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	Folder	#	Nested	Cause	Description	source
Closed	b1	FC1	2	*CG*	Code generation issue when converting types	*DATm*
Closed	b2-	FN2	2	*OF*	Numerical error + other issues	*DATm*
Closed	b3	FC3	2	*OF*	Can not take inner-product of fields	*DATm*
Closed	b4	FC4	2	*CG*	Multiple creation of functions with the same name	*DATm*
OPEN	b5	FC5	-	*OF*	Inside error + other issues	Examples
Closed	b6	FC6	2	*TF*	Summation in a single term not handled correctly	*DATm*
OPEN	b6& b7	FC7	2	*CG*	conversion of types done incorrectly	*DATm*
Closed	b8	FC8	2	*TF*	Differential indices are constants	*DATm*
OPEN	b9	FC9	2	*CG*	– indexing tensors	*DATm*
Check	b10	FN10	2		Numerical incorrect	*DATm*
OPEN	b3 & b4		-		" got an unexpected keyword argument 'dim'"	*DATm*
Closed	b11	FC11	-		slicing of gradient compile Error.	
OPEN	b12 & b11	FT12	Run time erro		Manipulation of vector fields, weird error	
OPEN	b14	FC14		CG	Multiple creation of functions with the same name	
OPEN	b15	FC15		T	Missing support for op	

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_l_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. $normalize(\nabla(F0))$ also norm(hessian)

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 TI (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];
```

FT10 Issue unknown

```
                Rst: Z-3 RD  max diff: 51.5896 sumdiff: 13.9962 67.4956% c:24.8443995169280
```

FC11 uncaught exception Fail [Fail: unknown type]

```
  raised at common/phase-timer.sml:78.57-78.59
  raised at driver/main.sml:84.76-84.79
  raised at typechecker/check-expr.sml:611.47-611.66
make: *** [ex1.o] Error 1
cp: ex1.cxx: No such file or directory
cp: ex1.cxx: No such file or directory


***rtn:compile __p_o23_o29_t2_tN_tN__l2
         -: slicev0(grad)
        -_F_s_d3 |p_o23_o29_t2_tN_tN__l2
        rtn:compile
```

FT12 Weird allocation error

```
                Error when creating a vector fields in python. Syntax probably wrong.

                python(24510,0x7fff796c2300) malloc: *** error for object 0x7ff48bbf7800: po
*** set a breakpoint in malloc_error_break to debug
[Charisees-MacBook-Air:24510] *** Process received signal ***
[Charisees-MacBook-Air:24510] Signal: Abort trap: 6 (6)
[Charisees-MacBook-Air:24510] Signal code:  (0)
[Charisees-MacBook-Air:24510] [ 0] 0   libsystem_platform.dylib            0x00007fff88cd3f1a
[Charisees-MacBook-Air:24510] [ 1] 0   ???                                 0x0000000000000000
[Charisees-MacBook-Air:24510] [ 2] 0   libsystem_c.dylib                   0x00007fff88d439a3
[Charisees-MacBook-Air:24510] [ 3] 0   libsystem_malloc.dylib              0x00007fff8d8941cb
```

CF14

```
        0_tensor[2] compositionl,ex1.cxx:777:15: error: redefinition of 's_makeEval_Unit
inline double s_makeEval_UnitCubeMesh_Lagrange_4_(NodeTy nodes, newposT...
              ^
```

CF15 error supporting inner product and outer product.