



Integr8tor v2018.09

Release notes
Ucamco NV - Belgium



Integr8tor

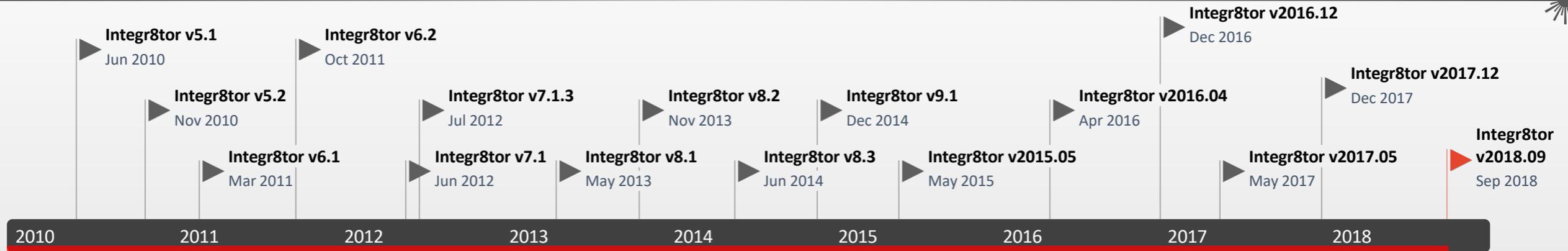
v2018.09

Data Analysis Made Easy...



Integr8tor v2018.09

Serving our customer base with regular updates



Version	Release date	Highlights	
7.1	Jun-12	Localized interface.	Line width on planes.
7.1.3	Jul-12	Bug fix release for 'recovered job'.	
8.1	May-13	Support for ODB++ v7.	Compatible with Windows server 2012 and windows 8.
8.2	Nov-13	Detection and flagging of duplicate archives.	Edge connector recognition.
8.3	Jun-14	New standard parameters.	Determination of laser/mechanical drilling.
9.1	Dec-14	Support for Gerber X2 datasets.	Optimized and new QED values.
2015.05	Jun-15	New standard parameters.	Determination of laser/mechanical drilling.
2016.04	Apr-16	SMD/BGA pads differentiates copper- and solder mask defined	DFM Checks (former Capabilities) revised
2016.12	Dec-16	Introducing Integr8tor Job Perspectives	Drill hole tolerances
2017.05	May-17	Support for PCB Surface finish	Same-sized jobs detection
2017.12	Dec-17	Checkpoint review extensions for various QED results	Analysis of via holes with different solder mask openings top/bottom
2018.09	Sep-18	New QED feature: Minimum Critical Trace Width	User-selectable layer registration

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New features - Overview



NEW



- New QED features
 - Minimum Trace Width
 - Minimum Critical Trace Width
 - Minimum Clearance Trace to Traceavailable on QED PDF, QED XML and Checkpoint review

- New Job Submit option: **Keep original registration**

- Zero size apertures display** on PDF report images

- UTF-8 support** for new Integr8tor installations

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Enhancements - Overview



ENHANCED

- Min. **Same Net Spacing** extensions
- Extended **Edge Connector** information
- BGA recognition** enhancements
- Extensions to the QED PDF **Routed Holes** section
- Added routing info to **QED.XML**
- Added **base material thickness from Ustack** to QED stack-up image
- Min. copper width now available in **DFM Classes** and **DFM review**
- Drill format** recognition improvements
- Stackup recognition** improvements

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Enhancements - Overview



ENHANCED



❑ Gerber X2 data flow enhancements:



- Automatically switch off **layer alignment** if permitted
- Active usage of .FileFunction "**Profile**" attribute in outline determination process

❑ Various **industrializations**:

- More intuitive and logical QED PDF **report structure**
- Smoothened installation of the **local Checkpoint** client

❑ Various additions to **Job Flow Control**

- Netcompare added to the **Work-Up** stage
- Creation of the '**realTray**' variable for better flow control in custom scripts

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Code fixes



We are very grateful to our customer base for reporting any software malfunctions or inconsistencies that may have slipped through the nets of our quality control...

