A Comprehensive CIF Test Set

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A Comprehensive CIF Test Set

This is the first in a series of documents of length at least two on the CIF program test set. The test set consists of several CIF2.0 files which are used to test CIF processing software. At present, there are four CIF files in the CIF test set. They are: BLITST.CIF, NASTY.CIF, PLA.CIF and TEST.CIF. All of the files can be found on (SSPCDOC).

This document describes each one briefly, its purpose and some specifics on how it tries to do that. The CIF test files and this document will be evolving over the next few months, so stay tuned to this printer.

BLITST.CIF

BLITST is a tester for "bloating", the expanding of graphic features in PAI. BLITST contains a few graphic primitives and allows the user to try different bloating values on them, observing the error messages or lack of them, and checking the resulting features to ensure their correctness.

NASTY.CIF

NASTY is a vicious test for a CIF2.0 parser. It is constructed of several bad- and questionable constructs. You can expect it to evoke every error message in your parser, and/or some in your run time system. If your CIF
handler can take NASTY, it is very robust. Many hackers spent lots of time making NASTY truly nasty. To give you an example of their abilities, NASTY blasts "FAIL" into space dust. NASTY is not for the faint-hearted. A listing of the error messages produced on one sample run of NASTY is appended to this document. This should give you an idea of what to look for. There are a lot of comments in NASTY describing what feature each test is checking. You should use nasty only after your program has passed TEST (below). Be armed with a source listing of your program and a listing of NASTY. Use it on somebody else's software (it hurts too much to see your own in such bad shape).

PLA.CIF

PLA is a real chip designed by Alastair Thompson at Caltech. There is nothing very special about it, in fact, there are a lot of known bugs in it as well as some systematic errors caused by bugs in the design system which created it. But it is an example of a real chip. PLA was made with no thought to testing CIF software, its indifference to CIF processing programs is the main part of its desirability. PLA is big enough to be a real test and short enough to be reasonably quick test. We have found enough bugs in our programs with PLA to warrant its inclusion unchanged in the CIF test set.

TEST.CIF

TEST is an example of forthright CIF code to test a number of CIF parser and plotter properties. Test is designed to
be a powerful test of many CIF parsing and plotting features. It contains only legal syntax, and strains it to the limit. Your parser may identify some questionable CIF constructs, but it should not identify any errors. The plot from test is shown below and a detailed description of each test is included. Read this section entirely before running test. If your parser refuses to accept test, the reason may well be buried in the description of the particular section.

The plot from TEST looks like this:

<table>
<thead>
<tr>
<th>PICTURE</th>
<th>LEGEND</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1</td>
<td>1 mirror, rotation stack test</td>
</tr>
<tr>
<td>1 1</td>
<td>+ DD bug test</td>
</tr>
<tr>
<td>1 1 4</td>
<td>0 Def #0 test</td>
</tr>
<tr>
<td>1 1</td>
<td>F transformation test</td>
</tr>
<tr>
<td>1 1 1</td>
<td>4 rotation test</td>
</tr>
<tr>
<td>1 1 1</td>
<td>: polygon test</td>
</tr>
<tr>
<td>1 1 1</td>
<td>, box test</td>
</tr>
<tr>
<td>1 1 1</td>
<td>. round flash test</td>
</tr>
<tr>
<td>1 1 1</td>
<td>; wire test</td>
</tr>
</tbody>
</table>

Mirror, Rotation Stack Test

This test checks all mirror and rotation combinations two calls deep. The figure output is an "1", transformed in all the various ways in sets of eight. The result should look like this:
If the result does not look like this, you have a problem in either your transformation routines for mirroring and rotating, or your matrix operations for calling cells. To determine which one, check the results of the transformation tests.

**DD Bug Test**

If the figure in the upper right is a big green (diffusion layer) plus sign "-", then your software passed this test. If it is a big red (polysilicon) "-", then you have the
Definition Delete bug. You should read the discussion in \$2686 carefully about the Definition Delete and call. Remember: Symbol references are resolved in the context in which they are called, not the context they are written. Therefore, you can throw out the data defining a call after you encounter a DD statement which deletes that call. A CIF file is meant to be plotted in one scan, all data outside symbol definitions is to be plotted immediately as it is found in the file. See also \$2685 "Recent Clarifications of [:f2.0]."

Both bars of the "÷" are the same length. This can be used to check the aspect ratio of the output device.

Def #0 Test

Definition #0 is a valid number. Your design system should allow it. If it does, there will be a little red box here. If not, you probably got an error in parsing.

