Summary of RETRAN-3D MOD004.1
Code Modifications

The latest version of RETRAN-3D is the most significant update since the original release of the code. It includes 72 modifications to RETRAN-3D MOD003.1 to produce RETRAN-3D MOD004.1. They include 51 error corrections and another 21 modifications that either extend existing models or add new models or user conveniences. A summary of the modifications that implemented a new model or feature is given below. They are followed by a summary of the modifications that corrected code errors.

New Models and Features

Model	Modification	Description
BWR Fuel Models	196	1. Provides capability to compute flows for active core and bypass channels 2. Allows FIBWR style calculation of core support plate and lateral leakage flow paths 3. Allows modeling of advanced fuel designs utilizing part length rods and water rods 4. Accounts for Reynolds number dependent grid losses
Choking Model Improvements	202 221	Use stagnation properties to evaluate functions Replace isentropic HEM curve fits with table and interpolation
Automatic Bypass Heating Model	204	Used with channel model and 3-D kinetics
Control System Improvements	205 207 245	Added super summer block - sum multiple inputs Increase number of input and control blocks Added super min and max blocks - multiple input max and min blocks
Variable Junction Inertial	206	Allow for a variable junction inertia using a control block
Option to Include Condensation Heat Transfer with Forced Convection Map	218	Previously condensation heat transfer was only available with the combined (IHTMAP=1) heat transfer map. An option to make condensation heat transfer available with the forced convection map.
Option to Force Single-Phase Heat Transfer	219	Allows specification of a Dittus-Boelter single phase heat transfer coefficient for use with a given heat conductor.
Option to Use a Multiplier with the Chexal-Lellouche Algebraic Slip	220	Allows a multiplier to be applied to the slip velocity computed using the Chexal-Lellouche drift flux correlation. May be used to obtain a target mass inventory in a steam generator secondary.

Model	Modification	Description
Option to Use a Multiplier on Thermal Conductivity	231	This is the same model that is available in the RETRAN-02 computer program.
FTB Dynamic Memory Allocation	235	Use F90 feature to dynamically allocate memory at run time using a user defined memory size. Removes need to recompile to change size of fixed arrays and need for a separated 3-D kinetics version.
A Run Time Option To Disable Screen Messages	236	Run time option to turn screen message writes off.
BWR Separator Centrifugal DP Term	237	A new model option for an additional pressure drop term in steam-water separators.
Revised stagnation pressure major edit term to be velocity head	238	Removed the hydrostatic head from the stagnation pressure edit for junctions (not an option – always done).
Simplified Problem Dimension Input	241	A new option that reduces the information supplied on the problem dimension input. The code computes the problem dimensions from the input file. Only 1 to 12 parameters are now required on 01000Y data. The old long form input is also supported.
NEM table based cross-section option	243	Option to allow use of NEM table based cross-sections with the 3-D kinetics model.
Automated RETRAN-3D to VIPRE Interface	248	Option to automate the transfer of boundary conditions from RETRAN-3D to VIPRE-01.
U-Tube Steam Generator Initialization	249	Auto initialization at off normal initial conditions using user supplied target values for key primary and secondary parameters
Improved Error Message Information	250	Provide more information on cause of error and time of occurrence. Remove redundant and misleading error messages. Provide a trouble shooting guide to aid users in resolving the error.

Error Corrections

Modification. No.	Trouble Report No.	Description of Change
179	246	Fix control block CP2 floating point error.
180	250	FTB file definition moved up one line.
181	251	Correct VSLPV calculation for volumes with multiple junctions.
182	252	Correct ICVOL to edit the correct transport volume mesh data.
183	256	Fix flag which activates noncondensable gas logic in EPRIDV.
184	247	Fix error in scratch space reservation for flow splits case.
185	257	Correct logic in SSSEP that overrides local energy balance when P is input for a 2-region nonequilibrium volume.
186	255	Count the number of entries on the material property data cards to calculate how much memory to reserve.
188	202	Correct enthalpy error when mixture level passes through junction; correct 5-eqn model errors when critical pressure is reached.
189	261	Correct the error for enthalpy transport with flow splits.
190	203	Correct the logic when single phase exists in two-region nonequilibrium model.
191	262	Add derivatives of slip velocity with respect to p, x, and w for ISFAG = 2. Revised relaxation scheme for steady state slip velocity.
192	264	Correct errors in NC state routine and NC condensation non-convergence.
193	265	Smoothing logic in the mass transfer model changes the transfer term from SS to transient.
194	266	Several equilibrium thermodynamic initial condition options were not included for 5-equation volumes.
197	269	Added test to ensure that countercurrent properties aren't use to compute co-current slip velocity.
198	270	The call to ENTHAL was replace with a Newton-Raphson iteration to solve for enthalpy.
199	271	Test for flow split option before defining do loop indices.
200	263	The branch junction model added in MOD003.1 was revised to use the single junction form for separators.
201	274	Correct logic to trap negative relative volume.
208	277	Remove KMUL from Actinides. (Consistent with Theory Man).
210	278	Modified to use "to' volume enthalpy for junction enthalpy when flow is zero. Fixed a restart error. Another modification turns the transport delay model off when a junction flow is two-phase.
211	280	Bypasses the liquid volume convergence test for single-phase volumes.
212	281	Revised to use consistent time level values for the wall temperatures and replaced the iterative solution with a linear approximation.

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213	282	Revised the limiting void fractions, add logic to neglect countercurrent flow for low void fractions, and added a cut off to neglect slip for void fractions > 0.999 when the Chexal-Lellouche model is used.
214	283	Use the donor volume density for a TDV momentum flux.
215	284	Add option to initialize same as RETRAN-02.
216	285	Limit the junction area such that (0 <= ajunt <= ajun)
217	286	Apply density ratio to torque difference.
222	273	Reset pump stop/reverse flag trip.
223	276	Replace intrinsic SIGN with function SYGN.
224	287	Revise scratch space reservation.
225	290	Removed definition of phase=2 in common path.
226	291	Delete extra call to TRNSPT.
227	292	Add values in INVOL for correct interpretation by ICVOL for P>0, T=0, H=-1, ZM=ZVOL, Separated Volumes.
228	293	Revise zero flow test for volumes to use (wjsum1+wjsum2) rather than volume average flow.
229	294	Revise Bernoulli term in momentum equation to include cosine of angle.
230	295	Added logic to define the boundary temperature to local conditions value for specified HTC.
232	296	Removed a fix-up path that uses a hardwired value of the critical specific volume.
233	299	Revise local conditions model for setting bulk fluid temperature for non-equilibrium volume.
234	300	Correct consistency check for Chun and Seban conductor stack
239	302	Correct an error in input checking logic. Also, cleaned up some complicated branching logic.
240	305	Eliminate logic that over indexes array during 3D Kinetics input processing.
242	306	Correct slip calculation for negative fills
244	307	Correct index problem in the low power SG initialization model.
246	308	Remove unnecessary error condition from bubble rise velocity calculation
247	309	Correct enthalpy error on 0th iteration for a low the low power SG
251	304	Removed junction area change term from the inertial flow estimate used with the choking model
252	301	Smooth positive slip velocity to zero for low void
253	---	Ads copyright information to RETRAN-3D source library.
254	297	Add logic to limit velocity used in stagnation pressure and enthalpy.