

List of Error and Warning Messages in Finite Octree Mesh Generator

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Finite Octree mesh generator is capable of automatically generating meshes for complex three-dimensional models without any user interaction during the meshing process. The only interaction needed is with the geometric modeler supporting the definition of the geometric model being meshed. The modeler must provide topological adjacency information, pointwise geometric data, and meshing attributes.

During the meshing process, the Finite Octree may detect inconsistency in the result of geometric operations performed by the geometric modeler or may detect the existence of invalid geometric representations. Finite Octree has some limitations of dealing with models containing topological entities which interact with octant boundary within less than twice the modeler tolerance. Finite Octree is currently being enhanced to eliminate this limitation. Additional enhancement will follow to deal with the problem when inconsistent modeling results of a geometric operation by the geometric modeler is detected.

This report lists all current error and warning messages given by Finite Octree during mesh generation. The direct meaning of these messages and possible indirect cause are also explained. There could be more than one possible indirect cause for a given message, but tips are provided on indirect cause from the experience of dealing with most geometric modelers interfaced to Finite Octree.

Two lists are included in this report. The first is the list of warning messages. Warning messages are added to indicate that a certain representation has been detected. Warning messages are left in the code to help to pinpoint an indirect cause of a possible error. However, there are certain representation which may be similar to a possible problem, or a true inconsistency which the mesh generator can recover from and continue the meshing process to create a valid mesh. The second list includes all error messages that may not directly relate to the function listing the error. The cause of error messages may propagate to a very late stage in the meshing process until it is detected.

The list of all warning messages provided by the Finite Octree, which can change with new development, includes:

- Function Name: AD2OCT
 - Message: Wrong type to add to octant.
 - Direct cause: Incorrect mesh entity type to add to an octant.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: APNDUS
 - Message: No edge uses connected to edge.
 - Direct cause: Attempt to delete non existing mesh edge.

- Possible indirect cause: Internal bug or memory corruption.
- Frequency: Has not happened.
- Function Name: BOUEDG
 - Message: Odd number of face connection is detected.
 - Direct cause: An open polyhedral representation in an octant is detected to be tetrahedronized.
 - Possible indirect cause: Incorrect topological model where model face is not pointing to the proper model region with respect to its orientation.
 - Frequency: Not frequent
- Function Name: BKR FAC
 - Message: Unable to find matching Vertex.
 - Direct cause: Attempt to break a mesh face about an existing mesh vertex failed to find proper orientation of resulting faces. This can normally happen when a non manifold representation of mesh face is created.
 - Possible indirect cause: Internal bug or memory corruption
 - Frequency: Has not happened.
- Function Name: CHKARY
 - Message: Array is full.
 - Direct cause: Refinement as indicated by user requires a lot of mesh refinement and may cause the machine to run out of memory.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: CHKCLS
 - Message: A possible bridge is detected, edge deleted
 - Direct cause: Touch intersection between octant edges and a model face are connected to create a mesh edge. This may lead to a bridge on the model face.
 - Possible indirect cause: Missed intersections between octant edges or auxiliary intersection line to determine connection on octant faces is the cause of error for most modelers. F.O. may recover from missed intersection of auxiliary line segments. For modeler which does not support definition of periodic faces this message indicates true error.
 - Frequency: Frequent.

- Function Name: CHKCLS
 - Message: Vertex with no connection is found.
 - Direct cause: A mesh vertex classified on a model face with no mesh edge connected to it is detected. Incorrect modeling results or local mesh modifications may lead to this case.
 - Possible indirect cause: Missed intersections of a line segment and a model face may also lead to this representation. A missed intersection of an octant edge and a model face lead to a failure. F.O. may recover from a missed auxiliary intersection by locally refining the tree.
 - Frequency: Not frequent.
- Function Name: CHKCLS
 - Message: Topol inconsis is detected, octant is refined.
 - Direct cause: Missed intersection of line segments and model faces or a periodic model face penetrates through octant faces.
 - Possible indirect cause: Missed intersections between octant edges or auxiliary intersection line to determine connection on octant faces is the cause of error for most modelers. F.O. may recover from missed intersection of auxiliary line segments. For modeler which does not support definition of periodic faces this message indicates true error.
 - Frequency: Frequent.
- Function Name: CHKCLS
 - Message: Too many refinement is detected.
 - Direct cause: Topological inconsistency persists and attempts to resolve it by local refinement has failed. Refinement continues if meshing flag set in file gtfags is set keep trying until failure.
 - Possible indirect cause: When model contains periodic faces with extremely small size in one or more dimensions, local refinement to get enough intersection points is needed. For modeler which does not support modeling of periodic representation and can not provide direction of edges with respect to faces, may have similar problems.
 - Frequency: Frequent.
- Function Name: CHKSTK
 - Message: Face stack error.
 - Direct cause: Problem in face insertion stack. Internal bug or memory corruption
 - Possible indirect cause: None
 - Frequency: Has not happened.