Transformation Test

There should be one (count it, one!) blue (metal) "F" next to the Def #0 test. If there are nearby "F"'s mirrored or rotated, then your symbol call transformation scanning is not working. If there is only one "F" misplaced, it may be a problem with the matrix multiplication algorithm. If the rotation and mirroring test failed also, the latter is probably the case. If the rotation test next to this test failed, then there may be no problem with your transformations besides the rotation failure.
Above the "F", there should be an green horizontal bar. If the bar is blue, then your system incorrectly does not preserve the layer over a symbol call. This should be fixed.

Rotation Test

This test consists of four "F"s rotated in each quadrant. Each "F" should have the single bar closer to the origin than the two horizontal pieces of the "I". The "I" should face outward, away from all other "F"s in this test. None of the "F"s should appear mirrored.

Polygon Test

The polygon test consists of nine polygons, arranged in a three-by-three block as follows:

Pentagon     A-shape     M-shape
Square       I-shape     Two-blocks
Triangle \ Plus     O-shape

There are some concave and come convex, acute, right and obtuse angles and one even touches itself. Your system should be able to plot them all without botting on eye.
Box Test

The box test consists of one box with many rotations that you can give to such things. The boxes are listed below by their amount of rotation (in degrees):

<table>
<thead>
<tr>
<th>135</th>
<th>atan(157/37)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>315</td>
</tr>
<tr>
<td>45</td>
<td>270</td>
</tr>
<tr>
<td>0</td>
<td>225</td>
</tr>
<tr>
<td>atan(260/(-1))</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>180</td>
</tr>
</tbody>
</table>

If the lower right one is not there, your parser may have ignored it because it mistakenly thought the syntax was bad. Check the syntax in §2686, there need not be separators between keyletters and numbers. The box above that one can tell you if your raster-conversion algorithm suffers from jaggies.

Round Flash Test

This test consists of five round flash commands as listed below by radius:

<table>
<thead>
<tr>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

The top one, radius zero may or may not appear, as you wish, but your system must accept it as a legal input. If the bottom one is not there, your parser may have ignored
it because it mistakenly thought the syntax was bad. Check
the syntax in #2686, there need not be separators between
keyletters and numbers.

Wire Test

The wire test consists of a large number of wires, testing
the wire plotting code. The wires are:

1-point
2 coincident points
wire body touches self
circular path
intersecting path
path doubles back on itself exactly
path retraces self within width distance
high slope wire
moderate slope wire
low slope wire
no slope 2-point wire

extremely acute
very acute
acute angle
high angle
moderate angle
low angle
collinear

Much CIF software cannot handle the first wire. It should
be caught as a special case and treated as a round flash
(diameter=width). See #2686 for details. The second wire
should be the same. The self-intersecting and
self-touching wires should not be any problem for your
software. Some raster conversion software leaves annoying
holes where the wire overlaps itself, this should be
avoided. Unless doubling-back is caught as a special case,
it might show as an X-shape. Nearby retracing should be no
problem. The lower left slope tests can give you an
estimate of the accuracy of your output device.
The top of the second column provides much difficulty for most CIF software. If your program computes the polygon from the path by re-intersecting lines parallel to the path, this will appear as a very wide diamond shape, instead of a very acute angle. Your program should detect the special case where a point is within WIM of the previous segment, and position points properly. Note that this is a separate check from the check for co-linear points. The second wire is a very acute wire. Again, if your merely re-intersect the wires, this will have a lone point in the right. This could be disastrous in practice. The other wires in the second column give one feedback on the quality of the wire-plotting algorithm for many different angles.

Profuse apologies for the brevity of this document. The next pass will include information on how to determine errors in your CIF software with these files and how to interpret error messages. In the meantime, you will just have to read the CIF code, it actually explains itself reasonably well. (Where have I heard that before?...)

incl. 13352.app
(random geometrical figures);
Error on Line # 2 at char pos 1
Warning -- Semicolon missing. Who cares?

A COMMAND THAT PROBABLY IS NOT UNDERSTOOD;
Error on Line # 4 at char pos 2
Error -- Unrecognized Command. Skipping to semicolon.

;; (Well! can we do null commands? *2686 says no)
Error on Line # 6 at char pos 1

;; (Well! can we do null commands? *2686 says no)
Error on Line # 6 at char pos 2

(extra close paren, and one after the semicolon)); })
Error on line # 7 at char pos 49
Warning -- Semicolon missing. Who cares?

(extra close paren, and one after the semicolon)); })
Error on line # 7 at char pos 50
Error -- Unrecognized Command. Skipping to semicolon.

