

RETRAN-3D CODE TROUBLE REPORTS

R3D-TRF-003, Revision 78
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Prepared for
RETRAN/VIPRE User Group

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RETRAN-3D MOD004.9 Trouble Report List

The following table summarizes the status of all trouble reports that have been filed since RETRAN-3D MOD004.9 was released, in addition to those that were not resolved. New trouble reports or those whose status have changed since the previous trouble report list was issued are identified with **bold** trouble report numbers.

A complete list of trouble reports and their status is included on the RETRAN-3D MOD004.9 transmittal. It is an Acrobat pdf file that contains trouble reports 1 through 701.

The **Part 21 Status Codes** regarding relevance to 10CFR Part 21, *Reporting of Defects and Noncompliance*, are interpreted as follows;

- 1) "not a safety issue"
- 2) "potentially a substantial safety issue"
- 3) "indeterminate defect, which must be evaluated by licensee"

Code errors that are determined to pose a potential substantial safety issue are assigned a **Part 21 Status Code** of 2 and must be reported directly to the U.S. Nuclear Regulatory Commission. To date, no such error has been discovered in the RETRAN-3D code.

Indeterminate defects are assigned a **Part 21 Status Code** of 3. They must be evaluated by each organization using RETRAN-3D to determine whether or not the defect is reportable per the requirements of 10CFR21, based on the organization's use of the code version (or related version) identified above.

Copies of any preliminary modifications are available from Numerical Advisory Solutions, the RETRAN User Group Engineering Contractor. Please contact Mike Howard at (208) 419-4012 or Pam Richardson at (208) 419-4004; or via email at howardml@numerical.com or richardsonp@numerical.com, respectively.

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_685	<p>RETRAN-3D fails with a division by zero. This only occurs when using the MOC model (as the normal solver works fine) and can be bypassed by using time steps of 10-6 seconds. When the failure occurs, a forrtl division-by-zero message is provided, but nothing is appended to the error log.</p> <p>An examination of the source code revealed that the error occurs when the solution is reset to the beginning of the time step. Some indexes which are only used in the MOC model are not properly initialized, so a loop attempts to use increments of 0, which causes a fatal error before any error log can be written.</p> <p>Additionally, there was the potential for the water properties calculated by the MOC model to be outside the range of the RETRAN-3D water properties. This is a model limitation which could be mitigated using time step control. Lastly, due to inconsistent volume enthalpy values between the MOC model and the RETRAN flow equations, there could be nonphysical subcooling of two-phase particles due to flashing. This is also a modeling limitation, but it could be mitigated by checking the enthalpy of each particle against the liquid enthalpy in each volume and adjusting the particle energy addition accordingly.</p>	No	
tr_702	<p>This report describes three problems. The first problem was unexpected transient behavior reported by the user. The second and third problems were code errors discovered while investigating the first problem.</p> <p>1.The first problem involved the holdup of liquid over vapor on the steam generator secondary side. This caused unsteady behavior (oscillations and step changes) in the steam generator downcomer level.</p> <p>2.The bubble stack model will only process up to two bubble stacks. In subroutine inubfl.f90, lines 180 through 187 control the check to see if another bubble stack should be processed. If the next bubble stack card matches the value of the "next" local variable, then the code loops back to label 500. However, the "next" local variable is not updated. This causes the loop to process at most 2 bubble stacks. No code failure will be observed, but the output will only indicate that two bubble stacks are used.</p> <p>3.The bubble stack cards (06500X) do not require a corresponding bubble rise input card (060XXY) card if the stack is initially single-phase. However, if there are no 060XXY cards in the input deck, then the bubble stack cards are not processed. This causes a fatal error since the 06500X cards are not processed.</p>	No	mod_597

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_703	<p>When using the automatic subnodalization option, the user can specify to connect heat conductors to specific subnodes. However, if the user attempts to connect to the top subnode, the conductor is subnodalized again (since the top subnode has the same volume designation as the collection of subnodes).</p> <p>The trouble presents itself as fatal errors in the input processing. In the indicated output file, an infinite loop occurs while writing error messages.</p>	No	mod_604
tr_704	<p>Several errors were identified with the RETRAN-3D MOD004.9 manuals after release.</p> <ul style="list-style-type: none"> •Volume 1: <ul style="list-style-type: none"> oEquation II.2-48 appears to be missing a line. The static pressure difference and the momentum flux for volume k+1 are missing. oEquation VIII.4-172 is incorrect. The $6/Dhy$ should be a generic $A_{int-bar}$ term, and the equation should contain the derivatives of $A_{int-bar}$ as included in the code. •Volume 2: Appendix C was not updated to include the list of modifications for MOD004.9. •Volume 3: <ul style="list-style-type: none"> oThe note on page IV-31 is incorrect. WQCL and WQCR always reflect the heat addition of the primary conductor. oThe 2-D conductor inputs (Section IV.17.12) were based on preliminary change pages and not the final versions. The 2D conductor inputs as used in MOD004.9 are based on the stack model (Section IV.17.8). Section IV.7.12 should be removed, and Section IV.17.8 should reflect the 2D conductor inputs. oThe errors in C.3.5 are incomplete. Namely, errors 5026, 5027, and 5028 are missing from C.3.5. Volume 5: <ul style="list-style-type: none"> o In section II.3.1.4, the discussion on how to account for branching flow effects was truncated inappropriately. In particular, Equation II-3-10 from the MOD004.8 was removed, which is critical. o Equation III-7-4: the (i-1) should be in an exponent. 	No	mod_605

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_705	<p>During the verification of mod_597, additional errors were discovered. This trouble report was filed as a consequence in order to capture the dates accurately.</p> <p>It was observed that when multiple bubble stacks are used and they use different values of the first word (INITIAL, which indicates whether the bubble stack is initially full, initially empty, or partially full), the stacks are not initialized correctly. All stacks are initialized according to the flag of the last stack which was processed.</p> <p>Upon examination of subroutine inubl.f90, the istat value is a local integer which is set during the stack input processing loop but is only used after the loop has been finished. It should be an allocatable array so that one value may be saved per bubble stack.</p>	No	mod_597
tr_706	<p>When running a restart problem, sometimes the answers are inconsistent with the original run even if no changes were made. This can be seen readily with the TTWOB sample problem, in which the ttwob.rst file makes no changes to the original problem, yet visibly different results occur after 1.2 seconds in the reactivity.</p>	No	mod_601
tr_707	<p>During development of MOD004.9, the "debug" and "release" builds of RETRAN-3D gave slightly different results in the standard test suite. The differences were small, but in the 5 sample problems indicated above [accum, pipe, sp1, sp5, turb], the relative differences exceeded 0.1%. Generally, the differences were not visible when plotted, and the results were consistently repeatable, so they had been attributed to differences in optimization schemes (as the release version runs significantly faster).</p> <p>While investigating differences in compilers (see TR-708), it was discovered that the differences were solely because the debug configuration defaulted to using double precision for floating point numbers, while the release configuration defaulted to single precision. RETRAN-3D manually specifies all variables as using double precision, so an investigation was undertaken to determine if any were missed.</p> <p>It was found that although every variable was declared to be double precision, they were sometimes using single-precision constants. As an example, a value might be multiplied by 2.0 instead of 2.0d0. When all of these constants were converted to use double precision, the compiler setting for the default precision no longer made a difference.</p> <p>This issue was reproduced on both Linux and Windows machines.</p>	No	mod_600

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_708	<p>RETRAN-3D MOD004.9 was compiled using Version 14.0 of the Intel compiler. When using version 15.0, no differences are picked up with the standard COMPARE2 utility. However, when moving to version 16.0 and later, several differences appear. All results are visually similar when plotted, except for some points when the results were already noisy (such as the void fractions in the LRHR sample problem). A full list of differences is shown in M:\tsb\misc\ifort_version_testing\4.9.</p> <p>The compiler change logs do not indicate that the math libraries were updated between 15.0 and 16.0, whereas the change logs do indicate that the math libraries were updated between 14.0 and 15.0.</p> <p>Further investigation is needed to determine if the differences are due to a change in default compiler options or if underlying math libraries were changed.</p>	No	
tr_709	<p>When using multiple stratified pressurizers with the conduction solution, an access violation occurs which prevents code execution.</p> <p>The MIT pressurizer stratification V&V test problem was used to demonstrate this issue. All volume, junction, bubble rise, etc. cards were duplicated and renumbered. When the duplications are commented out, the model runs as documented in Volume 4. However, with the duplicated input, an access violate occurs while running the code.</p>	No	mod_611
tr_710	<p>If a volume is both a time-dependent volume (TDV) and a bubble rise volume, the quality on the TDV inputs should be mixture quality, as indicated in Volume 3. This is not reflected in the input processing in the attached file. With a quality of 0.1, it gives an error message if the mixture level is less than 19.9466 ft, which corresponds to the level for an *overall* quality of 0.1 (provided the mixture is saturated liquid). Further changes to the conditions were incorrect in the output.</p>	No	mod_603
tr_711	<p>When running a restart case, the following warning message is generated. However, the indicated card is not used on the original input or in the restart.</p> <p>WARNING, THE ENTRY ON SMALLR DATA CARD (000040) IS OUT OF RANGE A FULL OUTPUT LISTING WILL RESULT".</p>	No	mod_613

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_712	A REEDIT run failed indicating that the restart file was incompatible with MOD004.9. However, the restart file was generated with MOD004.9.	No	mod_613
	The error was determined to be in the input processing for the VIPRE boundary conditions for the REEDIT run. The VBC input (card 02600Y) is only permitted on the original input, but for REEDIT, the 02600Y card was not found, and the defaults were assumed. The number of VIPRE boundary conditions affects the restart file specification, so the mismatch causes an error.		
tr_713	In qdot37 (Chen heat transfer) line 239 there is a non-standard Fortran statement for the calculation of a partial derivative term. This calculation omits the necessary parenthesis with a negative exponentiation which may result in an unintended result, as Fortran will evaluate the multiplication before evaluating the exponent. This may result in NaNs and infinities in the partial derivative term. This only affects the initialization for the implicit steam generator model (JSST >= 2 on the 01000Y cards).	No	mod_602
	$dqdx1 = hc1*(ref8*dfxidx+dp8*ref**(-0.2d0*ffactor*drex dx)*dx dx*delt$		
	should be:		
	$dqdx1 = hc1*(ref8*dfxidx+dp8*ref**(-0.2d0)*ffactor*drex dx)*dx dx*delt$		
tr_714	The RETRAN and RESTRT cases had small output differences at the restart time of 0.5 s, involving: (a) four values (P, h, ρ, T) for accumulator Volume 134; and (b) the initial mixture qualities for Bubble Rise Volumes 1 (pressurizer Volume 22) and 2 – 4 (primary separator Volumes X71). What prevented these output values from being identical?	No	mod_601

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_715	<p>For stratified flows, the interfacial heat transfer coefficient and its derivative are incorrect in both the code and the documentation.</p> <p>In Section III.6.2.3.5 of Volume 1, eqn. III.6-59 uses D_hyd in the denominator, whereas in Ref. III.6-8, it uses a liquid hydraulic diameter. The documentation was corrected with mod_605.</p> <p>In the code (ifhtc.f90), something that is almost the liquid hydraulic diameter is used. However, there are two problems:</p> <ol style="list-style-type: none"> 1. The vapor volume fraction is used rather than the liquid volume fraction. 2. The subtended angle is incorrectly divided in half. <p>Likewise, its derivative is calculated incorrectly. In addition to inheriting the above issues, the derivative of the liquid hydraulic diameter is not multiplied by the superheat term.</p>	No	mod_631
tr_716	<p>In a stagnant volume, if the bubble velocity is calculated by a control block, an incorrect value (likely zero) is used for most of the steady state logic. The correct value is used during the transient calculation.</p> <p>A code review found that when performing the input processing, the "old" bubble velocity is set to the input VBUB word on the 060XXY cards before the control block setting the bubble velocity is read. During the steady state iterations, for volumes which have nonzero quality in inlet junctions below the mixture level, the code can calculate the bubble velocity to balance steady state based on the continuity equation, and will update the "old" bubble velocity calculation. However, for bubble rise volumes with trivial steam continuity equations (generally stagnant volumes or pure liquid volumes), the code cannot calculate a bubble velocity and will instead revert to the "old" value. If the "old" value is zero, then this can cause logic problems, as a zero bubble velocity is used in the code to signify that the bubble rise model is disabled (as part of a bubble stack).</p> <p>As mentioned, this error can affect stagnant bubble rise volumes and bubble rise volumes which are initially fully mixture (ZMIX = ZVOL). This is not a problem for pure liquid volumes, since the bubble rise model does not do anything different in that case. For stagnant volumes with an initial level, this can prevent steady state convergence from being reached.</p>	No	mod_615

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_717	<p>If the 08000X cards are used to deactivate enthalpy transport for a set of junctions, the wrong trip number is used. In the input supplied, an error message was issued saying that the specified trip was invalid (even though it was valid). Examination of the source code showed that it was comparing the specified trip ID against the internal trip index for each trip signal, which is incorrect.</p> <p>During the trouble report evaluation, a change was made to see if any other errors would occur if a subset of junctions were disabled through an incorrect trip activation. This resulted in an access violation.</p>	No	mod_614
tr_718	<p>In the input edits for the trips (in which RETRAN indicates how the trips are read and interpreted), the trip numbers do not correspond to anything useful. It corresponds to the ordinal number in which the trip cards were processed; e.g., if a deck contains the trip cards 040010, 049990, and 040500, then trip 1 would correspond to 040010, trip 2 would correspond to 040500, and trip 3 would correspond to 049990.</p> <p>This extends to the trip numbers reported in error 4006. In most other input errors in trip processing, the card number is provided with the error output; however, if an invalid trip ID is processed, then the card number is unavailable for error 4006 so only the trip number is provided, which can be difficult to trace to a card number.</p>	No	mod_619
tr_719	<p>The IUDC input in the separator input cards does not seem to affect results.</p> <p>A source code review found that the IUDC input was only used to provide the level indication in the steady state edit. The carryover and carryunder level multipliers in the source code were actually based on the level in the separator. Typically, the level multipliers are based on the upper downcomer level, since that is what is available during testing.</p>	No	mod_612
tr_720	<p>When running a case with the implicit SG initialization (JSST >= 2 on problem dimensions), index errors were encountered while running in debug mode. This is indicative of a coding error; however, if no data is written outside the bounds of the indicated array, then no results are impacted. Since steady state convergence is achieved, it is expected that results are not impacted.</p>	No	mod_630