- Function Name: CISBND
 - Message: Point should not be here
 - Direct cause: Problem of orientation of internal mesh faces defining the polyhedra that is being tetrahedronized
 - Possible indirect cause: May be due to the existence of a model face that is dangling inside a solid region
 - Frequency: Has not happened.
- Function Name: CISBND
 - Message: No intersection occurred
 - Direct cause: Problem of orientation of internal mesh faces defining the polyhedra that is being tetrahedronized. As face removal is applied it can not determine the location of the node to be inserted inside the polyhedra to be connected to the face
 - Possible indirect cause: None
 - Frequency: Rare.
- Function Name: CISPSC
 - Message: Concave edge does not exist
 - Direct cause: An assumption that a mesh face is bounded by a mesh edge which have a dihedral angle > 180 is violated.
 - Possible indirect cause: Possible round off or implementation problem.
 - Frequency: Rare.
- Function Name: CISPSC
 - Message: Second concave edge does not exist
 - Direct cause: An assumption that a mesh face is bounded by two mesh edges which have a dihedral angle > 180 is violated.
 - Possible indirect cause: Possible round off or implementation problem.
 - Frequency: Rare.
- Function Name: CIVCVE
 - Message: Internal vertex position causes geometric violation. Moving internal vertex closer to face
 - Direct cause: Attempts to insert a node inside the polyhedra to allow for face removal. Newly created edges may intersect mesh entities in the octant and it attempts to get the node closer to the face to allow for the removal.
 - Possible indirect cause: None.
 - Frequency: Frequent.

- Function Name: CIVCVE
 - Message: Intersection point to close to edge.
 - Direct cause: Attempts to insert a node inside the polyhedra to allow for face removal. Newly created faces intersect mesh edges in the octant and it attempts to get the node closer to the face to allow for the removal.
 - Possible indirect cause: None.
 - Frequency: Frequent.

- Function Name: CIVOTR
 - Message: Internal vertex position causes geometric violation. Moving internal vertex closer to face.
 - Direct cause: Attempts to insert a node inside the polyhedra to allow for face removal. Newly created edges may intersect mesh entities in the octant and it attempts to get the node closer to the face to allow for the removal.
 - Possible indirect cause: None.
 - Frequency: Not Frequent.

- Function Name: CKEMEM
 - Message: Non Positive-Definite Jacobian.
 - Direct cause: Placing high order finite element nodes on the boundary of the model causes the element to have non positive definite Jacobian at an integration point. This can only happen if the option of placing high order nodes on the boundary is selected. The flag is set in file gtfllags.f
 - Possible indirect cause: None.
 - Frequency: Frequent.

- Function Name: CKEMEM
 - Message: Excessive Element Distortion.
 - Direct cause: Placing high order finite element nodes on the boundary of the model uses the element to be excessively distorted. This can only happen if the option of placing high order nodes on the boundary is selected. The flag is set in file gtfllags.f
 - Possible indirect cause: None.
 - Frequency: Frequent.

- Function Name: CKFFCS
 - Message: Both common faces represent model faces

- Direct cause: Collapsing of mesh vertices to eliminate disproportionately small segments violates the topological compatibility requirements. Two mesh faces classified on two different model faces will be merged to a single face.
- Possible indirect cause: None.
- Frequency: Not frequent.
- Function Name: CKFPRS
 - Message: Incorrect parametrization.
 - Direct cause: Parametric representation of all mesh vertices on the closure of a model face is incorrect. Intersection of edges in parametric space is detected.
 - Possible indirect cause: Model face may have degenerate or periodic parametric representation. This may lead to the inability to build a proper parametric representation.
 - Frequency: Not frequent.
- Function Name: CKINFC
 - Message: Invalid interior mesh face.
 - Direct cause: The Jacobians of the two regions sharing an interior finite element face are incompatible (one is positive and the other is negative). Can result from improper face orientations of a given region.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Rare
- Function Name: CKRLOP
 - Message: Pb???
 - Direct cause: The local tags for the model entities in the radial edge data structure do not match the ones with the geometric modeler.
 - Possible indirect cause: Problem in Finite Octree interface. This error may happen when a geometric model is augmented to eliminate periodic representations. It is used for debugging purposes only.
 - Frequency: Not frequent.
- Function Name: CKSMEG
 - Message: Octant being refined for small segments.
 - Direct cause: Octant is refined after edge insertion to improve the element aspect ratio because of the presence of very small finite element edges which cannot be removed during collapsing. This occurs due to existence of very small model edge relative to the size of the geometric model. This is done only if small segment check has been activated for the particular model edge.

- Possible indirect cause: None.
- Frequency: Very frequent when option is activated.
- Function Name: CKSMFC
 - Message: Octant being refined for small segments.
 - Direct cause: Octant is refined after model face insertion to improve the element aspect ratio because of the presence of very small finite element edges which cannot be removed during collapsing. This occurs due to existence of very small model face relative to the size of the geometric model. This is done only if small segment check has been activated for the particular model face.
 - Possible indirect cause: None
 - Frequency: Very frequent when option is activated.
- Function Name: CKSMRG
 - Message: Octant being refined for small segments.
 - Direct cause: Octant is refined after model region insertion to improve the element aspect ratio because of the presence of very small finite element edges which cannot be removed during collapsing. This occurs due to existence of very small model region relative to the size of the geometric model. This is done only if small segment check has been activated for the particular model region.
 - Possible indirect cause: None.
 - Frequency: Very frequent when option is activated.
- Function Name: CKTOPE
 - Message: A missed intersection is detected, taking midpoint.
 - Direct cause: A missed model edge/plane intersection is detected. Finite Octree attempts to recover from this problem by taking the midpoint in the parametric space of the edge to resolve the detected problem.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: CKTOPE
 - Message: Unable to split an edge within an octant.
 - Direct cause: Failure to split a mesh edge classified on a model face and an octant face.
 - Possible indirect cause: Inconsistent modeling interrogation results by the modeler. (i.e missed line/model face intersection, or returned intersection not on the closure of the model face.)
 - Frequency: Not frequent.