(extra close paren, and one after the semicolon)); })
Error on line # 7 at char pos 54
Error -- Unrecognized Command. Skipping to semicolon.

(meanwhile, back at NASTY) (no semicolon (}))
Error on Line # 10 at char pos 32
Warning -- Semicolon missing. Who cares?

Layer mumble; (bad layer)
Error on Line # 11 at char pos 1
Warning -- Semicolon missing. Who cares?

Layer mumble; (bad layer)
Error on Line # 11 at char pos 13
Error -- Short name must be digits and letters. Proceeding.

Layer mumble; (bad layer)
Error on Line # 11 at char pos 13
Error -- Layer specification not recognized. Layer unchanged.

B 10 20 30 40; (now can we do a box?)
Error on Line # 12 at char pos 1
Warning -- Semicolon missing. Who cares?

B 10 20 30 40; (now can we do a box?)
Error on Line # 12 at char pos 14
Error -- No layer specified before graphic command. Command Skipped.

B 10 20 30 40; (should be no defined layer)
Error on Line # 17 at char pos 14
Error -- No layer specified before graphic command. Command Skipped.

Round flash 50 (hi! expecting me?) 200 100 ; (you shouldn't be!!)
Error on Line # 20 at char pos 16
Error -- No number found. (using 0)
Layer VERYLONGNAME1; (and this);  
Error on Line #  31 at char pos  24  
Error -- Layer specification not recognized. Layer unchanged.  

Layer N1; (this ain't legal either);  
Error on Line #  32 at char pos  8  
Error -- Layer specification not recognized. Layer unchanged.  

Layer N1; (this ain't legal either);  
Error on Line #  32 at char pos  9  
Warning -- Semicolon missing. Who cares?  

Layer N1; (this ain't legal either);  
Error on Line #  32 at char pos 10  
Error -- Unrecognized Command. Skipping to semicolon.  

L N!#; (not our favorite layer); (it should use N the without error));  
Error on Line #  33 at char pos  4  
Error -- Layer specification not recognized. Layer unchanged.  

L N!#; (not our favorite layer); (it should use N the without error));  
Error on Line #  33 at char pos 73  
Warning -- Semicolon missing. Who cares?  

L N!#; (not our favorite layer); (it should use N the without error));  
Error on Line #  33 at char pos 74  
Error -- Unrecognized Command. Skipping to semicolon.  

DS 2 0 0; (0/0 as the sclae of the sym); (your system should see it);  
Error on Line #  39 at char pos  2  
Error -- A or B is zero in symbol def. Set to 1.  

DS 2 0 100; (deja-vu. Already defined. Just a=0 this time);  
Error on Line #  44 at char pos 11  
Error -- A or B is zero in symbol def. Set to 1.  

DS 2 0 100; (deja-vu. Already defined. Just a=0 this time);  
Error on Line #  44 at char pos 11  
Warning -- Symbol previously defined. Re-defining symbol.  

DS -3; (negative sym nums are not allowed.));  
Error on Line #  49 at char pos  4  
Error -- Negative number not allowed here. Taking positive part.  

C -3; (can you call this?));  
Error on Line #  54 at char pos  3  
Error -- Negative number not allowed here. Taking positive part.  

DS 3 100 i;  
Error on Line #  58 at char pos 11  
Warning -- Symbol previously defined. Re-defining symbol.  

DS 4 100 i; (plus a little confusion);  
Error on Line #  61 at char pos  2  
Error -- Start Def inside a Symbol Definition. Previous Def terminated.  

)))))When you try to comment out a bunch of LIL;  
Error on Line #  68 at char pos 47  
Warning -- Unrecognized user command. Command ignored
Round flash 50 (hi! expecting me?) 200 100 ; (you shouldn't be!!)
Error on Line #: 20 at char pos 16
Error -- No number found. (using 0)

Round flash 50 (hi! expecting me?) 200 100 ; (you shouldn't be!!)
Error on Line #: 20 at char pos 16
Warning -- Semicolon missing. Who cares?

Round flash 50 (hi! expecting me?) 200 100 ; (you shouldn't be!!)
Error on Line #: 20 at char pos 36
Warning -- Semicolon missing. Who cares?

Round flash 50 (hi! expecting me?) 200 100 ; (you shouldn't be!!)
Error on Line #: 20 at char pos 44
Warning -- Unrecognized user command. Command Ignored

DD 2; (delete a non-symbol (that's OK, you know)); (inside a def);
Error on Line #: 21 at char pos 1
Warning -- Semicolon missing. Who cares?