In line with tradition, this v2018.09 update incorporated a series of fixes for issues you have cared to flag – details in the last section of these release notes

Thank you for helping us make an excellent product even better...



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New Features



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New features – Minimum (Critical) Trace Width

NEW ✨

New QED features **Minimum Trace Width**

Minimum Critical Trace width



- Find out about the smallest trace width in the blink of an eye
 - ❖ Trace width is a very important quotation parameter
 - ❖ Trace widths problems are usually much harder to fix in CAM than copper width problems in regions
 - ❖ Increasing trace widths tends to be less accepted by end users and requires intensive documentation and validation cycles
 - ❖ Plating, etching and quality control departments require minimum trace width locations on the board to check their processes
- ❖ Knowing about the exact minimum trace width is of paramount importance...

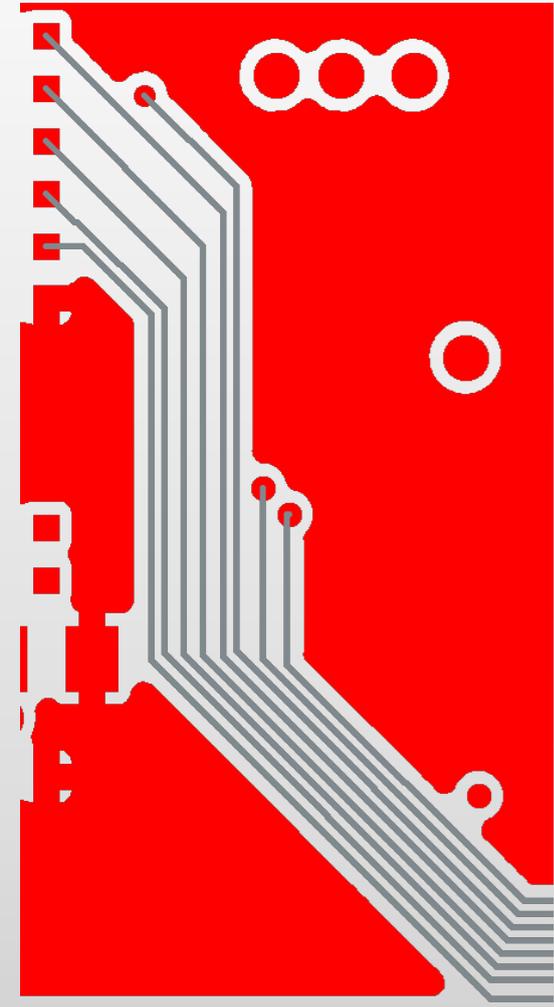
Min. Trace Width		Min. Critical Trace Width	
mm		mm	
3	0.100	4	0.100
13	0.100	14	0.100



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New features – Minimum (Critical) Trace Width

NEW ✨



- Earlier Integr8tor versions reported Min. Copper Width and Min. Line Width
- Line widths were electrically significant copper widths, regardless of the construction (contour, painted, pos/neg,...)

- Integr8tor v2018.09 introduces the concept of **Trace Width**
- **Trace widths** are copper widths that are made using a single draw with a positive aperture (no contour, no painted, no pos/neg,...)
- If a Trace width is electrically critical, it is reported as *Min. **Critical** Trace Width* – if not, it is listed as *Min. Trace width*
- Min. Copper width continues to exist
- Min. Line Width has been renamed to Min. Critical Copper Width for consistency



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New features – Minimum (Critical) Trace Width – QED PDF

NEW



Pre-v2018.09:

Min. Line Width		Min. Copper Width	
	mm		mm
1	0.05	2	0.058
	0.10		0.028

v2018.09:

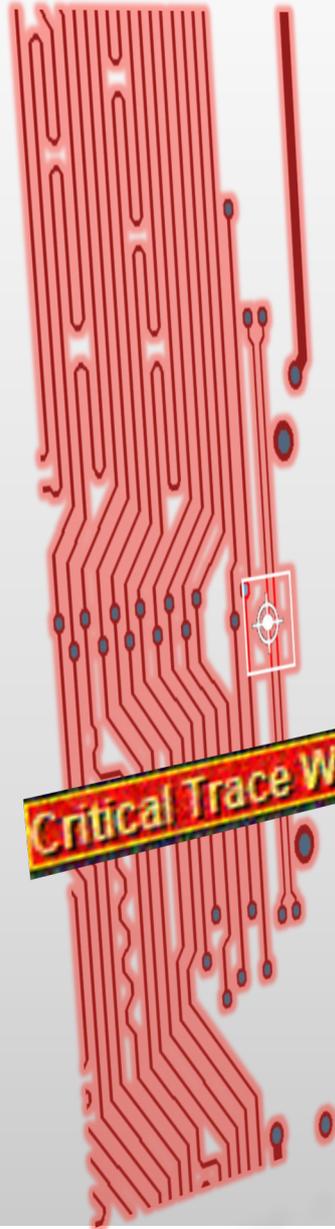
NEW

Min. Trace Width	Min. Critical Trace Width	Min. Copper Width	Min. Critical Copper Width
mm	mm	mm	mm
3 0.150	4 0.150	1 0.058	2 0.105



Electrically critical

Image, critical or not



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New features – Minimum (Critical) Trace Width – QED XML

NEW ✨

```
<CopperCharacteristics id="original">  
  <CopperLayer layerOrGroupRef="jdp7588_0_1">  
    <MinTrack threshold="0.4">0.105</MinTrack>  
    <MinTrackAllCopper threshold="0.4">0.058</MinTrackAllCopper>  
    <MinTrackCriticalTrace threshold="0.4">0.150</MinTrackCriticalTrace>  
    <MinTrackAllTrace threshold="0.4">0.150</MinTrackAllTrace>
```

In QED XML

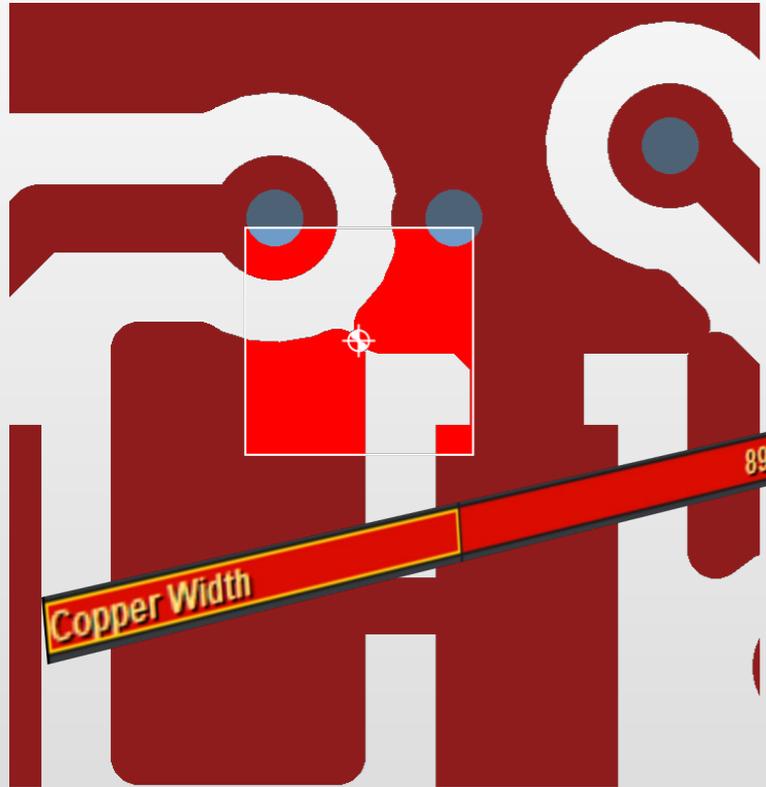
- MinTrackAllCopper = Min. copper width
- MinTrack = Min. critical copper width
- **MinTrackAllTrace** = Min. trace width
- **MinTrackCriticalTrace** = Min. critical trace width