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_721	When using 3D kinetics, the slip model within the core is forced to be HEM.	No	mod_607
	The error was introduced when the ability to change slip models on a junction basis (through the IFRJ input) was introduced in the code. Corresponding logic was not introduced to the channel model input processing, so the slip option defaults to zero (rather than the global slip option).		
tr_722	When using the flux edits (NED4>0 on the 670010 card), the outputs are not as expected.	No	mod_608
	<p>* When using NED4 = 1, the real/forward fluxes are not output at time = 0.0.</p> <p>* When using NED4 = 1, the fluxes are provided at every time step, rather than at the major edits.</p> <p>* When using NED4 > 0 and NADJNT (on 670021) =1, the fluxes are labeled as adjoint fluxes in the output, but the values after time 0 are actually real fluxes.</p> <p>* Leakage rates are provided when NED4 = 2 but not when NED4 = 1. The manual indicates that the only difference between NED4=1 and 2 is the frequency of output edits.</p>		
tr_723	In Volume 1 of the RETRAN-3D manual, in Table III.1-2, the values of mu_2 are all cut off after five significant digits, and the mu_2 header is also not displayed. Most significantly, the exponents are not displayed (and they should all be on the order of 10^-8). This error appears as early as Revision 4 of the Volume 1 manual (corresponding to MOD003.0).	No	mod_610
	In volume 2, table IV.2-10, the first and six entries are incorrect. The BXF file contains the transport cross section, not the diffusion coefficient. The table appears to be created based on the comments in xsnew.f90; this subroutine returns the diffusion coefficient after reading the transport cross section. This is consistent with the coding used within BXFGEN.		
	In Volume 3, page IV-118, on the 080000 card description for HDELT, the data type is listed as W2-I yet the description clearly states it is a real data type		
	In Volumes 3 and 5, the IMCL and IMCR options are confusing, especially around the point of the ones digit (Z) when the tens digit is 3 (which suppresses the CHF calculation) or zero/blank (which uses the default CHF logic). The details of the transition flow regime logic selection in Volume 1 are also lacking.		

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_724	<p>While developing mod_611 to address TR-709, issues with the original local conditions model and with the enhanced local conditions model were discovered. Both issues arise when the level is in the top conductor node of the stack.</p> <p>When using the original local conditions model, the top conductor number is misidentified for the last stack if more than one stack is used in the model. Since the local conditions logic is modified for the top conductor, the local conditions heat addition is incorrect when the level is adjacent to the top subnode for the last stack.</p> <p>When using the segmented local conditions model, when the level is in the top subnode, the condensation lengths are incorrectly calculated. Instead of treating the top as zero condensation length, it extends the bottom of the next stack. This only affects condensation when the level is in the top subnode.</p>	No	mod_611
tr_725	<p>The separator model is not giving the expected results for separator carryover and carryunder. Two issues were noted:</p> <ol style="list-style-type: none"> 1. The initial/design carryunder is not matching an analytical solution because the carryunder is limited to the inlet flowing quality during auxiliary steady state calculations, which is incorrect. This logic only needs to be applied for the transient calculation. Similar logic is used for carryover and should be corrected. 2. The carryover and carryunder values "drift" to the right rather than following the lookup table because the junction quality is set by the upstream region quality. Description should be added to the RETRAN manual volumes 5 and 1 to clarify this behavior is expected. 	No	mod_612
tr_726	<p>Summary:</p> <ul style="list-style-type: none"> oThere is a step change in the evaluated Fanning friction factor when going from two-phase flow to single-phase vapor flow, which causes a step change in the two-phase pressure drop for most correlations. oThe density ratio in STPM does not align with the two-phase multiplier calculated within STPM (at least for the Baroczy correlation, JTPMJ=3). oThe Martinelli-Nelson correlation with the Jones correction (JTMPJ=4) overpredicts the two-phase multiplier by a significant margin. <p>See Duke_R3D_Trouble_Report_2022-01-18.pdf for more details.</p>	No	

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tr_727	When using a bubble rise volume with noncondensables, the initialization logic in subroutine BUBIN1 does not correctly set up the water property arrays. This leads to a code failure.	No	mod_615
	While resolving this issue with mod_615, additional initialization logic issues were found which would prevent noncondensables from being correctly propagated throughout the system.		
	The error was introduced during the F95 conversion.		
tr_728	The FIBWR model has error messages which are not documented in Appendix C of volume 3 of the manual. These messages indicate that the junctions in each channel must be numbered in ascending order, and further that the bypass channel must use the same number of axial planes as the fuel channel.	No	

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tr_729	<p>These issues have been identified during the investigation of differences found when building and running RETRAN-3D with the 19.0 version of the Intel Fortran compiler.</p> <ol style="list-style-type: none"> 1. in m_work_arrays, the opt array is not allocated to the proper dimension. 2. when running the sample problem ttqx1 an error exists in xspo.f90 at line 49 where the coe pointer-array is not in the range of the target-array. This error only stops the code execution with a executable built with the 'check pointer' run-time flag set and the 19.0 ifort version build. <p>The results of the ttqx1 sample problem are in line with the expected results so it appears to not attempt to access values on a bad range.</p> <ol style="list-style-type: none"> 3. Generalized restart cases do not run as intended. There is an issue in the read-in of the restart deck title name which causes the code to abort. 4. Certain models cause a code failure in subroutine printm if the width of the matrix to print is near the 120 column limit. This is due to the code not accounting correctly for the actual width printed to the output and therefore exceeding the bound of the IPIC2 array. NOTE: this only affects debugging (with array bound check enabled). 5. The Valgrind program reports certain memory losses at allocation statements in files fihth.f90, m_minor_edit_search.f90, and masbal.f90. Each of these memory losses occurs at a place in the code where an allocation statement is not prefaced by a check if the pointer is already allocated. Additionally, the unflg parameter is uninitialized in subroutine inedit. This is noted in Valgrind output. 	No	mod_618
tr_730	<p>Equations VI.1-17, VI.1-19 and VI.1-20 have subscript errors. Clarification should be added to describe the change in the area change momentum flux term for jet pump drive and suction junctions. An equation should be added for the jet pump suction junction pressure, similar to that for the drive junction .</p>	No	

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tr_731	<p>When using the stratified pressurizer model, the local conditions flag is sometimes incorrectly set. This may show itself as a conductor using a liquid heat transfer correlation in the vapor region.</p> <p>The local conditions flag should be set for all conductors in the second stack associated with a stratified pressurizer. A code review found that during initialization, the local conditions flag is set for conductors from the bottom of the FIRST stack associated with the stratified pressurizer, up for a number of conductors equal to the length of the second stack associated with the stratified pressurizer. Conductors which were input in the second stack have the flag appropriately set, but conductors which are input on the first stack but moved to the second stack during initialization may use the wrong flag.</p>	No	mod_611
tr_732	<p>When testing the improved accuracy liquid temperature and improved calculational efficiency vapor temperature curve fits (modification mod_616), the loss of residual heat removal (lrhr) sample problem failed with a minimum time-step size error. The error is due to poor initial estimated for the pressure search unknowns that lead to negative vapor pressures. The negative pressures are left unchanged for subsequent iterations until the search fails.</p> <p>A warning message from the saturation temperature calculation indicated that it had been called with a zero vapor pressure. The case encountered is benign since the resulting saturation temperature (zero) is not used because there is no vapor in the volume.</p>	No	mod_616
tr_733	<p>The general transport, method of characteristics, DNB, and kinetics models are initialized after the control systems in the steady state solution. As a result, any control inputs which use variables from these models are zero on the first time step (regardless of actual value).</p>	No	mod_606

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tr_734	<p>This TR is related to specifying trips in a simple restart case as well as trip error messages</p> <p>#1. If a trip is revised via an 04XXX0 card in the restart input (see V3.V.5.0) and its value of IX1 or IX2 is updated then the trip summary printed to the restart input will still contain the 'original run' value of IX1 and/or IX2. It should print the 'updated' restart input value of the IX1 and/or IX2 for that specific trip which has been revised. The results of the restart case are as-expected with this issue only affecting the printed table summary of the trips.</p> <p>#2. For a simple restart, if a value of '0' is entered as NTRP (W4-l) on the restart input card 010001 and the user still specifies trip cards (04XXX0) in the restart input then the code does not gracefully exit and no relevant error is supplied. This is due to the code still trying to process the restart input listing of the 04XXX0 trip cards without allocating the parameters necessary to process the restart trip info.</p> <p>Additionally, if a value of NTRP is input on the restart which is greater than the original run's NTRP then the code does not fail gracefully. Error 95003 (from inrstr) is written to the error log but the code continues its attempt to process trip data (in intrip) which may result in a code failure.</p> <p>The value of NTRP does not matter as long as it is not equal to 0 and it is less than or equal to the original run's value of the number of trips. This is somewhat inconsistent with the documentation in V3.V.2.0.</p> <p>#3. Errors on IDSIG = 8 (avg fuel temp) signal w/ bad IX1/IX2 values do not contain the correct message. The error log message indicates an issue with IDSIG = 10. Similarly, errors for bad IX1/IX2 inputs with IDSIG = 10 (conductor temp) signal are not caught and cause a code failure.</p>	No	mod_619
tr_735	<p>Warning messages 801, 804, 805, 806, and 917 are not issued if steady state convergence is reached. Warning 917 will generally prevent the steady state solution from converging, so it is not an issue, but the other warnings should be issued if they are encountered at the first iteration (804 and 805) or the last iteration (801).</p>	No	mod_615
tr_736	<p>In RETRAN-02, it was possible to use a bubble rise volume with air as an accumulator and bypass the special accumulator model. As of RETRAN-3D MOD004.7, it is no longer possible to specify a bubble rise volume with air without setting NCFLOW=1. Setting NCFLOW=1 is not permitted when running in RETRAN-02 mode.</p>	No	mod_629

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_737	<p>When using the pressurizer thermal stratification model, the elevation head and junction pressure are not calculated correctly for junctions which are connected to the stratified pressurizer but not internal to the pressurizer. The junction pressure (PJUN) varies significantly (more than +/-1 psi) based on the number of subnodes used.</p> <p>When using conductors with the automatic subnodalization model, it may or may not use the correct properties. After a source code review, it was found that the number of conductors associated with each stack was not properly processed in the automatic subnodalization model, and if conductors were associated with a subnodalized volume, it may use the stack length for a different stack in order to sum the heat transfer areas and conductor volume.</p> <p>While resolving this trouble report, a few other code errors were observed and corrected. These are noted below.</p> <ul style="list-style-type: none"> * The elevation head for most junctions connected to the vapor region of a stratified pressurizer was incorrectly calculated. This affects PORVs, safety valves, and spray junctions. * When a junction which is not "internal" to the pressurizer stratification model is connected to an inactive subnode, the major edit will still refer to the inactive subnode on its "from" or "to" connection. * The heat conductor input logic would have an error if more than 9 stacks were used, including stacks that the code generated. There is no need for this limitation. * During input processing, the code would fail to associate non-internal junctions connected to a stratified pressurizer with the stratified pressurizer if automatic subnodalization was used. This has no direct impact to the user, but is related to the previously identified errors. 	No	mod_620
tr_738	<p>Warning message 904 can be issued indicating that there is a steam mass imbalance in a bubble rise volume. When that warning message is issued, RETRAN cannot calculate a physical bubble velocity in the indicated control volume, so it uses the most recent bubble velocity which was calculated. Depending on the numbering scheme used, this might be the bubble velocity that was entered on the input or it may be a different value.</p>	No	mod_615
tr_739	<p>When using the FIBWR model, there is a 10 psi limit on the lateral pressure drop which does not seem reasonable.</p> <p>The axial bypass flows account for elevation head in a way that is not reflected in the documentation. The method is appropriate and consistent with the FIBWR code, but it is underdocumented.</p>	No	mod_621

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_740	<p>Several issues were noted with the dynamic gap model input processing and error checking:</p> <ul style="list-style-type: none"> - The molar gas fractions in the 225XXY cards are not summing correctly for certain values (0.77 Helium, 0.23 Xenon), resulting in error 22501 being given. - Error number 22503 (related to long form input) is being displayed when the short form problem input is used. Error number 22504 seems more appropriate. The error occurs when there is a mismatch between the number of conductor stacks and gap models. - In the 17XXYY cards, for YY > 01 and IGP = -1, Volume 3 section 17.4 of the RETRAN manual states the material index, IM, should be set to XX on the 225XXY gap model card. When input is entered this way, RETRAN still looks for the 18XXYY cards and 19XXYY cards corresponding to IM and will return an error if there are not matching values. Dummy cards have to be supplied for the 18XXYY and 19XXYY cards to bypass this error. 	No	mod_628
tr_741	<p>When a PORV opens and then closes, the total flow rate and junction area are zero, but the phasic flow rates (WGJ* and WLJ*) are equal and opposite and nonzero. There should be no flow through a closed valve.</p> <p>The error is due to an inconsistency between the phasic flows and the total flow during the time step advancement. During the time step advancement, the total flow rate is updated by the governing equations, and the phasic flow rates are updated afterwards based on the change in total flow rate and slip velocity. However, when a valve is closed, the change in flow rate is not updated, so the last nontrivial changes in flow and slip are used for the phasic velocities. This change is proportional to the time step size at the time of the valve closure, so the resulting phasic flow rates are also proportional to the time step size.</p>	No	mod_622
tr_742	<p>If TMIN divided by DELTM is not an integer then the timing of the values printed to the TAPE60 file may not be as expected i.e. matching the TMIN frequency. This affects the internal time step calculations driven by the TMIN selection. The code continues to run with the incorrect time step scheme. This appears only to affect the TAPE60 output for the current time card (until the TLAST time) for which the TMIN and DELTM do not divide to an integer.</p> <p>If a fixed time step size scheme is used (NCHK = 1) then the same problem persists.</p> <p>As an example, if DELTM = 0.02 and TMIN = 0.05, then the TAPE60 file will print results at every 0.06 s and not every 0.05 s as expected based on the input of TMIN. This happens for both a fixed time step scheme and the internal time step size calc (NCHK = 0) scheme.</p>	No	mod_624