- Function Name: CKTOPF
 - Message: Unable to split an edge within an octant.
 - Direct cause: Failure to split a mesh edge classified on a model face and an octant face.
 - Possible indirect cause: Inconsistent modeling interrogation results by the modeler. (i.e. missed line/model face intersection, or returned intersection not on the closure of the model face.)
 - Frequency: Not frequent.
- Function Name: CONFCE
 - Message: Unable to connect two faces.
 - Direct cause: Failure to connect two mesh loops classified on the closure of a model face to create a simply-connected loop.
 - Possible indirect cause: When at least one loop bounding a hole on the model face exists within an octant and modeler can not provide proper orientation of edges, a possible incorrect decision on connection may result in creation of incorrect loop orientation. Thus octant is refined until this problem is resolved.
 - Frequency: Not frequent.
- Function Name: CONFCP
 - Message: Unable to connect two faces.
 - Direct cause: Failure to connect two mesh loops classified on the closure of a model face to create a simply-connected loop. One of the loops is a one vertex loop.
 - Possible indirect cause: When a vertex loop exists within an octant and modeler can not provide proper orientation of edges or continuous non periodic parametric representation for the model face, a possible incorrect decision on connection may result in creation of incorrect loop orientation. Thus octant is refined until this problem is resolved. This situation can happen only with modelers than can support non-manifold modeling. This in general leads to a failure in the meshing process unless the vertex loop would lie on an octant boundary after refinement.
 - Frequency: Not frequent.
- Function Name: CONNDS
 - Message: Could not determine in/out test.
 - Direct cause: Failure to determine if two mesh vertices classified on an octant edge should be connected by a mesh edge classified inside the geometric model.
 - Possible indirect cause: Extremely coarse discrete representation and near tangency between mesh face loops and edge to be created is detected. Local refinement would normally resolve this problem as discrete representation is improved.

- Frequency: Not frequent.
- Function Name: CRTTRI
 - Message: Both common faces represent model faces.
 - Direct cause: Two coincident mesh faces classified on two different model faces are being created.
 - Possible indirect cause: In the triangulation process, two mesh faces classified on model faces sharing common boundaries will overlap.
 - Frequency: Not frequent.
- Function Name: CRTTRI
 - Message: Both common faces represent model interior.
 - Direct cause: Two coincident mesh faces classified on two different model regions are being created.
 - Possible indirect cause: Can not happen with the changes to the nodal collapsing algorithm.
 - Frequency: Not frequent.
- Function Name: CRTTRI
 - Message: Merging two model interior faces.
 - Direct cause: Two coincident mesh faces classified on the same model region are detected and merged.
 - Possible indirect cause: Can not happen with the changes to the nodal collapsing algorithm.
 - Frequency: Not frequent.
- Function Name: DFCTRI
 - Message: Cannot triangulate an octant, octant is refined.
 - Direct cause: Unable to triangulate all mesh face loops classified on the closure of an octant. In addition, if the created triangulation has intersecting mesh entities and attempts to eliminate the intersection problem fail.
 - Possible indirect cause: None.
 - Frequency: Frequent.
- Function Name: DTLPCN
 - Message: Cannot determine region for loop.
 - Direct cause: A mesh loop that must be classified inside the geometric model is created and the proper model region can not be determined. The created loop consists of all

- mesh edges classified on model edges and a point that is contained inside the loop on the octant face can not be classified with respect to any model region.
- Possible indirect cause: Coarse discrete representation is created. As mesh is locally refined this situation is eliminated.
 - Frequency: Not frequent.
- Function Name: ENDCON
 - Message: Too many connections, quadtree refined.
 - Direct cause: During building binary tree on an octant face to determine connection of mesh vertices classified on closure of a model face, a near tangency situation is detected and binary tree is refined to obtain more data to connect the appropriate vertices.
 - Possible indirect cause: If modeler keeps returning incorrect intersections and the problem persist, a near planar situation is assumed where connection can be determined later on a neighboring octant face.
 - Frequency: Frequent.
 - Function Name: ENDCON
 - Message: Two connections through same quad, quadtree refined.
 - Direct cause: During building binary tree on an octant face to determine connection of mesh vertices classified on closure of a model face, a near tangency situation is detected and binary tree is refined to obtain more data to connect the appropriate vertices.
 - Possible indirect cause: If modeler keeps returning incorrect intersections and the problem persist, a near planar situation is assumed where connection can be determined later on a neighboring octant face.
 - Frequency: Frequent.
 - Function Name: FACEDR
 - Message: New case detected.
 - Direct cause: As orientation of a mesh loop classified on a model face, in which the orientation of the bounding model edges is not known, is being determined, a new case which is not accounted for by the algorithm is detected.
 - Possible indirect cause: None.
 - Frequency: Has not happened.
 - Function Name: FACINT
 - Message: No point to refine about, refining about center.
 - Direct cause: While refining an octant to meet the element size prescribed on a model face, no mesh vertices classified on the closure of the model face were found for the octant.

