steps

minimum		maximum		time domain data to be used		
time	time	time	long	graphics	dump	short
step (s)	step (s)	end (s)	edit	edit	edit	edit
1.000E-03	1.000E+00	5.600E+01	5.000E+00	5.000E-01	1.000E+01	1.000E+00

convective energy-error controller is 1.0000E+20 w

time-step	problem	time-step	outer-it.	cpu
number	time (s)	size (s)	number	time (s)
88	1.122178	0.053215	1	
102	2.217262	0.105362	2	
110	3.273677	0.155667	2	
116	4.385453	0.208609	2	
120	5.329539	0.253565	2	
124	6.477082	0.308210	2	
128	7.790086	0.346010	2	
131	8.935421	0.400549	3	
134	10.261289	0.463686	2	

restart dump generated at problem time 10.261289 s after 134 time steps

at 10.000000 s, the trip 1 signal crossed setpoint s2 = 1.000000E+01 *

at 10.261289 s, the trip 1 signal is 1.026129E+01 *

at 10.261289 s, trip 1 is reset from 0 to 1 with a set status of on-forward

time-step	problem	time-step	outer-it.	cpu
number	time (s)	size (s)	number	time (s)
135	10.748160	0.486870	3	

restart dump generated at problem time 10.748160 s after 135 time steps

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)
137	11.796148	0.536774	2	
139	12.951554	0.591794	3	
141	13.958118	0.472437	2	
143	14.975039	0.520862	2	

at 15.000000 s, the trip 2 signal crossed setpoint s2 = 1.500000E+01 *

at 15.521944 s, the trip 2 signal is 1.552194E+01 *

at 15.521944 s, trip 2 is reset from 0 to 1 with a set status of on-forward

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)
145	16.068849	0.546905	2	

restart dump generated at problem time 16.068849 s after 145 time steps

end of problem

computative timing statistics

cpu time is s

Note: IEEE floating-point exception traps enabled:

overflow; division by zero; invalid operation;

See the Numerical Computation Guide, ieee_handler(3M)

castor:/export/castor1/rgs/trac> mv trcout marvikout

**ZIONPWR test problem - changed ntdp=0 to 1 on line 1444
and added lines 1467 to 1471 in file ZIONPWRIN**

```

1441 * trips
1442 *
1443 *          ntse          ntct          ntsf          ntdp          ntsd
1444 *          1              0              0              1              0
1445 *
1446 * trip controlling the pump and defining signal-variable ids 551 & 561
1447 *          idtp          isrt          iset          itst          idsg
1448 *          1              1              0              2              1
1449 *          lutrpsig
1450 *          lutemp
1451 *          setp(1)          setp(2)
1452 *          5.5050e+02      5.5060e+02
1453 *          dtsp(1)          dtsp(2)
1454 *          0.0000e+00      0.0000e+00
1455 *          ifsp(1)          ifsp(2)
1456 *          0              0
1457 *
1458 *          idse          inse          incn
1459 *          1              1              1
1460 *          ise(1,1)      ise(2,1)      ise(3,1)
1461 *          2              231          801
1462 *          lscn(1)
1463 *          lutempd
1464 *          scn(1)
1465 *          5.5556e-20
1466 *

```

```

1467 *      ndmp      terminate the calculation when trip id 1 is set on
1468      1
1469 *      idmp
1470      -1
1471 *
1472 *****
1473 * component data *
1474 *****

```

End of terminal output from test problem ZIONPWRIN

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp cell
5	0.005000	0.001000	2					

time domain data to be used							
minimum time	maximum time	time domain	long edit	graphics edit	dump edit	short edit	
step (s)	step (s)	end (s)	step (s)	step (s)	step (s)	step (s)	
1.000E-03	2.500E-01	2.000E+01	2.100E+01	5.000E-01	2.100E+01	2.100E+01	

convective energy-error controller is 1.0000E+20 w

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp cell
10	0.010000	0.001000	2		0.0053	0.0053	0	2 3
20	0.022027	0.001551	2		0.0080	0.0080	0	2 3
30	0.041539	0.002527	2		0.0137	0.0138	0	3 3
40	0.073323	0.004116	2		0.0219	0.0219	0	2 3
50	0.125095	0.006705	1		0.0357	0.0357	0	2 3
60	0.209427	0.010921	1		0.0582	0.0582	0	2 3
70	0.346794	0.017790	1		0.0948	0.0950	0	3 3
80	0.570551	0.028978	1		0.1545	0.1554	0	3 3
90	0.935027	0.047201	1		0.2516	0.2544	0	3 3
100	1.528721	0.076886	1		0.4099	0.4169	0	3 3
110	2.495786	0.125239	1		0.6678	0.6854	0	3 3

at 3.894929 s, the trip 1 signal crossed setpoint s1 = 5.505000E+02 k
at 4.071032 s, the trip 1 signal is 5.504990E+02 k

at 4.071032 s, trip 1 is reset from 0 to 1 with a set status of on-forward

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp cell
120	4.071032	0.204002	1		1.0879	1.1331	1	3 4

restart dump generated at problem time 4.275034 s after 121 time steps

time-step number	problem time (s)	time-step size (s)	outer-it. number	cpu time (s)	courant 1-d	numbers 3-d	sets flag	location cmp cell
121	4.275034	0.204002	1					

end of problem

computative timing statistics
cpu time is s

Note: IEEE floating-point exception traps enabled:
overflow; division by zero; invalid operation;

See the Numerical Computation Guide, ieee_handler(3M)

```
castor:/export/castor1/rgs/trac> mv trcout zionpwout
```