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Trouble Report No. (1)	Description	Part 21 Status Code	Corr. Status(2)
tr_743	<p>A RETRAN-3D MOD 4.9 transient showed unexpected results from a Control Block of type LLG (Lead/Lag). Initial investigation found that the results depended on the indexing of the Control Block operand and the Control Block. The unexpected results occurred when the index of the Control Block was smaller (less negative) than the index of the Control Block operand. The expected results occurred when the index of the Control Block was larger (more negative) than the index of the Control Block operand.</p> <p>The control system logic in the provided input contained several instances in which the inputs to control blocks depended on other control blocks whose index was more negative. The RETRAN-3D control system solution uses a Gauss-Siedel algorithm with a user-supplied convergence criterion to ensure self-consistency, such that the control block numbering has no impact on results. In the provided input, the default criterion was used, which was insufficient to resolve the control system at the latest time step.</p>	No	mod_625
tr_744	<p>Two issues were observed when running the off-rated initialization procedure (ORIP) with RETRAN-3D MOD004.9. The issues were introduced at different times.</p> <p>1. If changing the feedwater/steam flow using the ORIP logic, the flow rate is correctly modified for steady state initialization, but then not maintained during a null transient. Accordingly, the code will fail to hold a null transient. This error has been present since the ORIP logic was added in MOD004.1.</p> <p>2. If the ORIP logic is used and it converges on the inner loops (where it solves the momentum and energy equations as in the normal steady state logic) but not the outer loop (in which it solves the special ORIP equations), subsequent outer iterations will not iterate on the inner loop and instead advance the outer loop after inner iteration six (where it starts on iteration five). This makes it very unlikely to reach steady state convergence. This issue appears to have been introduced during the F95 conversion, and affects MOD004.6 through MOD005.0.</p>	No	mod_623
tr_745	<p>An invalid minor edit should result in a fatal error message (error 2007). However, when it is preceded by warning 4014 (circular trip logic), it may be nonfatal.</p> <p>It was found that the issue originates with warning 4014, which can cause subsequent errors to be downgraded to warnings.</p>	No	mod_627

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Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_685

Reported By: Hiral Kadakia, NuScale

Date: 10/7 /2019

Reported To: Michael Howard

Date: 10/11/2019

Program Version: RETRAN-3D MOD004.8 **Computer/Operating System:** Linux

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

Stability analysis using the MOC model. Saved in the Maintenance\Trouble_Reports\tr_685 directory.

Description of Problem:

RETRAN-3D fails with a division by zero. This only occurs when using the MOC model (as the normal solver works fine) and can be bypassed by using time steps of 10⁻⁶ seconds. When the failure occurs, a forrtl division-by-zero message is provided, but nothing is appended to the error log.

An examination of the source code revealed that the error occurs when the solution is reset to the beginning of the time step. Some indexes which are only used in the MOC model are not properly initialized, so a loop attempts to use increments of 0, which causes a fatal error before any error log can be written.

Additionally, there was the potential for the water properties calculated by the MOC model to be outside the range of the RETRAN-3D water properties. This is a model limitation which could be mitigated using time step control. Lastly, due to inconsistent volume enthalpy values between the MOC model and the RETRAN flow equations, there could be nonphysical subcooling of two-phase particles due to flashing. This is also a modeling limitation, but it could be mitigated by checking the enthalpy of each particle against the liquid enthalpy in each volume and adjusting the particle energy addition accordingly.

Impact of Error on Current and Previous Code Versions:

MOD004.5 and later

Modeling Alternatives:

The error is only encountered when using the MOC model. Additionally, as it only occurs when the simulation is reset to the beginning of the current time step, it can be bypassed using a maximum time step size of 10⁻⁶ seconds, as this is the hard-coded minimum that RETRAN-3D supports; thus, if the time step would be reduced further, it would result in a code failure with a helpful error log.

Modification Number or Resolution:

Originator Notification:

User Notified: Yes **Method of Contact:** Email

Notified By: Hiral Kadakia, NuScale **Date:** 10/11/2019

Trouble Report Disposition:

Determined By: Phillip Gorman **Closure/Discovery Date:** 10/11/2019



Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Deviation Evaluation: Minor

Reason for Determination:

The main deviation (regarding the division by zero) is a coding error caused by improper initialization of index variables. The erroneous lines of code cannot be executed without causing an abnormal early termination, which is thus a minor deviation.

The subsequent issues (regarding water properties and nonphysical subcooling) are model limitations and thus not deviations.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Issue identified as "minor Deviation" by default is not a 10 CFR Part 21 concern. Additionally, the MOC model has not been reviewed or approved by the NRC and has not been implemented in licensing basis modeling.

Determined By: Michael Howard

Date: 12/16/2019

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_702

Reported By: Rich Schoff, Duke

Date: 10/5 /2020

Reported To: Phillip Gorman

Date: 10/5/2020

Program Version: RETRAN-3D MOD_594 **Computer/Operating System:** All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Robinson main steam line break.

Description of Problem:

This report describes three problems. The first problem was unexpected transient behavior reported by the user. The second and third problems were code errors discovered while investigating the first problem.

- 1.The first problem involved the holdup of liquid over vapor on the steam generator secondary side. This caused unsteady behavior (oscillations and step changes) in the steam generator downcomer level.
- 2.The bubble stack model will only process up to two bubble stacks. In subroutine inbubl.f90, lines 180 through 187 control the check to see if another bubble stack should be processed. If the next bubble stack card matches the value of the "next" local variable, then the code loops back to label 500. However, the "next" local variable is not updated. This causes the loop to process at most 2 bubble stacks. No code failure will be observed, but the output will only indicate that two bubble stacks are used.
- 3.The bubble stack cards (06500X) do not require a corresponding bubble rise input card (060XXY) card if the stack is initially single-phase. However, if there are no 060XXY cards in the input deck, then the bubble stack cards are not processed. This causes a fatal error since the 06500X cards are not processed.

Impact of Error on Current and Previous Code Versions:

All previous

Modeling Alternatives:

- 1.Two modeling alternatives were identified for the first problem. First, use the bubble stack model to activate mixture level tracking across multiple volumes. Second, revise the input model to incorporate specific adjustments expected to improve the code response to the transient conditions. This included changing the nodalization to avoid vapor entrainment in volumes below the level (as that violates the assumptions of the bubble stack model).
- 2.To avoid the first code error, do not use more than 2 bubble stacks.
- 3.To avoid the second code error, include at least one bubble rise volume (060XXY) card in the input deck. If there is no existing level, then a dummy bubble rise volume can be created.

Modification Number or Resolution:

mod 597

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phillip Gorman

Date: 10/14/2020



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Disposition:

Determined By: Michael Howard ***Closure/Discovery Date:*** 1/14/2021

Deviation Evaluation: Major

Reason for Determination:

- 1.No code error/deviation is associated with the first problem. This is a known limitation of the bubble rise model (SER condition 24) which is addressed with the bubble stack model. Modeling alternatives expected to improve the code response have been provided. Further remodeling may also be required.
- 2.The first code error indicated in the problem description is a major deviation because the requested model feature is not enabled where it is requested, yet it continues without an error message. Using incorrect models and generating incorrect results are considered major deviations.
- 3.The second code error is a minor error because the problem terminates without generating incorrect results.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The output clearly shows that extra bubble rise volumes not created for the third or later stacks. Additionally, the code will experience an error and fail due to the fact that a level is not present when expected for the bubble rise volumes.

Determined By: Michael Howard ***Date:*** 1/14/2021



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_703

Reported By: Phillip Gorman, ZNE

Date: 10/28/2020

Reported To: Phillip Gorman

Date: 10/28/2020

Program Version: RETRAN-3D MOD004.9 **Computer/Operating System:** All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

The error was observed when converting a RELAP5 feedwater heater model into a RETRAN3D model.

Description of Problem:

When using the automatic subnodalization option, the user can specify to connect heat conductors to specific subnodes. However, if the user attempts to connect to the top subnode, the conductor is subnodalized again (since the top subnode has the same volume designation as the collection of subnodes).

The trouble presents itself as fatal errors in the input processing. In the indicated output file, an infinite loop occurs while writing error messages.

Impact of Error on Current and Previous Code Versions:

Automatic subnodalization was first introduced in MOD004.8; no earlier versions are affected.

Modeling Alternatives:

Only use automatic subnodalization in volumes which are simple pipes and don't have any convoluted conductor connections.

Modification Number or Resolution:

mod 604

Originator Notification:

User Notified: Yes **Method of Contact:** Email

Notified By: Phillip Gorman **Date:** 10/28/2020

Trouble Report Disposition:

Determined By: Phillip Gorman **Closure/Discovery Date:** 12/7/2020

Deviation Evaluation: Minor

Reason for Determination:

RETRAN produces an infinite loop while writing error messages. Although the model is not being correctly applied, the input processing still has a code error. Since the error causes code failure before the calculation begins, it is a minor error.

10CFR Part 21 Evaluation:



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Reportable Defect: No

Reason for Determination:

Minor deviation

Determined By: Michael Howard

Date: 1/14/2021

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_704

Reported By: Phillip Gorman, ZNE & Richard Schoff, Duke **Date:** 11/30/2020

Reported To: Phillip Gorman **Date:** 11/30/2020

Program Version: RETRAN-3D MOD004.9 **Computer/Operating System:** All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

N/A

Description of Problem:

Several errors were identified with the RETRAN-3D MOD004.9 manuals after release.

•Volume 1:

oEquation II.2-48 appears to be missing a line. The static pressure difference and the momentum flux for volume $k+1$ are missing.

oEquation VIII.4-172 is incorrect. The $6/D_{hy}$ should be a generic $A_{int-bar}$ term, and the equation should contain the derivatives of $A_{int-bar}$ as included in the code.

•Volume 2: Appendix C was not updated to include the list of modifications for MOD004.9.

•Volume 3:

oThe note on page IV-31 is incorrect. WQCL and WQCR always reflect the heat addition of the primary conductor.

oThe 2-D conductor inputs (Section IV.17.12) were based on preliminary change pages and not the final versions. The 2D conductor inputs as used in MOD004.9 are based on the stack model (Section IV.17.8).

Section IV.7.12 should be removed, and Section IV.17.8 should reflect the 2D conductor inputs.

oThe errors in C.3.5 are incomplete. Namely, errors 5026, 5027, and 5028 are missing from C.3.5.

Volume 5:

o In section II.3.1.4, the discussion on how to account for branching flow effects was truncated inappropriately. In particular, Equation II-3-10 from the MOD004.8 was removed, which is critical.

o Equation III-7-4: the $(i-1)$ should be in an exponent.

Impact of Error on Current and Previous Code Versions:

RETRAN-3D MOD004.9

Modeling Alternatives:

N/A

Modification Number or Resolution:

mod 605

Originator Notification:

User Notified: Yes **Method of Contact:** Email

Notified By: Pam Richardson **Date:** 12/10/2020



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 1/4/2021

Deviation Evaluation: Not a

Reason for Determination:

Documentation error only

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Not a code error.

Determined By: Michael Howard

Date: 1/14/2021



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_705

Reported By: Phillip Gorman, ZNE

Date: 12/22/2020

Reported To: Phillip Gorman

Date: 12/22/2020

Program Version: RETRAN-3D MOD004.9 **Computer/Operating System:** All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Test model to show that the bubble stack model performs as expected. 3 vertical pipes (each with ten normal volumes and a TDV) driven by fills at the bottom. Each pipe has its own bubble stack. One pipe is initially filled with water, while the other two have an initial level.

Description of Problem:

During the verification of mod_597, additional errors were discovered. This trouble report was filed as a consequence in order to capture the dates accurately.

It was observed that when multiple bubble stacks are used and they use different values of the first word (INITIAL, which indicates whether the bubble stack is initially full, initially empty, or partially full), the stacks are not initialized correctly. All stacks are initialized according to the flag of the last stack which was processed.

Upon examination of subroutine inubl.f90, the istat value is a local integer which is set during the stack input processing loop but is only used after the loop has been finished. It should be an allocatable array so that one value may be saved per bubble stack.

Impact of Error on Current and Previous Code Versions:

All previous

Modeling Alternatives:

To avoid this code error, if using 2 bubble stacks, make sure they use the same initial configuration. If using more than 2 bubble stacks, the error reported on TR-702 trumps this one.

Modification Number or Resolution:

mod 597

Originator Notification:

User Notified: Yes **Method of Contact:** Self

Notified By: Phillip Gorman, ZNE **Date:** 12/22/2020

Trouble Report Disposition:

Determined By: Phillip Gorman **Closure/Discovery Date:** 12/22/2020

Deviation Evaluation: Major

Reason for Determination:



Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

This code error is a major deviation because the initial conditions are not what was specified in the input.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

This error is related to the one on TR-702. Due to the issues on TR-702, the only way in which this error can be encountered is if two bubble stacks are used and they use different initialization values. Using more than 2 bubble stacks results in the error noted in TR-702 for the third stack and later; this error was not reportable. If different initialization values are used, then the initial mixture level is very obviously wrong. In the input provided with this trouble report, a bubble stack which was supposed to be initially filled with liquid was instead treated as if the mixture level was at the bottom of the stack, and the bubble rise models in that stack were disabled. Numerical difficulties in the transient subsequently occurred. Something like this is expected to occur whenever this error is present. Since it causes obvious issues which any qualified user should be able to identify, the error is not reportable.