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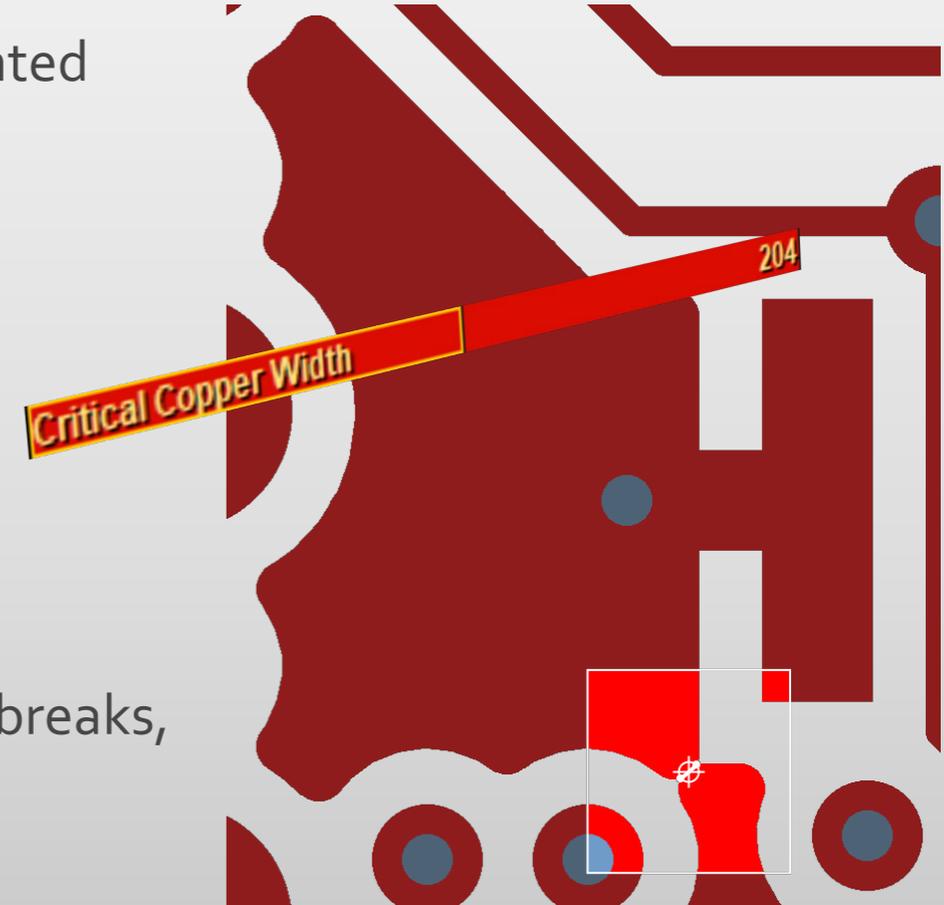
New features – Minimum (Critical) Copper Width – Checkpoint Review

NEW



Min. copper width

- Not electrically critical – if connection breaks, netlist/electrical function remains intact
- Construction = contour/painted