- Possible indirect cause: None.
- Frequency: Has not happened.
- Function Name: FACREM
 - Message: Poor shaped face removal, allowing for vertex removal.
 - Direct cause: A polyhedra being triangulated has a sliver region which can not be triangulated without face removal. The face removal operation results in a poorly shaped element.
 - Possible indirect cause: None.
 - Frequency: Frequent.
- Function Name: FACREM
 - Message: Poor shaped face removal, allowing for edge removal.
 - Direct cause: A polyhedra being triangulated has a sliver region which can not be triangulated without face removal. The face removal operation results in a poorly shaped element.
 - Possible indirect cause: None.
 - Frequency: Frequent.
- Function Name: FACREM
 - Message: Poor shaped face removal, 4 nodes left, accepting tetra.
 - Direct cause: Only remaining choice. Resulting element has poor shape.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: FACREM
 - Message: Poor shaped face removal, no choice, accepting tetrahedron.
 - Direct cause: A polyhedra being triangulated has a sliver region which can not be triangulated without face removal is detected. The face removal operation results in a poorly shaped element.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: FACREM
 - Message: Vertex removal better than face removal, choosing vertex.
 - Direct cause: A vertex removal operation resulting in a poorly shaped element which was not considered would allow for the creation of better element than any face removal operation.
 - Possible indirect cause: Original polyhedral representation is near flat.

- Frequency: Not frequent.
- Function Name: FACREM
 - Message: Edge removal better than face removal, choosing edge.
 - Direct cause: An edge removal operation resulting in a poorly shaped element which was not considered would allow for the creation of better element than any face removal operation.
 - Possible indirect cause: Original polyhedral representation is near flat.
 - Frequency: Not frequent.
- Function Name: FCELPS
 - Message: Unable to find a vertex within an octant.
 - Direct cause: Improper data about the content of an octant is detected. This is normally an error, but due to refinement this problem can be resolved.
 - Possible indirect cause: Internal bug or memory corruption
 - Frequency: Has not happened recently.
- Function Name: FCELPS
 - Message: Too many loops on an octant face.
 - Direct cause: Local arrays are full and many mesh face loops classified on one octant face are being created. This can be resolved either by increasing size of arrays or allowing for mesh refinement.
 - Possible indirect cause: The arrays in this part of the code are still static due to the complexity of the algorithm and in general to avoid the creation of many loops on the same octant face which lead to the creation of extremely poorly shaped elements.
 - Frequency: Not frequent.
- Function Name: FCELPS
 - Message: Too many loops contained each other.
 - Direct cause: Local arrays are full and many nested mesh face loops classified on one octant face are being created. This can be resolved either by increasing size of arrays or allowing for mesh refinement.
 - Possible indirect cause: The arrays in this part of the code are still static due to the complexity of the algorithm and in general to avoid the creation of many loops on the same octant face which lead to the creation of extremely poorly shaped elements.
 - Frequency: Not frequent.

- Function Name: FCELPS
 - Message: Too many loops edges to be updated.
 - Direct cause: Local arrays are full and one mesh loop consisting of large number of mesh edges is being created. This can be resolved either by increasing size of arrays or allowing for mesh refinement.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: FCELPS
 - Message: Unable to connect to an octant face.
 - Direct cause: Unable to find a loop on an octant face which matches an existing loop classified inside the geometric model.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: FDPTIN
 - Message: Unexpected feature.
 - Direct cause: Misclassification of a mesh edge with respect to an octant.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: FDPTIN
 - Message: Encountered face with no use during in/out.
 - Direct cause: A model face in the model is not used by any model region.
 - Possible indirect cause: This warning may also arise if the region insertion is attempted for a model which has no solid regions (sheet body). This must be a problem if the model is not containing any shell faces.
 - Frequency: Not frequent
- Function Name: FEGTRI
 - Message: Edge does not exist for triangle.
 - Direct cause: Failure to find proper mesh edges for a given local mesh triangle.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: FXOFAC
 - Message: Unable to find face.
 - Direct cause: Unable to find a mesh face sharing a given mesh edge

- Possible indirect cause: Internal bug or memory corruption
- Frequency: Not frequent.
- Function Name: FXOTYP
 - Message: Unknown type.
 - Direct cause: An invalid/unknown mesh type was passed.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: GETFEN
 - Message: No free entities of that type.
 - Direct cause: An invalid/unknown mesh type was passed.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: GTFNOC
 - Message: No free entities of that type.
 - Direct cause: An invalid/unknown mesh type was passed.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: GTFNT1
 - Message: Current entity does not match last entity.
 - Direct cause: The next entity asked for from the free entity list of an octant does not match the last one asked.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTFNTT
 - Message: Current entity does not match last entity.
 - Direct cause: The next entity asked for from the free entity list of an octant does not match the last one asked.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTFREG
 - Message: Current entity does not match last entity.
 - Direct cause: The next region asked for from an octant does not match the last one asked.
 - Possible indirect cause: None.