Determined By: Michael Howard

Date: 1/14/2021



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_706

Reported By: Phillip Gorman

Date: 12/11/2021 11:50:13 AM

Reported To: Phil Gorman

Date: 2/22/2021

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

ttwob: Turbine trip sample problem with point kinetics and the 4-equation model. There is an analogous input for restart which makes no changes (ttwob.rst).

Description of Problem:

When running a restart problem, sometimes the answers are inconsistent with the original run even if no changes were made. This can be seen readily with the TTWOB sample problem, in which the ttwob.rst file makes no changes to the original problem, yet visibly different results occur after 1.2 seconds in the reactivity.

Impact of Error on Current and Previous Code Versions:

All previous versions of RETRAN-3D

Modeling Alternatives:

Don't use the restart feature if the separator performance model is used; otherwise, there is no modeling alternative.

Modification Number or Resolution:

mod 601

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Mark Paulsen

Date: 3/10/2021

Trouble Report Disposition:

Determined By: Mark Paulsen

Closure/Discovery Date: 3/10/2021

Deviation Evaluation: Major

Reason for Determination:

The separator performance normalization constants determined during steady-state initialization are not saved in the restart file. As a result, the carryover and carryunder normalization constants are incorrect after restart which changes the carryover and carryunder values from those of the original run.

The change to the accumulator pressure search has a minor effect since the pressure calculated with the erroneous initial liquid specific volume still converges within the convergence criteria. While the results may be slightly different, they are not significant in terms of the affect on the results.

The bubble rise mixture quality is a one time error in the edited quality, but has no effect on the bubble rise mass integration or results.



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Although the error results in an impact to results, the error would result in a step change in the separator conditions and in the steam system. Therefore, appearance of the error would be directly appearant to the analyst at the point of the restart due to a stepchange in PWR secondary and BWR steam conditions.

Determined By: Mike Howard

Date: 3/18/2021

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_707

Reported By: Taylor Blyth

Date: 121 11:01:42 AM

Reported To: Phil Gorman

Date: 3/5/2021

Program Version: RETRAN-3D MOD004.8 **Computer/Operating System:** All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Standard installation test suite. Cases accum, pipe, sp1, sp5, and turb showed relative differences >0.1% in requested minor edits.

Description of Problem:

During development of MOD004.9, the "debug" and "release" builds of RETRAN-3D gave slightly different results in the standard test suite. The differences were small, but in the 5 sample problems indicated above [accum, pipe, sp1, sp5, turb], the relative differences exceeded 0.1%. Generally, the differences were not visible when plotted, and the results were consistently repeatable, so they had been attributed to differences in optimization schemes (as the release version runs significantly faster).

While investigating differences in compilers (see TR-708), it was discovered that the differences were solely because the debug configuration defaulted to using double precision for floating point numbers, while the release configuration defaulted to single precision. RETRAN-3D manually specifies all variables as using double precision, so an investigation was undertaken to determine if any were missed.

It was found that although every variable was declared to be double precision, they were sometimes using single-precision constants. As an example, a value might be multiplied by 2.0 instead of 2.0d0. When all of these constants were converted to use double precision, the compiler setting for the default precision no longer made a difference.

This issue was reproduced on both Linux and Windows machines.

Impact of Error on Current and Previous Code Versions:

MOD004.8 and previous

Modeling Alternatives:

Recompile with a default precision set to double.

Modification Number or Resolution:

mod 600

Originator Notification:

User Notified: Yes

Method of Contact: Self

Notified By: Taylor Blyth

Date: 3/5/2021

Trouble Report Disposition:



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Determined By: Phil Gorman

Closure/Discovery Date: 3/5/2021

Deviation Evaluation: Major

Reason for Determination:

It is a programming error which leads to a (slight) difference in results, which is defined as a major error.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The differences are on the order of roundoff error for single-precision numbers. Although this is larger than intended, it has no safety consequence.

Determined By: Mike Howard

Date: 3/10/2021



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_708

Reported By: Taylor Blyth

Date: 121 11:09:56 AM

Reported To: Phil Gorman

Date: 3/5/2021

Program Version: MOD004.9

Computer/Operating System: Windows

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Standard installation test suite

Description of Problem:

RETRAN-3D MOD004.9 was compiled using Version 14.0 of the Intel compiler. When using version 15.0, no differences are picked up with the standard COMPARE2 utility. However, when moving to version 16.0 and later, several differences appear. All results are visually similar when plotted, except for some points when the results were already noisy (such as the void fractions in the LRHR sample problem). A full list of differences is shown in M:\tsb\misc\ifort_version_testing\4.9.

The compiler change logs do not indicate that the math libraries were updated between 15.0 and 16.0, whereas the change logs do indicate that the math libraries were updated between 14.0 and 15.0.

Further investigation is needed to determine if the differences are due to a change in default compiler options or if underlying math libraries were changed.

Impact of Error on Current and Previous Code Versions:

MOD004.9

Modeling Alternatives:

N/A

Modification Number or Resolution:

Originator Notification:

User Notified: No

Method of Contact:

Notified By:

Date:

Trouble Report Disposition:

Determined By: Mike Howard

Closure/Discovery Date: 3/10/2021

Deviation Evaluation: Not a

Reason for Determination:

This is a compiler based issue that will need to be dealt with before moving to a newer version of the



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compiler. It does not represent a code error for MOD004.9.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Not an error.

Determined By: Mike Howard

Date: 3/10/2021

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_709

Reported By: Phil Gorman

Date: 121 11:35:12 AM

Reported To: Phil Gorman

Date: 3/5/2021

Program Version: MOD004.9

Computer/Operating System: Windows

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

MIT pressurizer stratification V&V problem.

Description of Problem:

When using multiple stratified pressurizers with the conduction solution, an access violation occurs which prevents code execution.

The MIT pressurizer stratification V&V test problem was used to demonstrate this issue. All volume, junction, bubble rise, etc. cards were duplicated and renumbered. When the duplications are commented out, the model runs as documented in Volume 4. However, with the duplicated input, an access violate occurs while running the code.

Impact of Error on Current and Previous Code Versions:

MOD004.7.1 and later

Modeling Alternatives:

Avoid using the wall conduction model with the thermal stratification model if multiple stratified pressurizers are needed.

Modification Number or Resolution:

mod 611

Originator Notification:

User Notified: Yes

Method of Contact: Self

Notified By: Phil Gorman

Date: 3/5/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 3/5/2021

Deviation Evalaution: Minor

Reason for Determination:

The error prevents code execution, which prevents incorrect results from being reported. Thus, the error is considered minor.

10CFR Part 21 Evaluation:



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Reportable Defect: No

Reason for Determination:

Minor deviation

Determined By: Mike Howard

Date: 3/10/2021



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_710

Reported By: Phil Gorman

Date: 121 11:53:31 AM

Reported To: Phil Gorman

Date: 3/5/2021

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

ATWS sample problem, with the pressurizer replaced with a TDV bubble rise volume. The conditions are kept constant, and the results are not significant for anything.

Description of Problem:

If a volume is both a time-dependent volume (TDV) and a bubble rise volume, the quality on the TDV inputs should be mixture quality, as indicated in Volume 3. This is not reflected in the input processing in the attached file. With a quality of 0.1, it gives an error message if the mixture level is less than 19.9466 ft, which corresponds to the level for an *overall* quality of 0.1 (provided the mixture is saturated liquid). Further changes to the conditions were incorrect in the output.

Impact of Error on Current and Previous Code Versions:

All previous

Modeling Alternatives:

1. Do not use TDV bubble rise volumes.
2. If needed, use the overall quality rather than the mixture quality for the TDV input.

Modification Number or Resolution:

mod 603

Originator Notification:

User Notified: Yes

Method of Contact: Self

Notified By: Phil Gorman

Date: 3/5/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 3/8/2021

Deviation Evaluation: Major

Reason for Determination:

The code error affects the interpretation of the conditions in the indicated volume, which can affect results. Thus, this is a major error.

10CFR Part 21 Evaluation:

Reportable Defect: No



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Reason for Determination:

The error was identified while modeling a feedwater heater drain tank for a non-licensing basis application. The time dependent bubble rise model was a workaround for a different model limitation and should not be applied in a licensing model. The use of a time dependent bubble rise volume does not have an application in any typical UFSAR Chapter 14/15 licensing basis safety analyses.

Determined By: Mike Howard

Date: 3/10/2021



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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_711

Reported By: Richard Schoff

Date: 3 /1 /2021

Reported To: Phil Gorman

Date: 3/5/2021

Program Version: MOD004.9

Computer/Operating System: Both

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

retran.inp is the base input file which runs a null transient, while retran.inp.rst is the restart file. No changes were input on the restart file.

Description of Problem:

When running a restart case, the following warning message is generated. However, the indicated card is not used on the original input or in the restart.

WARNING, THE ENTRY ON SMALLR DATA CARD (000040) IS OUT OF RANGE A FULL OUTPUT LISTING WILL RESULT".

Impact of Error on Current and Previous Code Versions:

TBD

Modeling Alternatives:

TBD

Modification Number or Resolution:

mod 613

Originator Notification:

User Notified: No

Method of Contact:

Notified By:

Date:

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 3/8/2021

Deviation Evaluation: Minor

Reason for Determination:

An extra warning message is printed, but the results are unimpacted. Since the results are unimpacted, this is a minor error.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:



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Minor Deviation

Determined By: Mike Howard

Date: 3/10/2021



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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_712

Reported By: Richard Schoff

Date: 2021 6:52:34 AM

Reported To: Phil Gorman

Date: 3/5/2021

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

retran.inp is a null transient input. The REEDIT input (retran.inp.rdt) uses the custom minor edit blocks to request TIMX 0 at every minor edit.

Description of Problem:

A REEDIT run failed indicating that the restart file was incompatible with MOD004.9. However, the restart file was generated with MOD004.9.

The error was determined to be in the input processing for the VIPRE boundary conditions for the REEDIT run. The VBC input (card 02600Y) is only permitted on the original input, but for REEDIT, the 02600Y card was not found, and the defaults were assumed. The number of VIPRE boundary conditions affects the restart file specification, so the mismatch causes an error.

Impact of Error on Current and Previous Code Versions:

RETRAN-3D MOD004.5 through MOD004.9

Modeling Alternatives:

Do not generate a VBC file if REEDIT will be used later.

Modification Number or Resolution:

mod 613

Originator Notification:

User Notified: No

Method of Contact:

Notified By:

Date:

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 3/8/2021

Deviation Evaluation: Minor

Reason for Determination:

The error prevents REEDIT from running, so no incorrect results are generated. Thus, this is a minor error.

10CFR Part 21 Evaluation:

Reportable Defect: No



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Reason for Determination:

Minor Deviation

Determined By: Mike Howard

Date: 3/10/2021

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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_713

Reported By: Taylor Blyth

Date: 2021 8:19:29 AM

Reported To: Taylor Blyth

Date: 3/8/2021

Program Version: MOD00.4.9

Computer/Operating System: All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

N/A

Description of Problem:

In qdot37 (Chen heat transfer) line 239 there is a non-standard Fortran statement for the calculation of a partial derivative term. This calculation omits the necessary parenthesis with a negative exponentiation which may result in an unintended result, as Fortran will evaluate the multiplication before evaluating the exponent. This may result in NaNs and infinities in the partial derivative term. This only affects the initialization for the implicit steam generator model (JSST >= 2 on the 01000Y cards).

$dqdx1 = hc1*(ref8*dfxidx+dp8*ref**(-0.2d0)*ffactor*drexdx)*dxfdx*delt$

should be:

$dqdx1 = hc1*(ref8*dfxidx+dp8*ref**(-0.2d0))*ffactor*drexdx)*dxfdx*delt$

Impact of Error on Current and Previous Code Versions:

MOD004.9

Modeling Alternatives:

Do not use the implicit steam generator model with the Chen heat transfer correlation.

Modification Number or Resolution:

mod 602

Originator Notification:

User Notified: Yes

Method of Contact: Self

Notified By: Taylor Blyth

Date: 3/8/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 3/8/2021

Deviation Evaluation: Minor

Reason for Determination:

This does not affect transient results. If it would not cause a NaN, would at worst prevent steady-state from



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being reached. Since transient results are unaffected,

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor error

Determined By: Mike Howard

Date: 3/10/2021

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_714

Reported By: Rich Schoff

Date: 2021 4:48:02 PM

Reported To: Mark Paulsen

Date: 3/19/2021

Program Version: MOD004.9

Computer/Operating System: Win/10

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

Duke - RNP RETRAN-3D MOD 4.8 BASE DECK (LOW SGTP)

Description of Problem:

The RETRAN and RESTRT cases had small output differences at the restart time of 0.5 s, involving: (a) four values (P, h, ρ , T) for accumulator Volume 134; and (b) the initial mixture qualities for Bubble Rise Volumes 1 (pressurizer Volume 22) and 2 – 4 (primary separator Volumes X71). What prevented these output values from being identical?

Impact of Error on Current and Previous Code Versions:

All RETRAN-3D versions since MOD004.6

Modeling Alternatives:

None

Modification Number or Resolution:

mod 601

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Mark Paulsen

Date: 3/19/2021

Trouble Report Disposition:

Determined By: Mark Paulsen

Closure/Discovery Date: 3/19/2021

Deviation Evaluation: Major

Reason for Determination:

The pressure, enthalpy, density and temperature for the first accumulator differ from the original run. While they are different, they are within the convergence criteria for the pressure search. Accumulators 2 and 3 (any after the first) are not affected.

