

List of type-error (T), compilation (C) and numerical (N) bug uncovered by testing. The list of type-error bugs are categorized by the number of *nested* operators needed to discover the bug, the cause of the bug, description, and testing source. Code generation issue for FEM code (CG), issue with other field structure (OF), translation between other field and code generation (TF),

Status	#	Nested	Cause	Description	source
b1-OPEN	FC1	2	CG	Code generation issue when converting types	DATm
b4-OPEN	FC4	2	CG	Multiple creation of functions with the same name	DATm
b2-OPEN	FN2	2	OF	Numerical error + other issues	DATm
b3-OPEN	FC3	2	OF	Can not take inner-product of fields	DATm
b5-OPEN	FC5	-	OF	Inside error + other issues	Examples
b6-Closed	FC6	2	TF	Summation in a single term not handled correctly	DATm
b6-OPEN	FC7	2	CG	conversion of types done incorrectly	DATm
b7-OPEN	FC8	2	TF	Differential indices are constants	DATm
b8-OPEN	FC9	2	CG	- indexing tensors	DATm

1 Bugs in FEMprime branch

FC1 Code generation issue when converting types

```
|(\nabla(F0))|;
ex1.cxx:798:16: error: no viable conversion from 'ex1::tensor_ref_2' to 'double'
      double l_probe_1_4_22 = makeEval_UnitSquareMesh_Lagrange_2_1(
                          ^~~~~~
***rtn: compile --p_o25_o6_t1_tN_tN_l2
```

FN2 Numerical error when taking the norm. Possible mistake causes from mini-merge and new operators. *normalize*($\nabla(F0)$)

FC3 Can not take inner-product of fields with different continuity.

```
Type error (adding ofields-check typechecker)
***rtn: compile --p_o25_o11_t1_t7_tN_l2
***rtn: compile --p_o25_o12_t1_t7_tN_l2
```

FC4 Multiple creation of functions with the same name (gradient of a field).

```
ex1.cxx:423:17: error: redefinition of 'helpEvalBasis_UnitSquareMesh_Lagrange_2'
inline double * helpEvalBasis_UnitSquareMesh_Lagrange_2(const double *k...
```

FC5

```
3pow T I (T0[]) <(T0)^2>HighToMid.expandOp: error converting InsideFEM<3>
uncaught exception Bind [nonexhaustive binding failure]
  raised at common/phase-timer.sml:78.57-78.59
  raised at high-to-mid/high-to-mid.sml:203.105-203.107
  raised at high-to-mid/buil
```

FC6

```
python pde.py 4 24 1 2 2
3HighToMid.expandEINAPP: error converting out051A = (F0[3], FNCSPACE1, FNCSPACE2, T3[3]) < Prob
uncaught exception Subscript [subscript out of bounds]
  raised at common/phase-timer.sml:78.57-78.59
  raised at high-to-mid/high-to-mid.sml:216.7-216.9
  raised at Basis/Implementation/list.sml:78.35-78.44
make: *** [ex1.o] Error 1
cp: ex1.cxx: No such file or directory
cp: ex1.cxx: No such file or directory
***rtn: compile --p_o24_o1_t2_t2_l2
-: trace(hessian)
-F_s_d3 | p_o24_o1_t2_t2_l2
rtn: compile
```

FC7 next error

```
ex1.cxx:870:6: error: no type named 'tensor_ref_3_3' in namespace 'ex1'
ex1::tensor_ref_3_3 s_makeEval_UnitCubeMesh_P_4_2(NodeTy nodes, newposTy b, coordTy c,int ce
~~~~~^
ex1.cxx:876:14: error:
```

FC8 Unhandled cases when using constant indices -Differential indices are constants - Constant indices in field components

```
(F0[2],FNCSPACE1,FNCSPACE2,T3[3])<Probe(BuildFEM(T0_{'0'})_1[2]),T3>
det(concat2)|22_3-
```

FC9

```
ex1.cxx:850:20: error: subscripted value is not an array, pointer, or vector
H[0][0][0] = H0[0][0];
~~~~~^
ex1.cxx:851:20: error: subscripted value is not an array, pointer, or vector
H[0][1][0] = H0[1][0];
```