- Frequency: Not frequent.
- Function Name: GTFREG
 - Message: Current octant does not match last octant.
 - Direct cause: The current octant for which the next region is asked is not the same as the last octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTFRG1
 - Message: Current entity does not match last entity.
 - Direct cause: The next region asked for from an octant does not match the last one asked.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTFRG1
 - Message: Current octant does not match last octant.
 - Direct cause: The current octant for which the next region is asked is not the same as the last octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTPCLF
 - Message: Unable to find a vertex in list.
 - Direct cause: All vertices in the given list do not belong to the specified octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTRGNV
 - Message: Exceeded the numbers of verts allowed.
 - Direct cause: Allocated memory for the list of vertices of a region was too small.
 - Possible indirect cause: None.
 - Frequency: Has not happened.
- Function Name: GTRVRT
 - Message: Exceeded the numbers of verts allowed.
 - Direct cause: Allocated memory for the list of vertices of a region was too small.
 - Possible indirect cause: None.
 - Frequency: Has not happened.

- Function Name: KILENT
 - Message: Bad type to delete.
 - Direct cause: Incorrect type of mesh entity is passed
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: LINBOX
 - Message: Wrong number of intersections.
 - Direct cause: Line segment lies outside the bounding box of the model This happens when a mesh face classified on a periodic model face has to be split into one or more faces.
 - Possible indirect cause: None
 - Frequency: Not frequent.
- Function Name: MIDSPL
 - Message: Arbitrary connection is taken.
 - Direct cause: Attempt to split a mesh edge classified on a periodic model face interacting with two neighboring octants leads to two possible connections along the octant faces.
 - Possible indirect cause: None
 - Frequency: Not frequent.
- Function Name: MIDSPL
 - Message: Unable to split an edge.
 - Direct cause: Attempt to split a mesh edge classified on a model face fails due to inconsistent intersection operations.
 - Possible indirect cause: None
 - Frequency: Not frequent.
- Function Name: MIDSPL
 - Message: Multiple connection for an edge.
 - Direct cause: Attempt to split a mesh edge classified on a periodic model face interacting with two neighboring octants leads to two possible connections along the octant faces.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: MKFCES
 - Message: New detected case.

- Direct cause: While determining the orientation of a mesh loop classified on an octant face and inside a model region, a new case which is not accounted for by the algorithm is detected.
- Possible indirect cause: None
- Frequency: Has not happened.
- Function Name: MKFCES
 - Message: Invalid mapping for a face is detected.
 - Direct cause: Mesh edges on an octant face are intersecting or an edge is mapped to a point on the octant face
 - Possible indirect cause: Coarse discrete representation, internal bug, or memory corruption
 - Frequency: Not frequent.
- Function Name: MKFLOP
 - Message: Duplicate face is detected.
 - Direct cause: A face loop is created where one already exists. May happen because of the presence of periodic model faces.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: QDCONN
 - Message: Too many connections quadtree is refined.
 - Direct cause: Many connections in binary tree within one quadrant. This is resolved by local refinement.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: QDCONN
 - Message: Unable to find connection.
 - Direct cause: Near tangency is detected when part of the model face is completely tangent to the octant face. This is normally resolved by local refinement.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: REFBTR
 - Message: Close inter., near planar surface assumed.

- Direct cause: planar or near tangency of a model face and an octant face. The modeler may keep returning intersection points for line segments that completely lie on the model face. For such cases, the binary tree can not determine the proper connection.
- Possible indirect cause: Inconsistent intersection results by the geometric modeler.
- Frequency: Not frequent.
- Function Name: REFEDG
 - Message: Refining tree to intersect closed edge.
 - Direct cause: A closed model edge lies completely inside an octant as a result of which no intersections could be found with the octant planes.
 - Possible indirect cause: Possible missed intersection between the closed edge and the octant planes.
 - Frequency: Frequent.
- Function Name: REFFAC
 - Message: Cannot find point, refining about center.
 - Direct cause: No mesh vertex was found within an octant classified on the closure of a model face, as a result octant has to be refined about its center.
 - Possible indirect cause: None.
 - Frequency: Not Frequent.
- Function Name: REMTET
 - Message: Invalid tetrahedron removal.
 - Direct cause: Incorrect type of element removal operation.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: RMVFEN
 - Message: Wrong type of free entity.
 - Direct cause: Incorrect mesh entity type to be deleted from an octant and mesh database
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not Frequent.
- Function Name: RWFOCT
 - Message: Unable to open save file.
 - Direct cause: The OCTREE.SAV file could not be opened for read/write.
 - Possible indirect cause: Out of disc space.
 - Frequency: Frequent.