The zero mixture qualities for bubble rise volumes with nonzero bubble masses affect the major and minor (if selected) edits, but are recalculated correctly.

10CFR Part 21 Evaluation:



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Reportable Defect: No

Reason for Determination:

The accumulator pressure calculation differences are minor and within the convergence criteria of the pressure search. The bubble rise mixture quality differences reported are only edit differences and do not affect the subsequent bubble rise results.

Determined By: Mike Howard

Date: 3/25/2021

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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_715

Reported By: Phillip Gorman

Date: 2021 8:46:38 AM

Reported To: Phil Gorman

Date: 3/29/2021

Program Version: MOD004.9

Computer/Operating System: Both

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Source code review (ifhtc.f90)

Description of Problem:

For stratified flows, the interfacial heat transfer coefficient and its derivative are incorrect in both the code and the documentation.

In Section III.6.2.3.5 of Volume 1, eqn. III.6-59 uses D_{hyd} in the denominator, whereas in Ref. III.6-8, it uses a liquid hydraulic diameter. The documentation was corrected with mod_605.

In the code (ifhtc.f90), something that is almost the liquid hydraulic diameter is used. However, there are two problems:

1. The vapor volume fraction is used rather than the liquid volume fraction.
2. The subtended angle is incorrectly divided in half.

Likewise, its derivative is calculated incorrectly. In addition to inheriting the above issues, the derivative of the liquid hydraulic diameter is not multiplied by the superheat term.

Impact of Error on Current and Previous Code Versions:

All previous

Modeling Alternatives:

N/A

Modification Number or Resolution:

mod 631

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phil Gorman

Date: 3/31/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 3/31/2021

Deviation Evaluation: Major

Reason for Determination:



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This is a coding error which affects results. Thus, it is a major deviation.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

This represents a impact to derivative calculations and the linearization of heat transfer coefficients. The error in the derivative calculation is proportional to the time step size and ultimately insignificant with respect to the code results. The error is minimized by the completion of time step sensitivity studies by the user.

Determined By: Mike Howard

Date: 4/2/2021

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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_716

Reported By: Phillip Gorman

Date: 2021 7:10:04 AM

Reported To: Phil Gorman

Date: 4/9/2021

Program Version: MOD004.9

Computer/Operating System: Windows

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Turkey Point Unit 3 MSLB at HFP model. The model without the MSLB overlay achieved steady state initialization; when adding the MSLB overlay, it did not. For the MSLB transient, the bubble velocity in the SG upper downcomer was calculated by a control system; reverting back to a constant bubble velocity allowed it to initialize.

Description of Problem:

In a stagnant volume, if the bubble velocity is calculated by a control block, an incorrect value (likely zero) is used for most of the steady state logic. The correct value is used during the transient calculation.

A code review found that when performing the input processing, the "old" bubble velocity is set to the input VBUB word on the 060XXY cards before the control block setting the bubble velocity is read. During the steady state iterations, for volumes which have nonzero quality in inlet junctions below the mixture level, the code can calculate the bubble velocity to balance steady state based on the continuity equation, and will update the "old" bubble velocity calculation. However, for bubble rise volumes with trivial steam continuity equations (generally stagnant volumes or pure liquid volumes), the code cannot calculate a bubble velocity and will instead revert to the "old" value. If the "old" value is zero, then this can cause logic problems, as a zero bubble velocity is used in the code to signify that the bubble rise model is disabled (as part of a bubble stack).

As mentioned, this error can affect stagnant bubble rise volumes and bubble rise volumes which are initially fully mixture (ZMIX = ZVOL). This is not a problem for pure liquid volumes, since the bubble rise model does not do anything different in that case. For stagnant volumes with an initial level, this can prevent steady state convergence from being reached.

Impact of Error on Current and Previous Code Versions:

All prior

Modeling Alternatives:

Use the initial value of the bubble velocity in the VBUB word of the 060XXY cards even though it won't be used beyond steady state.

Modification Number or Resolution:

mod 615

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phil Gorman

Date: 4/9/2021



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RETRAN-3D Software Trouble Report

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 4/9/2021

Deviation Evaluation: Minor

Reason for Determination:

The input was processed slightly incorrectly (which is a code error), but it only affects steady state initialization. The transient calculation is unaffected. Since this is at worst a failure to reach steady state, this is a minor deviation.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor deviation

Determined By: Mike Howard

Date: 4/9/2021



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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_717

Reported By: Phillip Gorman

Date: 2021 7:39:18 AM

Reported To: Phil Gorman

Date: 4/30/2021

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Turkey Point model. The enthalpy transport model was intended to be deactivated for each steam generator separately shortly after the main feedwater isolated.

Description of Problem:

If the 08000X cards are used to deactivate enthalpy transport for a set of junctions, the wrong trip number is used. In the input supplied, an error message was issued saying that the specified trip was invalid (even though it was valid). Examination of the source code showed that it was comparing the specified trip ID against the internal trip index for each trip signal, which is incorrect.

During the trouble report evaluation, a change was made to see if any other errors would occur if a subset of junctions were disabled through an incorrect trip activation. This resulted in an access violation.

Impact of Error on Current and Previous Code Versions:

MOD004.5 and later - introduced during the conversion to F95

Modeling Alternatives:

Do not use 08000X cards. Use global enthalpy transport deactivation options instead (card 080000).

Modification Number or Resolution:

mod 614

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phil Gorman

Date: 4/30/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 5/27/2021

Deviation Evaluation: Minor

Reason for Determination:

If the specified trip ID corresponds to a valid internal trip index, the enthalpy transport model will be deactivated at a time that is not what the user specified. However, if this were to happen, an access violation would occur (causing premature code termination). Since no incorrect results can be generated, this is a minor error.

10CFR Part 21 Evaluation:



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Reportable Defect: No

Reason for Determination:

Minor Deviation

Determined By: Mike Howard

Date: 6/3/2021



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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_718

Reported By: Brandon Blackburn (Exelon)

Date: 2021 6:44:19 AM

Reported To: Phil Gorman

Date: 5/27/2021

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

Lasalle base deck model (after a renumbering effort has been undertaken).

Description of Problem:

In the input edits for the trips (in which RETRAN indicates how the trips are read and interpreted), the trip numbers do not correspond to anything useful. It corresponds to the ordinal number in which the trip cards were processed; e.g., if a deck contains the trip cards 040010, 049990, and 040500, then trip 1 would correspond to 040010, trip 2 would correspond to 040500, and trip 3 would correspond to 049990.

This extends to the trip numbers reported in error 4006. In most other input errors in trip processing, the card number is provided with the error output; however, if an invalid trip ID is processed, then the card number is unavailable for error 4006 so only the trip number is provided, which can be difficult to trace to a card number.

Impact of Error on Current and Previous Code Versions:

All prior

Modeling Alternatives:

If trip cards are entered consecutively, then the provided output is the same as the desired output.

Modification Number or Resolution:

mod 619

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phil Gorman

Date: 5/27/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 5/27/2021

Deviation Evaluation: Minor

Reason for Determination:

The input edits provided by the code are supposed to help debugging, but in this case, they are not useful. There is no impact to the results, however, so this is a minor error.

10CFR Part 21 Evaluation:



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Reportable Defect: No

Reason for Determination:

Minor Deviation

Determined By: Mike Howard

Date: 6/3/2021



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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_719

Reported By: Phil Gorman (ZNE)

Date: 2021 1:06:50 PM

Reported To: Phil Gorman

Date: 6/28/2021

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Source code review, subroutines sepcov and sepcun.

Description of Problem:

The IUDC input in the separator input cards does not seem to affect results.

A source code review found that the IUDC input was only used to provide the level indication in the steady state edit. The carryover and carryunder level multipliers in the source code were actually based on the level in the separator. Typically, the level multipliers are based on the upper downcomer level, since that is what is available during testing.

Impact of Error on Current and Previous Code Versions:

All RETRAN-3D versions; RETRAN-02 is unaffected

Modeling Alternatives:

Use a control system to calculate carryover and carryunder. The same functional behavior can be specified using FNG and MUL blocks.

Modification Number or Resolution:

mod 612

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phil Gorman

Date: 6/28/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 6/28/2021

Deviation Evaluation: Major

Reason for Determination:

Code error that affects results.

10CFR Part 21 Evaluation:

Reportable Defect: No



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Reason for Determination:

The separator model only has safety consequences for a BWR. The only RETRAN-3D user with a licensed BWR application is Iberdrola, who has specifically identified that the separator model is not in use. Thus, there is no safety consequence at this time.

Determined By: Mike Howard

Date: 7/2/2021

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_720

Reported By: Phillip Gorman

Date: 2021 9:24:32 AM

Reported To: Phil Gorman

Date: 7/21/2021

Program Version: MOD004.9

Computer/Operating System: Windows 10

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

ATWS sample problem, modified to use the implicit SG steady state solution. When running with the release configuration, the problem runs to completion. In debug mode, the above error is encountered.

Description of Problem:

When running a case with the implicit SG initialization (JSST ≥ 2 on problem dimensions), index errors were encountered while running in debug mode. This is indicative of a coding error; however, if no data is written outside the bounds of the indicated array, then no results are impacted. Since steady state convergence is achieved, it is expected that results are not impacted.

Impact of Error on Current and Previous Code Versions:

N/A

Modeling Alternatives:

Since it is not encountered in the release version, no modeling alternative is needed.

Modification Number or Resolution:

mod 630

Originator Notification:

User Notified: No

Method of Contact: self

Notified By: Phil Gorman

Date: 7/21/2021

Trouble Report Disposition:

Determined By:

Closure/Discovery Date:

Deviation Evaluation: Minor

Reason for Determination:

PRELIMINARY EVALUATION Index errors are generally major errors, since data being written outside the bounds of an array can lead to unpredictable results. However, in this case, no data is being written outside the bounds of the array. Although the index is not being used correctly, the error can only affect steady state initialization, which is a minor error.

10CFR Part 21 Evaluation:

Reportable Defect: No



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Reason for Determination:

Minor deviation

Determined By: Mike Howard

Date: 7/29/2021



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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_721

Reported By: Phillip Gorman

Date: 121 10:17:22 AM

Reported To: Phil Gorman

Date: 8/5/2021

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Peach bottom turbine trip benchmark.

Description of Problem:

When using 3D kinetics, the slip model within the core is forced to be HEM.

The error was introduced when the ability to change slip models on a junction basis (through the IFRJ input) was introduced in the code. Corresponding logic was not introduced to the channel model input processing, so the slip option defaults to zero (rather than the global slip option).

Impact of Error on Current and Previous Code Versions:

RETRAN-3D MOD004.8 and later

Modeling Alternatives:

Only applies when using 3D kinetics.

Modification Number or Resolution:

mod 607

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phillip Gorman

Date: 8/5/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 8/5/2021

Deviation Evaluation: Major

Reason for Determination:

This prevents slip from being used within the core when 3D kinetics are used. While generally acceptable for a PWR, this is inappropriate for a BWR, and even for a PWR, it fails "silently" -- there is nothing to indicate that the slip model has been disabled. This can affect results, and constitutes a major error.

10CFR Part 21 Evaluation:

Reportable Defect: No



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Reason for Determination:

3D core modeling has not been licensed by any entity currently utilizing RETRAN-3D.

Determined By: Mike Howard

Date: 8/25/2021

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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_722

Reported By: Phillip Gorman

Date: 2021 1:51:48 PM

Reported To: Phil Gorman

Date: 9/29/2021

Program Version: RETRAN-3D mod_607

Computer/Operating System: Windows 10

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Peach bottom turbine trip

Description of Problem:

When using the flux edits (NED4>0 on the 670010 card), the outputs are not as expected.

- * When using NED4 = 1, the real/forward fluxes are not output at time = 0.0.
- * When using NED4 = 1, the fluxes are provided at every time step, rather than at the major edits.
- * When using NED4 > 0 and NADJNT (on 670021) = 1, the fluxes are labeled as adjoint fluxes in the output, but the values after time 0 are actually real fluxes.
- * Leakage rates are provided when NED4 = 2 but not when NED4 = 1. The manual indicates that the only difference between NED4=1 and 2 is the frequency of output edits.

Impact of Error on Current and Previous Code Versions:

All prior RETRAN-3D

Modeling Alternatives:

Set NED4 = 0 (don't get flux calculations).

Modification Number or Resolution:

mod 608

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phillip Gorman

Date: 9/29/2021

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 9/29/2021

Deviation Evaluation: Major

Reason for Determination:

The normal flux distributions may be mislabeled as "adjoint," which can cause incorrect conclusions. The other errors are related to the output frequency and are minor.

10CFR Part 21 Evaluation:



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Reportable Defect: No

Reason for Determination:

First, 3D kinetics has not been used in licensing applications. Second, anyone familiar with the adjoint flux would be aware that the magnitude of the flux is significantly different and thus would be aware that the mislabeled fluxes are not actually the adjoint flux.

Determined By: Mike Howard

Date: 10/11/2021

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_723

Reported By: Phillip Gorman

Date: 12/14/2021 9:30:37 AM

Reported To: Phil Gorman

Date: 12/14/2021

Program Version: RETRAN-3D MOD004.9 **Computer/Operating System:** All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Documentation

Description of Problem:

In Volume 1 of the RETRAN-3D manual, in Table III.1-2, the values of mu_2 are all cut off after five significant digits, and the mu_2 header is also not displayed. Most significantly, the exponents are not displayed (and they should all be on the order of 10^{-8}). This error appears as early as Revision 4 of the Volume 1 manual (corresponding to MOD003.0).

In volume 2, table IV.2-10, the first and six entries are incorrect. The BXF file contains the transport cross section, not the diffusion coefficient. The table appears to be created based on the comments in xsnew.f90; this subroutine returns the diffusion coefficient after reading the transport cross section. This is consistent with the coding used within BXFGEN.