DD 2; (delete a non-symbol (that's OK, you know)); (inside a def);
Error on Line #: 21 at char pos 2
Warning -- Def Delete inside symbol. Command carried out.

DD -1; (not legal, twerp! gotta be non-negative);
Error on Line #: 24 at char pos 4
Error -- Negative number not allowed here. Taking positive part.

Layer NP 0 0 100 50; (crap after a layer selection);
Error on Line #: 26 at char pos 10
Warning -- Semicolon missing. Who cares?

Layer NP 0 0 100 50; (crap after a layer selection);
Error on Line #: 28 at char pos 20
Warning -- Unrecognized user command. Command Ignored

L humble in lower case ; (no layer after o));
Error on Line #: 29 at char pos 74
Error -- Short name must be digits and letters. Proceeding.

L humble in lower case ; (no layer after o));
Error on Line #: 29 at char pos 74
Error -- Layer specification not recognized. Layer unchanged.

Layer garbageM; (you should complain about this);
Error on Line #: 30 at char pos 3
Error -- Layer specification not recognized. Layer unchanged.

Layer garbageM; (you should complain about this);
Error on Line #: 30 at char pos 15
Warning -- Semicolon missing. Who cares?

Layer garbageM; (you should complain about this);
Error on Line #: 30 at char pos 16
Error -- Unrecognized Command. Skipping to semicolon.

Layer VERYLONGLAYERNAME ; (and this);
Error on Line #: 31 at char pos 11
Warning -- Shortname for layer more than 4 chars. ShortName truncated.
DF; (a spare finish);
Error on Line # 72 at char pos 2
Warning -- Def End command before Def Start. Command ignored.

DF; (another spare finish);
Error on Line # 73 at char pos 2
Warning -- Def End command before Def Start. Command ignored.

LNM;
Error on Line # 77 at char pos 5
Warning -- Semicolon missing. Who cares?

DF; 0 here just for fun;
Error on Line # 90 at char pos 25
Warning -- Unrecognized user command. Command ignored.

C i1 T 0,0;  (Call on undefined symbol);
Error on Line # 92 at char pos 11
Error -- Symbol in call not defined. Call was skipped.
CIF # 11 My $ /

C i1 T 0,0;  (the recursion express);
Error on Line # 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.
CIF # 15 My $ /

C i1 T 0,0;  (the recursion express);
Error on Line # 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.
CIF # 15 My $ /

C i1 T 0,0;  (the recursion express);
Error on Line # 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.
CIF # 15 My $ /

C i1 T 0,0;  (the recursion express);
Error on Line # 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.
CIF # 15 My $ /

C i1 T 0,0;  (the recursion express);
Error on Line # 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.
CIF # 15 My $ /

C i1 T 0,0;  (the recursion express);
Error on Line # 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.
Error on line 4: 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.

C 11 T 0,0;  (the recursion express)
Error on line 4: 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.

C 11 T 0,0;  (the recursion express)
Error on line 4: 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.

C 11 T 0,0;  (the recursion express)
Error on line 4: 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.

C 11 T 0,0;  (the recursion express)
Error on line 4: 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.

C 11 T 0,0;  (the recursion express)
Error on line 4: 93 at char pos 11
Error -- Recursive symbol call. Call was skipped.

C 3 R 0 0;  (bad rotation)
Error on line 6: 96 at char pos 10
Warning -- Rotation direction must not be (0,0). Rotation deleted.

C 3 MN;  (illegal mirror)
Error on line 6: 97 at char pos 6
Warning -- Axis must be X or Y. Mirroring deleted.

C 3 MXY;  (another bad mirror)
Error on line 7: 98 at char pos 7
Warning -- Semicolon missing. Who cares?

C 3 MXY;  (another bad mirror)
Error on line 7: 98 at char pos 8
Error -- Unrecognized Command. Skipping to semicolon.

C 3 X 150;  (bad transform type)
Error on line 7: 100 at char pos 5
Warning -- Semicolon missing. Who cares?

C 3 X 150;  (bad transform type)
Error on line 7: 100 at char pos 6
Error -- Unrecognized Command. Skipping to semicolon.

C 3 1 100 MX R 10 0;  (one-point translates are no good)
Error on line 7: 101 at char pos 9
Warning -- Semicolon missing. Who cares?