- Function Name: SELTRG
 - Message: First vertex not highest priority.
 - Direct cause: Mesh vertex that must be classified on a model vertex is assumed as the first vertex in the list of vertices to be collapsed. This assumption is violated
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened
- Function Name: SHPJAC
 - Message: Element type specified is not available.
 - Direct cause: Incorrect type of tetrahedral element is passed. Algorithm assumes 4 or 10 noded elements.
 - Possible indirect cause: Implementation error or memory corruption.
 - Frequency: Has not happened.
- Function Name: SPLBEG
 - Message: Could not find an edge in a face.
 - Direct cause: Failure to find a given mesh edge in a given mesh face.
 - Possible indirect cause: Implementation error, invalid local mesh modifications, memory corruption.
 - Frequency: Has not happened.
- Function Name: SPLELM
 - Message: Element could not be split.
 - Direct cause: Splitting would cause topological inconsistency or may result in negative Jacobian for resulting elements.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: SURROU
 - Message: A vertex with no use is found.
 - Direct cause: A mesh vertex classified on a model edge of face and does not bound any mesh edge.
 - Possible indirect cause: Invalid local mesh modifications or memory corruption.
 - Frequency: Has not happened.
- Function Name: SWP2FC
 - Message: Unexpected nbr of faces, report to RPI.
 - Direct cause: A mesh edge classified on a model face with more than three mesh faces attached was attempted to be swapped to improve connected element shapes.

- Possible indirect cause: None.
- Frequency: Has not happened.
- Function Name: TEMESH
 - Message: Cannot tetra. an octant, octant is refined.
 - Direct cause: Coarse discretization which can not be tetrahedonized.
 - Possible indirect cause: Internal bugs or memory corruption.
 - Frequency: Frequent.
- Function Name: TRIOCT
 - Message: Unable to triangulate an octant loop.
 - Direct cause: Newly created edges by the triangulation may intersect existing edges classified on a model face are detected
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.

The list of error messages when meshing process terminates abnormally:

- Function Name: ALLARY
 - Message: Wrong array type
 - Direct cause: Incorrect array type for allocating memory, can handle only real and integer arrays (type = 1 and 2)
 - Possible indirect cause: Internal bug or memory corruption
 - Frequency: Never happen
- Function Name: ALLIAR
 - Message: Memory Can not be allocated
 - Direct cause: There is no memory available in the system to be allocated.
 - Possible indirect cause: Will happen if the system runs out of memory when meshing large problems.
 - Frequency: Not frequent.
- Function Name: ALLRAR
 - Message: Memory Can not be allocated
 - Direct cause: There is no memory available in the system to be allocated.
 - Possible indirect cause: Will happen if the system runs out of memory when meshing large problems.
 - Frequency: Not frequent.

- Function Name: BADSTH
 - Message: Algorithmic problem
 - Direct cause: Problem in explicit smoothing vertex processing queue management.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happened.
- Function Name: CBTSHP
 - Message: Octant is flat
 - Direct cause: The volume of the octant is nearly equal to zero.
 - Possible indirect cause: None.
 - Frequency: Never happened.
- Function Name: CHKCLS
 - Message: Could not find a face about an edge
 - Direct cause: A mesh edge has a pointer to a mesh face, but the face does not contain the edge in the list of edges for the face.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Not frequent.
- Function Name: CHKCLS
 - Message: Too many local refinement is detected
 - Direct cause: Topological inconsistency persists and attempts to resolve it by local refinement has failed.
 - Possible indirect cause: Missed line/face intersection, or extremely small periodic model faces.
 - Frequency: Frequent.
- Function Name: CKENOC
 - Message: Invalid entity type
 - Direct cause: Incorrect entity type passed to the routine.
 - Possible indirect cause: Internal bug or memory corruption
 - Frequency: Never happened.
- Function Name: CKENTO
 - Message: Face stack error
 - Direct cause: Error in the number of entities pushed to the stack, the number of entities requested to be taken out of the stack is greater than the number of entities pushed to the stack.

- Possible indirect cause: Internal bug or memory corruption
- Frequency: Never happened.
- Function Name: CKSPLE
 - Message: Cannot break a face
 - Direct cause: Unable to split a mesh edge and all higher order mesh entities connected to it.
 - Possible indirect cause: Split the edge at a location may cause the creation of invalid representation.
 - Frequency: Not frequent.
- Function Name: CKSWPS
 - Message: Number of regions connected to a vertex is exceeded.
 - Direct cause: The size of local array is small to hold all the regions connected to a vertex. Currently this can happen if only static array is used. The size of the array is passed by a calling function.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happened.
- Function Name: CKTOPE
 - Message: Unable to find a vertex within an octant.
 - Direct cause: Unable to find the vertices for an edge in an octant. The edge is in the list of edges for the octant.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: CKTOPE
 - Message: Unable to find a point on an edge.
 - Direct cause: A missed model edge/plane intersection is detected. However, attempt to find a point in the parametric space of the edge has also failed.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: CKTOPF
 - Message: Unable to find a vertex within an octant.
 - Direct cause: Unable to find the vertices for an edge in an octant. The edge is in the list of edges for the octant.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Not frequent.

- Function Name: CLCPR2
 - Message: Parameter values not bounded properly.
 - Direct cause: Inconsistency is the parameter values of the vertex before and after (connected) the considered vertex. This happens while ordering the with respect to the increasing parameter values.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: CLCPRM
 - Message: Parameter values not bounded properly.
 - Direct cause: Inconsistency is the parameter values of the vertex before and after (connected) the considered vertex. This happens while ordering the with respect to the increasing parameter values.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: COMFAC
 - Message: Could not find edgeuse
 - Direct cause: Corrupted list of edge uses for a mesh face.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: CRFCLP
 - Message: Too many octant faces common to loop
 - Direct cause: Improper classification of mesh loops with respect to octants.
 - Possible indirect cause: Algorithmic problem, internal bug, or memory corruption.
 - Frequency: Has not happened.
- Function Name: CRTENT
 - Message: Bad type to create
 - Direct cause: Incorrect entity type to create, the allowed entities are face and region.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happen
- Function Name: EDGINT
 - Message: Could not find octant about intersection.
 - Direct cause: Inconsistent model edge/ plane intersection results are returned by the modeler. The majority of cases, modeler fails to return an intersection.