In Volume 3, page IV-118, on the 080000 card description for HDELTA, the data type is listed as W2-I yet the description clearly states it is a real data type

In Volumes 3 and 5, the IMCL and IMCR options are confusing, especially around the point of the ones digit (Z) when the tens digit is 3 (which suppresses the CHF calculation) or zero/blank (which uses the default CHF logic). The details of the transition flow regime logic selection in Volume 1 are also lacking.

Impact of Error on Current and Previous Code Versions:

All prior versions of RETRAN-3D

Modeling Alternatives:

N/A

Modification Number or Resolution:

mod 610

Originator Notification:

User Notified: Yes **Method of Contact:** self

Notified By: Phil Gorman **Date:** 12/17/2021

Trouble Report Disposition:

Determined By: Phil Gorman **Closure/Discovery Date:** 12/17/2021



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Deviation Evaluation: Minor

Reason for Determination:

Documentation error - cannot affect results.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor Deviation

Determined By: Mike Howard

Date: 12/21/2021

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_724

Reported By: Phillip Gorman

Date: 2022 8:31:20 AM

Reported To: Phil Gorman

Date: 1/17/2022

Program Version: RETRAN3D MOD004.9 **Computer/Operating System:** All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Modified MIT stratified pressurizer test case to use multiple identical pressurizers, and further modified such that the level reaches the top subnode. This case does not run with MOD004.9 or earlier versions because of the errors identified in TR-709; however, with preliminary versions of mod_611 (which corrects those issues), it was noted that the "single" pressurizer results only matched the results from the second pressurizer when the level was in the top subnode.

Description of Problem:

While developing mod_611 to address TR-709, issues with the original local conditions model and with the enhanced local conditions model were discovered. Both issues arise when the level is in the top conductor node of the stack.

When using the original local conditions model, the top conductor number is misidentified for the last stack if more than one stack is used in the model. Since the local conditions logic is modified for the top conductor, the local conditions heat addition is incorrect when the level is adjacent to the top subnode for the last stack.

When using the segmented local conditions model, when the level is in the top subnode, the condensation lengths are incorrectly calculated. Instead of treating the top as zero condensation length, it extends the bottom of the next stack. This only affects condensation when the level is in the top subnode.

Impact of Error on Current and Previous Code Versions:

RETRAN3D MOD004.9

Modeling Alternatives:

For the original local conditions model, a "dummy" stack may be used in which a level never develops. Neither error is present when 2D conduction is used.

Modification Number or Resolution:

mod 611

Originator Notification:

User Notified: Yes **Method of Contact:** self

Notified By: Phillip Gorman **Date:** 1/17/2022

Trouble Report Disposition:

Determined By: Phil Gorman **Closure/Discovery Date:** 1/17/2022

Deviation Evaluation: Major



Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Reason for Determination:

An incorrect heat transfer to the coolant is calculated, which can lead to incorrect results.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The error only impacts MOD004.9, which has not been applied in licensing basis safety analysis to-date. Additionally, while the error does result in an underprediction of heat transfer, the underprediction only occurs in one conductor node and lead to a small integrated error. A Loss of normal feedwater transient was examined to determine the long term impact on the pressurizer water volume and demonstrated to result in a maximum difference of 5 cu. Ft. over the 6000 second transient. A short term event, LOL/TT, was also examined and demonstrated to not impact the peak pressure results over the typical 10 second transient. Therefore, the practical implementation of the error in licensing basis safety analyses are demonstrated to accumulate a minimal error.

Determined By: Mike Howard

Date: 1/21/2022



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_725

Reported By: Trevor Ross

Date: 2022 9:11:29 AM

Reported To: Trevor Ross

Date: 1/17/2022

Program Version: RETRAN3D MOD004.9

Computer/Operating System: All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Separator model with initial level forcing function which is greater than 1.

Description of Problem:

The separator model is not giving the expected results for separator carryover and carryunder. Two issues were noted:

1. The initial/design carryunder is not matching an analytical solution because the carryunder is limited to the inlet flowing quality during auxiliary steady state calculations, which is incorrect. This logic only needs to be applied for the transient calculation. Similar logic is used for carryover and should be corrected.
2. The carryover and carryunder values "drift" to the right rather than following the lookup table because the junction quality is set by the upstream region quality. Description should be added to the RETRAN manual volumes 5 and 1 to clarify this behavior is expected.

Impact of Error on Current and Previous Code Versions:

All RETRAN-3D and RETRAN-02 versions

Modeling Alternatives:

For Item 1: Ensure forcing function tables are modified such that the initial forcing functions are 1.0.

Modification Number or Resolution:

mod 612

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Trevor Ross

Date: 1/17/2022

Trouble Report Disposition:

Determined By: Trevor Ross

Closure/Discovery Date: 1/17/2022

Deviation Evaluation: Major

Reason for Determination:

The carryunder and carryover results are incorrect for auxiliary steady state calculations, which can lead to incorrect results.



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

If a model is affected by this error, RETRAN will not hold a null transient and therefore the error is obvious to the user upon the review of their results.

Determined By: Mike Howard

Date: 1/21/2022

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_726

Reported By: Rich Schoff (Duke)

Date: 2022 7:44:55 AM

Reported To: Phil Gorman

Date: 1/18/2022

Program Version: RETRAN-3D MOD004.9 **Computer/Operating System:** All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

The simplified RETRAN-3D model simulated steady-state water flow in a one-dimensional pipe using a Fill Junction, ten Volumes, and a Time-Dependent Volume (TDV). The TDV pressure (780.03 psia) and Fill mass flow rate (277.778 lbm/s) were selected based on RETRAN-3D MOD 4.9 Theory Manual Table III.3-1, "RETRAN Values of the Modified Baroczy Two-Phase Friction Multiplier at $G = 1.0 \times 10^6$ lbm/hr-ft²". The TDV fluid quality and Fill enthalpy were varied to represent 12 sample quality values ($x = 0.0$ to 0.9 every 0.1 , 0.99 , and 1.0). Junction input JTPMJ was used to specify the two-phase friction model as Homogeneous (1), EPRI (2), Baroczy with flowing quality (3), or Martinelli-Nelson with the Jones correction (4). The files listed above were from the case with JTPMJ = 1 and $x = 0.0$.

Description of Problem:

Summary:

- o There is a step change in the evaluated Fanning friction factor when going from two-phase flow to single-phase vapor flow, which causes a step change in the two-phase pressure drop for most correlations.
- o The density ratio in STPM does not align with the two-phase multiplier calculated within STPM (at least for the Baroczy correlation, JTPMJ=3).
- o The Martinelli-Nelson correlation with the Jones correction (JTMPJ=4) overpredicts the two-phase multiplier by a significant margin.

See Duke_R3D_Trouble_Report_2022-01-18.pdf for more details.

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

Use alternate two-phase multipliers. As indicated in the trouble report disposition, for JTPMJ=0 through 3, the observed behavior is a modeling limitation. JTPMJ = 3 is the recommended option as it shows the smallest jump.

Modification Number or Resolution:

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Mark Paulsen

Date: 2/8/2022

Trouble Report Disposition:



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Determined By: Phil Gorman

Closure/Discovery Date: 2/8/2022

Deviation Evaluation: Minor

Reason for Determination:

These issues are modeling limitations. See "RE Trouble Report for RETRAN-3D Wall Friction Models (1182022).msg" for more details including math. The bottom line is that JTPMJ=1 is behaving exactly as expected, and the jump at X=1 is due to the difference in the single-phase vapor friction factor and the single-phase liquid friction factor. JTPMJ=2 is consistent with JTPMJ=1. JTPMJ=3 exhibits a smaller jump and is presumed to account for the difference in single-phase liquid and vapor friction factors; any difference may also be attributed to different water properties used for the empirical formulation.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor Deviation

Determined By: Mike Howard

Date: 2/11/2022



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_727

Reported By: Trevor Ross

Date: 2022 9:35:51 AM

Reported To: Phil Gorman

Date: 2/28/2022

Program Version: RETRAN3D MOD004.9 **Computer/Operating System:** All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Dummy problem to fill and drain a separator.

Description of Problem:

When using a bubble rise volume with noncondensables, the initialization logic in subroutine BUBIN1 does not correctly set up the water property arrays. This leads to a code failure.

While resolving this issue with mod_615, additional initialization logic issues were found which would prevent noncondensables from being correctly propagated throughout the system.

The error was introduced during the F95 conversion.

Impact of Error on Current and Previous Code Versions:

RETRAN-3D MOD004.5 and later

Modeling Alternatives:

N/A

Modification Number or Resolution:

mod 615

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phil Gorman

Date: 2/28/2022

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 2/28/2022

Deviation Evaluation: Minor

Reason for Determination:

The error leads to a code failure. Since no incorrect results are provided, this is a minor error.

10CFR Part 21 Evaluation:

Reportable Defect: No



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Reason for Determination:

Minor Deviation

Determined By: Mike Howard

Date: 3/7/2022



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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_728

Reported By: Chris Henry (Constellation)

Date: 122 10:58:49 AM

Reported To: Phil Gorman

Date: 3/25/2022

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: No

Input File Supplied: Yes

Input Model Description:

Peach bottom (step-wise pump speed reduction transient)

Description of Problem:

The FIBWR model has error messages which are not documented in Appendix C of volume 3 of the manual. These messages indicate that the junctions in each channel must be numbered in ascending order, and further that the bypass channel must use the same number of axial planes as the fuel channel.

Impact of Error on Current and Previous Code Versions:

MOD004.1 and later

Modeling Alternatives:

Use modeling schemes noted in trouble report description field.

Modification Number or Resolution:

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phil Gorman

Date: 3/25/2022

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 4/7/2022

Deviation Evaluation: Not a

Reason for Determination:

There are undocumented modelling limitations. These limitations are no errors in themselves, but the documentation requires correction. When used inappropriately, the code aborts with an error message, so this is not an error.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:



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RETRAN-3D Software Trouble Report

Not a deviation.

Determined By: Mike Howard

Date: 4/7/2022

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RETRAN-3D Software Trouble Report

Trouble Report Number: tr_729

Reported By: Taylor Blyth

Date: 122 11:28:52 AM

Reported To: Taylor Blyth

Date: 3/30/2022

Program Version: MOD004.9

Computer/Operating System: Windows 10

Listing Supplied: No

Input File Supplied: No

Input Model Description:

For item #2, use sample problem ttqx1

For item #3, use the ucrw.rst sample restart problem.

For item #4, use the Limerick model input 09_limerick_init=0.m606 w/ tape40 file lasalle_retran_3d.tape40

For item #5, use the ucrw sample problem (and build RETRAN-3D to run with Valgrind)

Description of Problem:

These issues have been identified during the investigation of differences found when building and running RETRAN-3D with the 19.0 version of the Intel Fortran compiler.

1.
in m_work_arrays, the opt array is not allocated to the proper dimension.

2.
when running the sample problem ttqx1 an error exists in xspo.f90 at line 49 where the coe pointer-array is not in the range of the target-array. This error only stops the code execution with a executable built with the 'check pointer' run-time flag set and the 19.0 ifort version build.

The results of the ttqx1 sample problem are in line with the expected results so it appears to not attempt to access values on a bad range.

3.
Generalized restart cases do not run as intended. There is an issue in the read-in of the restart deck title name which causes the code to abort.

4.
Certain models cause a code failure in subroutine printm if the width of the matrix to print is near the 120 column limit. This is due to the code not accounting correctly for the actual width printed to the output and therefore exceeding the bound of the IPIC2 array. NOTE: this only affects debugging (with array bound check enabled).

5. The Valgrind program reports certain memory losses at allocation statements in files fitht.f90, m_minor_edit_search.f90, and masbal.f90. Each of these memory losses occurs at a place in the code where an allocation statement is not prefaced by a check if the pointer is already allocated. Additionally, the untfllg parameter is uninitialized in subroutine inedit. This is noted in Valgrind output.

Impact of Error on Current and Previous Code Versions:

TBD

Modeling Alternatives:

1. TBD



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2. do not use 1D kinetics
3. do not use restart runs.
4. N/A
5. N/A

Modification Number or Resolution:

mod 618

Originator Notification:

User Notified: No

Method of Contact:

Notified By:

Date:

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 4/8/2022

Deviation Evaluation: Minor

Reason for Determination:

No data is being written outside the bounds of any array whose dimensions are improperly set (regardless of which dimension is being used). Therefore, the errors will have no impact on results.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor Deviation.

Determined By: Mike Howard

Date: 4/8/2022



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_730

Reported By: Mark P. Paulsen

Date: 122 10:49:07 AM

Reported To: Mark Paulsen

Date: 3/23/2022

Program Version: All

Computer/Operating System: N/A

Listing Supplied: No

Input File Supplied: No

Input Model Description:

N/A - documentation error

Description of Problem:

Equations VI.1-17, VI.1-19 and VI.1-20 have subscript errors. Clarification should be added to describe the change in the area change momentum flux term for jet pump drive and suction junctions. An equation should be added for the jet pump suction junction pressure, similar to that for the drive junction .

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

N/A

Modification Number or Resolution:

Originator Notification:

User Notified: No

Method of Contact:

Notified By: N/A

Date:

Trouble Report Disposition:

Determined By: Mike Howard

Closure/Discovery Date: 4/5/2022

Deviation Evaluation: Minor

Reason for Determination:

Has no effect on calculated results - documentation changes clarify the model basis.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Documentation Error



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RETRAN-3D Software Trouble Report

Determined By: Mike Howard

Date: 4/6/2022

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_731

Reported By: Phillip Gorman

Date: 122 10:04:10 AM

Reported To: Phil Gorman

Date: 4/13/2022

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Shippingport V&V problem, 54 MW case with manual subnode specification.

Description of Problem:

When using the stratified pressurizer model, the local conditions flag is sometimes incorrectly set. This may show itself as a conductor using a liquid heat transfer correlation in the vapor region.