C 3 1 100 MX R 10 0;  (one-point translates are no good)
Error on line 7: 101 at char pos 8
Warning -- Unrecognized user command. Command Ignored

C3M()X;       (we cant talk here!)
Error on line 7: 102 at char pos 4
W 100 400 400 400 400; (dup. points reduces to 1-point wire);
Warning -- Duplicate points found. Extra one deleted.

W 100 400 400 400 400 400 400 400; (dup. points reduces to 1-point wire);
Error on Line # 130 at char pos 38
Warning -- Duplicate points found. Extra one deleted.

W 100 400 400 400 400 400 400 400; (dup. points reduces to 1-point wire);
Error on Line # 130 at char pos 38
Warning -- Duplicate points found. Extra one deleted.

W 100 400 400 400 400 400 400 400; (dup. points reduces to 1-point wire);
Error on Line # 130 at char pos 38
Warning -- Duplicate points found. Extra one deleted.

200,800 500,700 800,800 800,800; 800,800; Error on Line # 133 at char pos 36
Warning -- Duplicate points found. Extra one deleted.

200,800 500,700 800,800 800,800; 800,800; Error on Line # 133 at char pos 36
Warning -- Duplicate points found. Extra one deleted.

200,800 500,700 800,800 800,800; 800,800; Error on Line # 133 at char pos 36
Warning -- Duplicate points found. Extra one deleted.

Wire -300 100 100 200 200; (is neg. width a problem? (parser should object));
Error on Line # 135 at char pos 6
Error -- Negative number not allowed here. Taking positive part.

Wire 300 100 100 200 200; (unpaired point!);
Error on Line # 136 at char pos 31
Error -- No number found. (using 0)

P; (trivial case polygon, (nullgon));
Error on Line # 142 at char pos 2
Error -- Zero-point path is illegal. Path remains zero-length.

P 100 100 100 100; (doubled points);
Error on Line # 145 at char pos 19
Warning -- Duplicate points found. Extra one deleted.

P 100 100 100 100; (doubled points);
Error on Line # 145 at char pos 19
Warning -- Duplicate points found. Extra one deleted.

P 100 100 100 100 100 100 100 100; (quintupled points);
Error on Line # 146 at char pos 43
Warning -- Duplicate points found. Extra one deleted.

P 100 100 100 100 100 100 100 100; (quintupled points);
Error on Line # 146 at char pos 43
Warning -- Duplicate points found. Extra one deleted.

P 100 100 100 100 100 100 100 100; (quintupled points);
Error on Line # 146 at char pos 43
Warning -- Duplicate points found. Extra one deleted.
Warning -- Axis must be X or Y. Mirroring deleted.

C3M()X; (we can't talk here!);
Error on Line # 102 at char pos 5
Warning -- Semicolon missing. Who cares?

C3M()X; (we can't talk here!);
Error on Line # 102 at char pos 6
Error -- Unrecognized Command. Skipping to semicolon.

C3MZ F; (what do you mean we can't talk here?);
Error on Line # 103 at char pos 4
Warning -- Axis must be X or Y. Mirroring deleted.

C3MZ F; (what do you mean we can't talk here?);
Error on Line # 103 at char pos 6
Warning -- Semicolon missing. Who cares?

C3MZ F; (what do you mean we can't talk here?);
Error on Line # 103 at char pos 10
Error -- Unrecognized Command. Skipping to semicolon.

DU; (do you know what this is?);
Error on Line # 105 at char pos 2
Error -- Unrecognized Def command. Command ignored.

DU; (do you know what this is?);
Error on Line # 105 at char pos 7
Warning -- Semicolon missing. Who cares?

DU; (do you know what this is?);
Error on Line # 105 at char pos 3
Error -- Unrecognized Command. Skipping to semicolon.

D (mumble) D 300; (you should flag this);;
Error on Line # 106 at char pos 3
Error -- Unrecognized Def command. Command ignored.

D (mumble) D 300; (you should flag this);;
Error on Line # 106 at char pos 3
Warning -- Semicolon missing. Who cares?

D (mumble) D 300; (you should flag this);;
Error on Line # 106 at char pos 12
Warning -- Semicolon missing. Who cares?

D (mumble) D 300; (you should flag this);;
Error on Line # 106 at char pos 14
Error -- Unrecognized Def command. Command ignored.

D (mumble) D 300; (you should flag this);;
Error on Line # 106 at char pos 14
Warning -- Semicolon missing. Who cares?

D (mumble) D 300; (you should flag this);;
Error on Line # 106 at char pos 17
Warning -- Unrecognized user command. Command ignored

D (mumble) D 300; (you should flag this);;
Error on Line # 106 at char pos 43