- Possible indirect cause: None.
- Frequency: Depends on the geometric modeler.
- Function Name: EDGINT
 - Message: Intersection point matches a vertex.
 - Direct cause: Returned intersection point by the modeler matches an existing mesh vertex that is classified on a different model entity.
 - Possible indirect cause: Incorrect model, where model entities overlap, internal bug, or memory corruption.
 - Frequency: Depends on the modeler being used.
- Function Name: EGFCDR
 - Message: Edge does not bound a face.
 - Direct cause: This routine returns the next edge in the definition of the face given the current edge. An edge is passed to the routine which does not bound the given face.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: EXTARY
 - Message: Bad array index
 - Direct cause: Incorrect array index (< 0) send to the program while freeing a local array.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happen
- Function Name: FACINF
 - Message: Edge does not bound a face
 - Direct cause: This routine returns the next edge in the definition of the face given the current edge. An edge is passed to the routine which does not bound the given face.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: FCEGCN
 - Message: Unable to find a vertex within an octant.
 - Direct cause: Unable to find the vertices for an edge in an octant. The edge is in the list of edges for the octant.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Not frequent.

- Function Name: FCELPS
 - Message: Wrong number of adjacent octants for face.
 - Direct cause: Mesh face loops classified inside the geometric model is being created on the boundary of the model universe. Loop would be known to only one octant.
 - Possible indirect cause: i) Mesh face loops classified on model faces has incorrect orientation with respect to geometric model. ii) Invalid topological representation where one or more model faces returning improper classification with respect to model regions, iii) Wrong orientation of model faces with respect to model regions.
 - Frequency: Depends on the geometric model being used.
- Function Name: FIXCRD
 - Message: Type not permitted.
 - Direct cause: Incorrect type passed to the program.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happen.
- Function Name: FNDTRA
 - Message: Cannot find face in list.
 - Direct cause: A mesh face bounding a mesh region can not be found in mesh database.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happen.
- Function Name: GETSON
 - Message: Not a continuation octant.
 - Direct cause: The octant is a terminal octant. The calling function assumes it is a non terminal octant.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: GMINFO
 - Message: Type does not contain pointer to geometry.
 - Direct cause: Incorrect entity type passed to the routine, information about classification can be requested for a mesh vertex, edge, face or region. Sending in any type other than this will cause this problem.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happens.

- Function Name: GTEGRG
 - Message: Could not find two faces for a region.
 - Direct cause: Fails to find the two mesh faces bounding a mesh region to be eliminated by collapsing two mesh vertices that must remain after collapsing
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: GTFEAT
 - Message: Current vertex not in list.
 - Direct cause: This routine is used to return the next vertex and its feature in a given octant given the current vertex. The current vertex given as input to the routine does not belong to the octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTFNT1
 - Message: Current vertex not in list.
 - Direct cause: This routine is used to return the next entity in the list of entities for a given octant given the current entity. The current entity given as input to the routine does not belong to the octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTFNTT
 - Message: Current vertex not in list.
 - Direct cause: This routine is used to return the next entity in the list of entities for a given octant given the current entity. The current entity given as input to the routine does not belong to the octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: GTFREG
 - Message: Current region not in list.
 - Direct cause: This routine is used to return the next region in the list of regions for a given octant given the current region. The current region given as input to the routine does not belong to the octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.

- Function Name: GTFRG1
 - Message: Current region not in list.
 - Direct cause: This routine is used to return the next region in the list of regions for a given octant given the current region. The current region given as input to the routine does not belong to the octant.
 - Possible indirect cause: None.
 - Frequency: Not frequent.

- Function Name: GTFVRT
 - Message: Exceeded number of vertices allowed.
 - Direct cause: The size of local array to hold the vertices of a face has exceeded. This routine returns the three vertices of a triangular face, enough memory should be allocated to hold all the three vertices of the face before calling this routine.
 - Possible indirect cause: None.
 - Frequency: Not frequent.

- Function Name: GTUPPR
 - Message: Invalid type to use.
 - Direct cause: The up pointer can be requested for a vertex, edge, or a face, if the type is anything other than these the error message is issued.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happened

- Function Name: GTUPPR
 - Message: Upper pointer not in list.
 - Direct cause: A higher order mesh entity is assumed to be bounded by a given mesh entity. This assumption is violated.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.

- Function Name: KILFAC
 - Message: Face points to a region.
 - Direct cause: A face can be deleted only if it is not used by any region in its definition, before deleting the face the regions connected to the face should be deleted.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.