The local conditions flag should be set for all conductors in the second stack associated with a stratified pressurizer. A code review found that during initialization, the local conditions flag is set for conductors from the bottom of the FIRST stack associated with the stratified pressurizer, up for a number of conductors equal to the length of the second stack associated with the stratified pressurizer. Conductors which were input in the second stack have the flag appropriately set, but conductors which are input on the first stack but moved to the second stack during initialization may use the wrong flag.

Impact of Error on Current and Previous Code Versions:

MOD004.7 and later

Modeling Alternatives:

Specify the conductors on the stack in which they reside at time zero, rather than relying on the code to reorganize the stacks for the stratification model. This will set the local conditions flag appropriately.

Modification Number or Resolution:

mod 611

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phil Gorman

Date: 4/13/2022

Trouble Report Disposition:

Determined By: Phil Gorman

Closure/Discovery Date: 4/13/2022

Deviation Evaluation: Major

Reason for Determination:

The local conditions flag affects which heat transfer regime is selected, and will thus impact the heat transferred to and from the stratified pressurizer.



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The stratified pressurizer model is not covered by the RETRAN-3D SER. Most pressurizer models do not include conduction as it is more conservative to neglect it. Correcting the error showed a small pressure increase in the Shippingport V&V problems, which simulated a loss of load.

Determined By: Mike Howard

Date: 4/15/2022



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_732

Reported By: Mark P. Paulsen

Date: 2022 1:13:49 PM

Reported To: Mark Paulsen

Date: 6/9/2022

Program Version: MOD004.9

Computer/Operating System: Windows\10

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

The loss of residual heat removal (Ihr) standard sample problem input deck encountered the error.

Description of Problem:

When testing the improved accuracy liquid temperature and improved calculational efficiency vapor temperature curve fits (modification mod_616), the loss of residual heat removal (Ihr) sample problem failed with a minimum time-step size error. The error is due to poor initial estimated for the pressure search unknowns that lead to negative vapor pressures. The negative pressures are left unchanged for subsequent iterations until the search fails.

A warning message from the saturation temperature calculation indicated that it had been called with a zero vapor pressure. The case encountered is benign since the resulting saturation temperature (zero) is not used because there is no vapor in the volume.

Impact of Error on Current and Previous Code Versions:

All RETRAN-3D

Modeling Alternatives:

In some instances, reducing the time-step size between 0.1 and 1.0 seconds will avoid the error. With mod_616, reducing time-step size does not resolve the problem. For the MOD004.9 Ihr sample problem, the time-step size had been reduced to 20 microseconds in the problematic region.

Modification Number or Resolution:

mod 616

Originator Notification:

User Notified: Yes

Method of Contact: Telephone

Notified By: mpp

Date:

Trouble Report Disposition:

Determined By: Mark Paulsen

Closure/Discovery Date: 6/10/2022

Deviation Evaluation: Minor

Reason for Determination:

The minimum time-step size associated with the pressure search leads to a problem termination.



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RETRAN-3D Software Trouble Report

As noted above, the saturation temperature for a zero pressure is benign.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Both problems are minor errors as noted above.

Determined By: Mike Howard

Date: 6/14/2022



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_733

Reported By: Phil Gorman

Date: 2022 8:13:37 AM

Reported To: Phillip Gorman

Date: 6/13/2022

Program Version: MOD004.9

Computer/Operating System: Windows 10

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Source code review (ststat.f90)

Description of Problem:

The general transport, method of characteristics, DNB, and kinetics models are initialized after the control systems in the steady state solution. As a result, any control inputs which use variables from these models are zero on the first time step (regardless of actual value).

Impact of Error on Current and Previous Code Versions:

All

Modeling Alternatives:

Do not use any control inputs that rely on the above variables.

Modification Number or Resolution:

mod 606

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phillip Gorman

Date: 6/13/2022

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 6/13/2022

Deviation Evaluation: Major

Reason for Determination:

This can change the solution in the first time step, which meets the definition of a major deviation.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Only affects steady state initialization/first time step. Any jump in the first time step is obvious, and if it impacts results, it should be obvious during a null transeint.



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Determined By: Mike Howard

Date: 6/14/2022

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_734

Reported By: Taylor Blyth

Date: 123 11:15:46 AM

Reported To: Taylor Blyth

Date: 2/1/2023

Program Version: MOD004.9

Computer/Operating System: Windows 11

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

See tr_734 directory for inputs and testing results.

Description of Problem:

This TR is related to specifying trips in a simple restart case as well as trip error messages

#1. If a trip is revised via an 04XXX0 card in the restart input (see V3.V.5.0) and its value of IX1 or IX2 is updated then the trip summary printed to the restart input will still contain the 'original run' value of IX1 and/or IX2. It should print the 'updated' restart input value of the IX1 and/or IX2 for that specific trip which has been revised. The results of the restart case are as-expected with this issue only affecting the printed table summary of the trips.

#2. For a simple restart, if a value of '0' is entered as NTRP (W4-I) on the restart input card 010001 and the user still specifies trip cards (04XXX0) in the restart input then the code does not gracefully exit and no relevant error is supplied. This is due to the code still trying to process the restart input listing of the 04XXX0 trip cards without allocating the parameters necessary to process the restart trip info.

Additionally, if a value of NTRP is input on the restart which is greater than the original run's NTRP then the code does not fail gracefully. Error 95003 (from inrstr) is written to the error log but the code continues its attempt to process trip data (in intrip) which may result in a code failure.

The value of NTRP does not matter as long as it is not equal to 0 and it is less than or equal to the original run's value of the number of trips. This is somewhat inconsistent with the documentation in V3.V.2.0.

#3. Errors on IDSIG = 8 (avg fuel temp) signal w/ bad IX1/IX2 values do not contain the correct message. The error log message indicates an issue with IDSIG = 10. Similarly, errors for bad IX1/IX2 inputs with IDSIG = 10 (conductor temp) signal are not caught and cause a code failure.

Impact of Error on Current and Previous Code Versions:

all previous

Modeling Alternatives:

- #1. the results are unaffected aside from the numbering of the IX1 & IX2 trip IDs (if changed via restart input)
- #2. ensure NTRP is entered properly on the simple restart input.
- #3. ensure IX1 and IX2 values are correct for IDSIG = 8 or 10.

Modification Number or Resolution:

mod 619



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Originator Notification:

User Notified: Yes **Method of Contact:** self
Notified By: Taylor Blyth **Date:** 2/1/2023

Trouble Report Disposition:

Determined By: Phillip Gorman **Closure/Discovery Date:** 2/1/2023
Deviation Evaluation: Minor

Reason for Determination:

Will not affect results. #1: results will contain improper data labels; editorial only. #2: code will not run. #3: error message is incorrect (or code will not run)

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Code will not produce anomalous results. It will crash or will display the incorrect IX1/IX2 value in portions of the trip summary table if that value was altered via the restart input.

Determined By: Mike Howard **Date:** 2/7/2023



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_735

Reported By: Brian Holman, Duke

Date: 123 11:45:46 AM

Reported To: Phillip Gorman

Date: 2/6/2023

Program Version: MOD004.9

Computer/Operating System: Linux

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

McGuire/Catawba base deck. Warning message 805 should be issued, yet it is only reported if steady state is not reached (for instance, by changing the acceleration pressure convergence criteria to 1.e-20 psi).

Description of Problem:

Warning messages 801, 804, 805, 806, and 917 are not issued if steady state convergence is reached. Warning 917 will generally prevent the steady state solution from converging, so it is not an issue, but the other warnings should be issued if they are encountered at the first iteration (804 and 805) or the last iteration (801).

Impact of Error on Current and Previous Code Versions:

MOD004.7 and later

Modeling Alternatives:

Prior to MOD004.7, the indicated error messages typically did not exist.

Modification Number or Resolution:

mod 615

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phillip Gorman

Date: 2/10/2023

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 2/10/2023

Deviation Evaluation: Minor

Reason for Determination:

The code fails to appropriately issue input warning messages. Warnings 801 and 804 only related to the potential for nonconvergence during steady state iterations. Warning 805 is related to inconsistent inputs regarding junction overlap. If any of these errors are relevant, they will still be made known to the user (either through a failure to reach steady state convergence or through a junction property error), so this is a minor error.

10CFR Part 21 Evaluation:

Reportable Defect: No



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RETRAN-3D Software Trouble Report

Reason for Determination:

Minor error

Determined By: Mike Howard

Date: 2/14/2023



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_736

Reported By: Brian Holman, Duke

Date: 123 12:36:21 PM

Reported To: Phillip Gorman

Date: 2/6/2023

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Description of Problem:

In RETRAN-02, it was possible to use a bubble rise volume with air as an accumulator and bypass the special accumulator model. As of RETRAN-3D MOD004.7, it is no longer possible to specify a bubble rise volume with air without setting NCFLOW=1. Setting NCFLOW=1 is not permitted when running in RETRAN-02 mode.

Impact of Error on Current and Previous Code Versions:

MOD004.7 and later

Modeling Alternatives:

Use NCFLOW=1 or accumulator special model (not permissible for RETRAN-02 mode)

Modification Number or Resolution:

mod 629

Originator Notification:

User Notified: Yes **Method of Contact:** Email

Notified By: Phillip Gorman **Date:** 2/10/2023

Trouble Report Disposition:

Determined By: Phillip Gorman **Closure/Discovery Date:** 2/10/2023

Deviation Evaluation: Minor

Reason for Determination:

The code fails to run with air in bubble rise volumes with NCFLOW=0. This is a minor deviation.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor error



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Determined By: Mike Howard

Date: 2/14/2023

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_737

Reported By: Christy Ray, Duke

Date: 2023 6:03:40 AM

Reported To: Phillip Gorman

Date: 2/21/2023

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

ONS model with a single node pressurizer (base), thermal stratification with 10 subnodes (strat10), and thermal stratification with 20 subnodes (strat20).

Description of Problem:

When using the pressurizer thermal stratification model, the elevation head and junction pressure are not calculated correctly for junctions which are connected to the stratified pressurizer but not internal to the pressurizer. The junction pressure (PJUN) varies significantly (more than +/-1 psi) based on the number of subnodes used.

When using conductors with the automatic subnodalization model, it may or may not use the correct properties. After a source code review, it was found that the number of conductors associated with each stack was not properly processed in the automatic subnodalization model, and if conductors were associated with a subnodalized volume, it may use the stack length for a different stack in order to sum the heat transfer areas and conductor volume.

While resolving this trouble report, a few other code errors were observed and corrected. These are noted below.

- * The elevation head for most junctions connected to the vapor region of a stratified pressurizer was incorrectly calculated. This affects PORVs, safety valves, and spray junctions.
- * When a junction which is not "internal" to the pressurizer stratification model is connected to an inactive subnode, the major edit will still refer to the inactive subnode on its "from" or "to" connection.
- * The heat conductor input logic would have an error if more than 9 stacks were used, including stacks that the code generated. There is no need for this limitation.
- * During input processing, the code would fail to associate non-internal junctions connected to a stratified pressurizer with the stratified pressurizer if automatic subnodalization was used. This has no direct impact to the user, but is related to the previously identified errors.

Impact of Error on Current and Previous Code Versions:

MOD004.7 and later

Modeling Alternatives:

The PJUN errors have little impact on downstream results. Junctions connected to the top subnode (such as safety valves) are unimpacted. Generally, the largest impact will be if the PJUN value is used through a control system, such as to represent pressure taps for level indication.

The heat conductor issue can be worked around by either using the same number of conductors in every stack in the model, or not using heat conductors in the stratified pressurizer.

Modification Number or Resolution:



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

mod 620

Originator Notification:

User Notified: Yes **Method of Contact:** Email

Notified By: Phillip Gorman **Date:** 2/20/2023

Trouble Report Disposition:

Determined By: Phillip Gorman **Closure/Discovery Date:** 2/21/2023

Deviation Evaluation: Major

Reason for Determination:

The PJUN, elevation head, and heat conductor input errors can impact the RETRAN results, which meets the criteria for a major deviation. The others only affect output processing or spurious error messages, which are minor deviations.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The thermal stratification model is not approved for use in licensing applications. Furthermore, if the PJUN error results in incorrect calculations, the impact is obvious and requires adjustment to initialize correctly. The heat conductor stack error is not adverse to safety for two reasons: a) it is generally more conservative to ignore passive heat conductors (i.e. those outside the core and steam generator), and the error leads to a truncation of conductors included in the stack; and b) conductors outside the pressurizer are unlikely to be used with the automatic subnodalization model.

Determined By: Mike Howard **Date:** 2/21/2023

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_738

Reported By: Richard Schoff (Duke Energy)

Date: 2 /14/2023

Reported To: Phillip Gorman

Date: 2/14/2023

Program Version: MOD004.9

Computer/Operating System: Linux

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

9 models with identical control volume and junction numbering schemes, and equivalent data on the bubble rise data cards. The bubble rise indexes are renumbered between the cases and show differences in the bubble velocities used during the transient.

Description of Problem:

Warning message 904 can be issued indicating that there is a steam mass imbalance in a bubble rise volume. When that warning message is issued, RETRAN cannot calculate a physical bubble velocity in the indicated control volume, so it uses the most recent bubble velocity which was calculated. Depending on the numbering scheme used, this might be the bubble velocity that was entered on the input or it may be a different value.

Impact of Error on Current and Previous Code Versions:

All prior

Modeling Alternatives:

Avoid encountering warning message 904. If the nodding scheme is such that error message 904 is likely to be encountered, use a simple control system to specify the bubble velocity, since that overrides the value calculated by steady state.

Modification Number or Resolution:

mod 615

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phil Gorman

Date: 2/23/2023

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 2/28/2023

Deviation Evalaution: Not a

Reason for Determination:

The indicated behavior is a modeling limitation. RETRAN does not permit negative bubble velocities, and when a negative bubble velocity is required to balance the steady state balance equations, warning message 904 is issued. Using the most recent bubble velocity is as reasonable as any other approach. However, it is not ideal that the bubble velocity can depend on the input numbering, so a code modification should still be made to ensure consistency.



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Although a code change is being implemented to avoid the warning message in the future and to ensure model implementation in a consistent manner, this issue does not represent a code error and is therefore not reportable.

Determined By: Mike Howard

Date: 3/2/2023



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_739

Reported By: Phillip Gorman, NAS

Date: 2/28/2023 7:36:28 AM

Reported To: Phillip Gorman

Date: 2/28/2023

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Modified version of ttqx1 sample problem to show hand calculation of FIBWR leakage flows.

Description of Problem:

When using the FIBWR model, there is a 10 psi limit on the lateral pressure drop which does not seem reasonable.

The axial bypass flows account for elevation head in a way that is not reflected in the documentation. The method is appropriate and consistent with the FIBWR code, but it is underdocumented.

Impact of Error on Current and Previous Code Versions:

MOD004.1 and later

Modeling Alternatives:

Do not use FIBWR model for lateral leakage flows if the pressure drop across the junction exceeds 10 psi.

Modification Number or Resolution:

mod 621

Originator Notification:

User Notified: Yes **Method of Contact:** self

Notified By: Phillip Gorman **Date:** 3/1/2023

Trouble Report Disposition:

Determined By: Phillip Gorman **Closure/Discovery Date:** 3/1/2023

Deviation Evaluation: Major

Reason for Determination:

The change impacts calculation results, which meets the definition of a major error.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:



Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

The FIBWR model has not been reviewed for licensing applications. Furthermore, as shown in the provided output, if the leakage path exceeds 10 psi, the flow rate hits a maximum and does not change much, which should be suspicious to any code user.

Determined By: Mike Howard

Date:

3/8/2023

Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Trouble Report Number: tr_740

Reported By: Trevor Ross, NAS

Date: 2023 8:07:13 AM

Reported To: Trevor Ross

Date: 4/24/2023

Program Version: MOD004.9

Computer/Operating System: Windows 10 Enterprise

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Halden Irradiation Test IFA-513 - Dynamic Gap Model V&V problem.

"prob1" input:

- In card 225041, molar gas fractions for Helium (0.77) and Xenon (0.23) sum to 1.0, yet still cause error 22501 (molar fractions do not sum to 1.0). This only seems to occur in conjunction with another error.

"prob2" input:

- "Dummy materials" are specified in the model, 18XXYY and 19XXYY cards where XX = 03 and XX = 04. These are not specified for XX = 05 and XX = 06, which causes error 17005.

Description of Problem:

Several issues were noted with the dynamic gap model input processing and error checking:

- The molar gas fractions in the 225XXY cards are not summing correctly for certain values (0.77 Helium, 0.23 Xenon), resulting in error 22501 being given.
- Error number 22503 (related to long form input) is being displayed when the short form problem input is used. Error number 22504 seems more appropriate. The error occurs when there is a mismatch between the number of conductor stacks and gap models.
- In the 17XXYY cards, for YY > 01 and IGP = -1, Volume 3 section 17.4 of the RETRAN manual states the material index, IM, should be set to XX on the 225XXY gap model card. When input is entered this way, RETRAN still looks for the 18XXYY cards and 19XXYY cards corresponding to IM and will return an error if there are not matching values. Dummy cards have to be supplied for the 18XXYY and 19XXYY cards to bypass this error.

Impact of Error on Current and Previous Code Versions:

TBD

Modeling Alternatives:

Dummy materials can be entered in the 18XXYY and 19XXYY cards to bypass the error 17005.

Error 22501 only occurred when another error occurred so should not need an alternative method.

Error 22503 is the incorrect error, but resolves when an equivalent number of gap model cards and conductor stacks (2200XY) cards are provided.

Modification Number or Resolution:

mod 628

Originator Notification:



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

User Notified: Yes **Method of Contact:** Self

Notified By: Trevor Ross **Date:** 4/24/2023

Trouble Report Disposition:

Determined By: Trevor Ross **Closure/Discovery Date:** 7/3/2023

Deviation Evaluation: Minor

Reason for Determination:

The code will not run to completion if the errors are encountered.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor deviation.

Determined By: Mike Howard **Date:** 7/7/2023

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_741

Reported By: John Lobate (Duke)

Date: 123 11:15:11 AM

Reported To: Phillip Gorman

Date: 4/26/2023

Program Version: MOD004.9

Computer/Operating System: Linux

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Demonstration model which shows the PORV opening and closing.

Description of Problem:

When a PORV opens and then closes, the total flow rate and junction area are zero, but the phasic flow rates (WGJ* and WLJ*) are equal and opposite and nonzero. There should be no flow through a closed valve.

The error is due to an inconsistency between the phasic flows and the total flow during the time step advancement. During the time step advancement, the total flow rate is updated by the governing equations, and the phasic flow rates are updated afterwards based on the change in total flow rate and slip velocity. However, when a valve is closed, the change in flow rate is not updated, so the last nontrivial changes in flow and slip are used for the phasic velocities. This change is proportional to the time step size at the time of the valve closure, so the resulting phasic flow rates are also proportional to the time step size.

Impact of Error on Current and Previous Code Versions:

MOD004.9 (introduced during momentum flux update)

Modeling Alternatives:

The error is proportional to the time step size at the time of the valve closure. A time step sensitivity study can reduce the magnitude of the error such that it is negligible.

Modification Number or Resolution:

mod 622

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phillip Gorman

Date: 4/26/2023

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 4/26/2023

Deviation Evaluation: Major

Reason for Determination:

This error can affect code results, which is a major error.

10CFR Part 21 Evaluation:



Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Reportable Defect: No

Reason for Determination:

The error is proportional to the time step size. Since a time step sensitivity study should be required per licensed reload methodologies to be conducted as part of any licensing application, the impact of the error would be captured and minimized through use of an appropriate time step size.

Determined By: Mike Howard

Date: 5/1/2023

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_742

Reported By: Taylor Blyth

Date: 123 11:42:41 AM

Reported To: Taylor Blyth

Date: 8/21/2023

Program Version: MOD004.9

Computer/Operating System: RHEL 7.9

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

sample problem accum is modified to show the issue of this TR. TMIN and DELTM are modified such that they no longer divide to an integer.

```
* -----
* MODIFY TIME STEPS SUCH THAT TMIN [W2] / DELTM [W7] IS NOT AN INTEGER
* IN THE 001 TIME CARD:
*   TMIN 0.2 -> 0.05
*   DELTM 0.1 -> 0.02
*
*30000 RTG MIN RST MMJ NDMP NCHK DTMAX TLAST
030010 0. 0.05 0. 2. 2. 0 0.02 1.
*
* CLEAN UP MINOR EDITS SO TAPE60 FILE IS EASIER TO READ THROUGH
* -> JUST TIMX 0 & PRES 20
*
020000 TIMX 0 PRES 20
020001 * PRES 4 PRES 20
020002 * WP** 4 WP** 200
020003 * WGJ* 3 WLJ* 3
020004 * WGJ* 4 WLJ* 4
020005 * AVEX 3 AVEX 4
020006 * TEML 3 TEML 4
020007 * TEMV 4 TEML 10
020009 * TAIR 20 TLIQ 20
020010 * TWAL 20 EXPC 20
*
```

Description of Problem:

If TMIN divided by DELTM is not an integer then the timing of the values printed to the TAPE60 file may not be as expected i.e. matching the TMIN frequency. This affects the internal time step calculations driven by the TMIN selection. The code continues to run with the incorrect time step scheme. This appears only to affect the TAPE60 output for the current time card (until the TLAST time) for which the TMIN and DELTM do not divide to an integer.

If a fixed time step size scheme is used (NCHK = 1) then the same problem persists.

As an example, if DELTM = 0.02 and TMIN = 0.05, then the TAPE60 file will print results at every 0.06 s and not every 0.05 s as expected based on the input of TMIN. This happens for both a fixed time step scheme and the internal time step size calc (NCHK = 0) scheme.

Impact of Error on Current and Previous Code Versions:



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

MOD004.9 and previous

Modeling Alternatives:

Ensure that TMIN / DELTM is an integer for all time cards.

Modification Number or Resolution:

mod 624

Originator Notification:

User Notified: Yes

Method of Contact:

Notified By: Self

Date: 8/21/2023

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 12/12/2023

Deviation Evaluation: Minor

Reason for Determination:

The issue is a noted code limitation, as discussed in Volume 3. However, a warning should have been issued to the error log, and was not. Since the code ultimately performed as it should, but insufficient messages were printed to the user, this is a minor error.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Minor deviation

Determined By: Mike Howard

Date: 12/12/2023

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_743

Reported By: Rich Schoff, Duke Energy

Date: 123 12:49:09 PM

Reported To: Phillip Gorman

Date: 8/17/2023

Program Version: MOD004.9

Computer/Operating System: Linux

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

The input model was designed to analyze a main steam line break event initiated from hot zero power conditions for 200 seconds.

Description of Problem:

A RETRAN-3D MOD 4.9 transient showed unexpected results from a Control Block of type LLG (Lead/Lag). Initial investigation found that the results depended on the indexing of the Control Block operand and the Control Block. The unexpected results occurred when the index of the Control Block was smaller (less negative) than the index of the Control Block operand. The expected results occurred when the index of the Control Block was larger (more negative) than the index of the Control Block operand.

The control system logic in the provided input contained several instances in which the inputs to control blocks depended on other control blocks whose index was more negative. The RETRAN-3D control system solution uses a Gauss-Siedel algorithm with a user-supplied convergence criterion to ensure self-consistency, such that the control block numbering has no impact on results. In the provided input, the default criterion was used, which was insufficient to resolve the control system at the latest time step.

Impact of Error on Current and Previous Code Versions:

All prior

Modeling Alternatives:

For RETRAN-02: Ensure that control blocks are numbered such that they are more negative than their inputs.

For RETRAN-3D: As above, *or* use a smaller convergence criterion.

Modification Number or Resolution:

mod 625

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phillip Gorman

Date: 8/22/2023

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 8/22/2023

Deviation Evaluation: Not a



Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Reason for Determination:

The behavior is a noted code limitation. Despite not being an error, the code should be changed to resolve the code limitation, since the default criterion should be sufficient to resolve out-of-order control blocks for practical applications.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

Not a code error.

Determined By: Mike Howard

Date: 8/24/2023

Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_744

Reported By: Phillip Gorman

Date: 123 11:04:00 AM

Reported To: Phillip Gorman

Date: 9/11/2023

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: Yes

Input File Supplied: Yes

Input Model Description:

Model originally used to test ORIP logic, modified for updated code version.

Description of Problem:

Two issues were observed when running the off-rated initialization procedure (ORIP) with RETRAN-3D MOD004.9. The issues were introduced at different times.

1. If changing the feedwater/steam flow using the ORIP logic, the flow rate is correctly modified for steady state initialization, but then not maintained during a null transient. Accordingly, the code will fail to hold a null transient. This error has been present since the ORIP logic was added in MOD004.1.
2. If the ORIP logic is used and it converges on the inner loops (where it solves the momentum and energy equations as in the normal steady state logic) but not the outer loop (in which it solves the special ORIP equations), subsequent outer iterations will not iterate on the inner loop and instead advance the outer loop after inner iteration six (where it starts on iteration five). This makes it very unlikely to reach steady state convergence. This issue appears to have been introduced during the F95 conversion, and affects MOD004.6 through MOD005.0.

Impact of Error on Current and Previous Code Versions:

MOD004.1 through MOD004.9

Modeling Alternatives:

Issue 1. Use IGTFS and IFWJUN equal to 0 on card 2360XY.

Issue 2. If it gets stuck performing one inner iteration, the convergence criteria may be changed on the 230000 card so that it will never actually converge (e.g. ACEPSI = 1.E-20), and LCOUNT is negative.

Modification Number or Resolution:

mod 623

Originator Notification:

User Notified: Yes

Method of Contact: self

Notified By: Phillip Gorman

Date: 9/14/2023

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 9/14/2023

Deviation Evaluation: Major



Numerical Advisory Solutions, LLC

RETRAN-3D Software Trouble Report

Reason for Determination:

The first error is a major deviation, since it affects feedwater flow throughout the transient without a warning message. The second error is a minor deviation, since it presents a failure to reach steady state convergence.

10CFR Part 21 Evaluation:

Reportable Defect: No

Reason for Determination:

The first error is obvious when running a null transient, which is required for compliance with the SER (condition 29). Therefore, it is not reportable. The second error is a minor deviation, which is by definition not reportable.

Determined By: Mike Howard

Date: 9/19/2023



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Trouble Report Number: tr_745

Reported By: John Lubatti (Duke)

Date: 123 11:30:14 AM

Reported To: Phillip Gorman

Date: 9/12/2023

Program Version: MOD004.9

Computer/Operating System: All

Listing Supplied: No

Input File Supplied: No

Input Model Description:

Description of Problem:

An invalid minor edit should result in a fatal error message (error 2007). However, when it is preceded by warning 4014 (circular trip logic), it may be nonfatal.

It was found that the issue originates with warning 4014, which can cause subsequent errors to be downgraded to warnings.

Impact of Error on Current and Previous Code Versions:

MOD004.9

Modeling Alternatives:

Do not use circular trip logic.

Modification Number or Resolution:

mod 627

Originator Notification:

User Notified: Yes

Method of Contact: Email

Notified By: Phillip Gorman

Date: 9/12/2023

Trouble Report Disposition:

Determined By: Phillip Gorman

Closure/Discovery Date: 9/18/2023

Deviation Evaluation: Minor

Reason for Determination:

Even though potentially incorrect results may be generated (depending on the error which follows warning 4014), the error message is still written to the output file and the error log file. Since the user is still notified about any errors which occur, this is a minor deviation.

10CFR Part 21 Evaluation:

Reportable Defect: No



Numerical Advisory Solutions, LLC
RETRAN-3D Software Trouble Report

Reason for Determination:

Minor Error

Determined By: Mike Howard

Date: 9/21/2023