- Function Name: KILVRT
 - Message: Deleting unconnected edge.
 - Direct cause: Incorrect local mesh modification.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: KILVRT
 - Message: Deleting a dangling edge.
 - Direct cause: Incorrect local mesh modification.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: KILVRT
 - Message: More than two edges having same vertices.
 - Direct cause: Incorrect local mesh modification.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: MAKRGS
 - Message: Unable to find edge in list.
 - Direct cause: Incorrect list of mesh edges for a given tetrahedronization of an octant.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: MKFREG
 - Message: Could not find a common face.
 - Direct cause: Incorrect local mesh modification.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: MKFREG
 - Message: Wrong number of common face.
 - Direct cause: Incorrect local mesh modification.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.

- Function Name: MRGFCE
 - Message: Both faces represent model faces.
 - Direct cause: Incorrect local mesh modification.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: MRGRGN
 - Message: Both faces represent model faces.
 - Direct cause: Incorrect local mesh modification.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: NEWLOC
 - Message: Invalid garbage collection link.
 - Direct cause: Corrupted memory list for an array.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Not frequent.
- Function Name: POCVSK
 - Message: Face stack error.
 - Direct cause: Error in the number of entities pushed to the stack.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Has not happened.
- Function Name: POPCRV
 - Message: Curvature stack error.
 - Direct cause: Error in the number of entities pushed to the stack.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Has not happened.
- Function Name: PROEDG
 - Message: Point is out of universe.
 - Direct cause: The universe origin and length has not been set properly. The universe should enclose the entire model.
 - Possible indirect cause: None
 - Frequency: Not frequent.

- Function Name: PROEDG
 - Message: Unable to find a vertex.
 - Direct cause: Incorrect model topological representation. Incorrect model vertices are returned as bounding a given model edge.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: PROVER
 - Message: Point is out of universe.
 - Direct cause: The universe origin and length has not been set properly. The universe should enclose the entire model.
 - Possible indirect cause: None.
 - Frequency: Not frequent.
- Function Name: PSCVSK
 - Message: Face stack error.
 - Direct cause: The number entities pushed to the stack is less than that requested to be removed from the stack.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Has not happened.
- Function Name: PSHENT
 - Message: Entity not supported.
 - Direct cause: Incorrect entity to be pushed to the stack, the valid entities are a mesh vertex, edge or a face attempt to push any other entity will cause this error.
 - Possible indirect cause: Memory corruption or internal bug.
 - Frequency: Has not happened.
- Function Name: PSHFAC
 - Message: Deleting unconnected edge.
 - Direct cause: Attempt to delete non existing mesh edge. Internal bug or memory corruption.
 - Possible indirect cause: None.
 - Frequency: Has not happened,
- Function Name: RECLME
 - Message: Cannot retrieve local tag.
 - Direct cause: Memory corruption.

- Possible indirect cause: Can only happen for modeler supporting augmenting to eliminate periodic representation.
- Frequency: Has not happened.
- Function Name: REGINF
 - Message: Current region does not match last region.
 - Direct cause: This routine returns the next face bounding the region, given the current face. The current region being send to the routine is not the same as the region send to the routine during a previous call.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happened.
- Function Name: REPEDF
 - Message: Unable to find an edge in a face.
 - Direct cause: Inconsistent representation of a mesh face.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: RETOFC
 - Message: Local array is full.
 - Direct cause: The size of the local array has exceeded. Currently a static array is used. If this problem occurs, the array should be changed to a dynamic array.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has never happened.
- Function Name: RGNEL1
 - Message: Invalid elt.
 - Direct cause: The Jacobian of the element is less than zero.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: RGNEL2
 - Message: Invalid elt.
 - Direct cause: The Jacobian of the element is less than zero.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.

- Function Name: RGNEL3
 - Message: Invalid elt.
 - Direct cause: The Jacobian of the element is less than zero.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: RWFOCT
 - Message: Unable to read save file.
 - Direct cause: Error in opening/closing a file.
 - Possible indirect cause: The disk capacity has exceeded and the program is not able to open a new file.
 - Frequency: has never happened.
- Function Name: SAMFAC
 - Message: Could not find edgeuse.
 - Direct cause: Corrupted list of edgeuses for a mesh face.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: SELTRG
 - Message: More than one model vertex in subset.
 - Direct cause: Incorrect list of mesh vertices to be collapsed to a single mesh vertex.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Has not happened.
- Function Name: SPLEL1
 - Message: Invalid elt.
 - Direct cause: The Jacobian of the element is less than zero.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: SPLEL2
 - Message: Invalid elt.
 - Direct cause: The Jacobian of the element is less than zero.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.

- Function Name: SPLEL3
 - Message: Invalid elt.
 - Direct cause: The Jacobian of the element is less than zero.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: SPLELM
 - Message: Invalid elt.
 - Direct cause: The Jacobian of the element is less than zero.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Not frequent.
- Function Name: SPLVRT
 - Message: Wrong number of edges.
 - Direct cause: Fails to split an edge about a vertex.
 - Possible indirect cause: Internal bug or memory corruption.
 - Frequency: Never happened.
- Function Name: UPDFCE
 - Message: Unable to connect two faces.
 - Direct cause: Could not find two vertices to define an edge to connect two mesh face loops to form simply connected loop.
 - Possible indirect cause: Inconsistent parametric representation, internal bug or memory corruption.
 - Frequency: Has never happened.