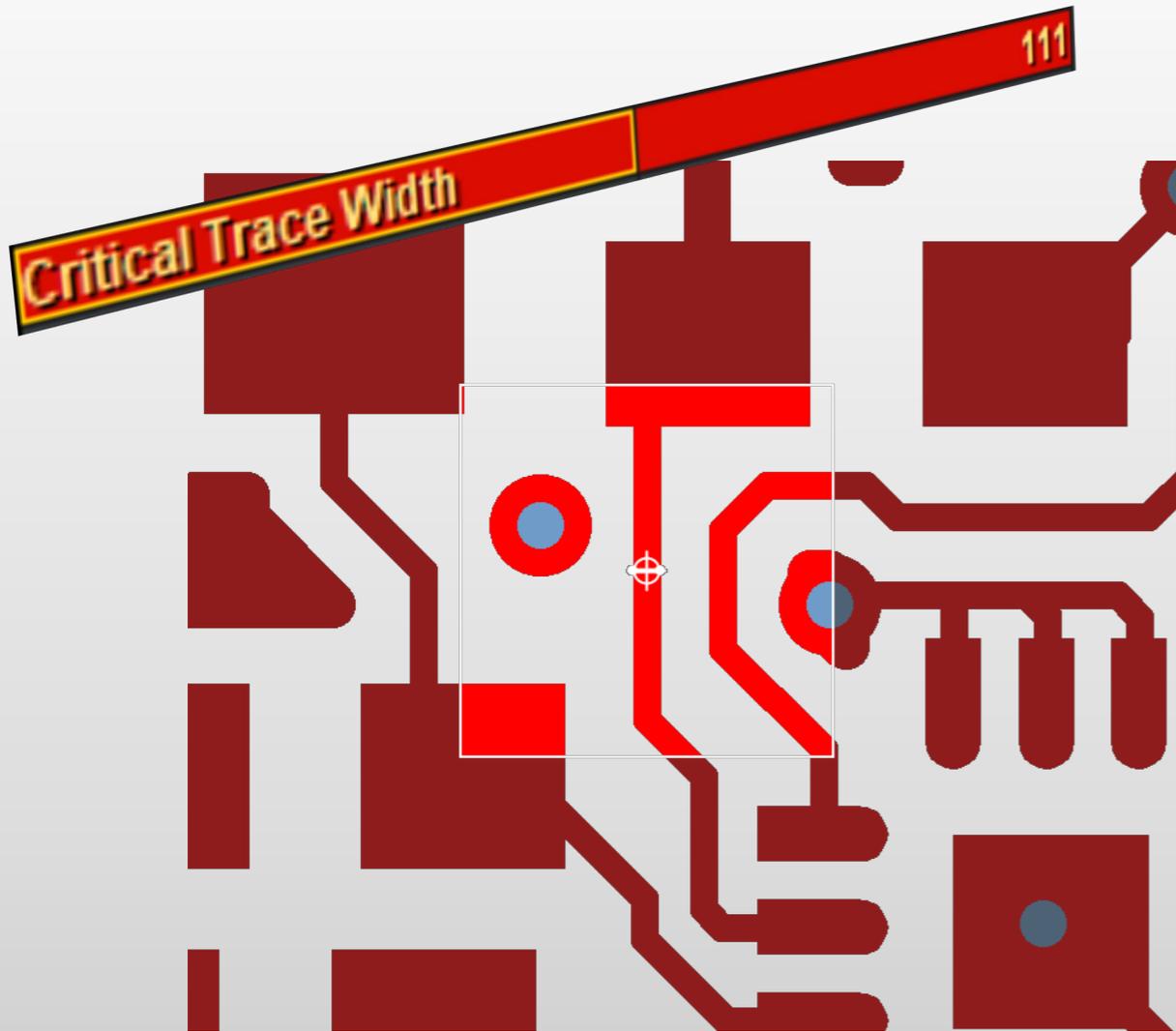
Min. critical copper width

- Electrically critical – if connection breaks, netlist/electrical function changes
- Construction = contour/painted

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New features – Minimum Critical Trace Width – Checkpoint Review

NEW



Min. critical trace width

- Electrically critical – if connection breaks, netlist/electrical function changes
- Construction = single draw with a circle aperture

And remember

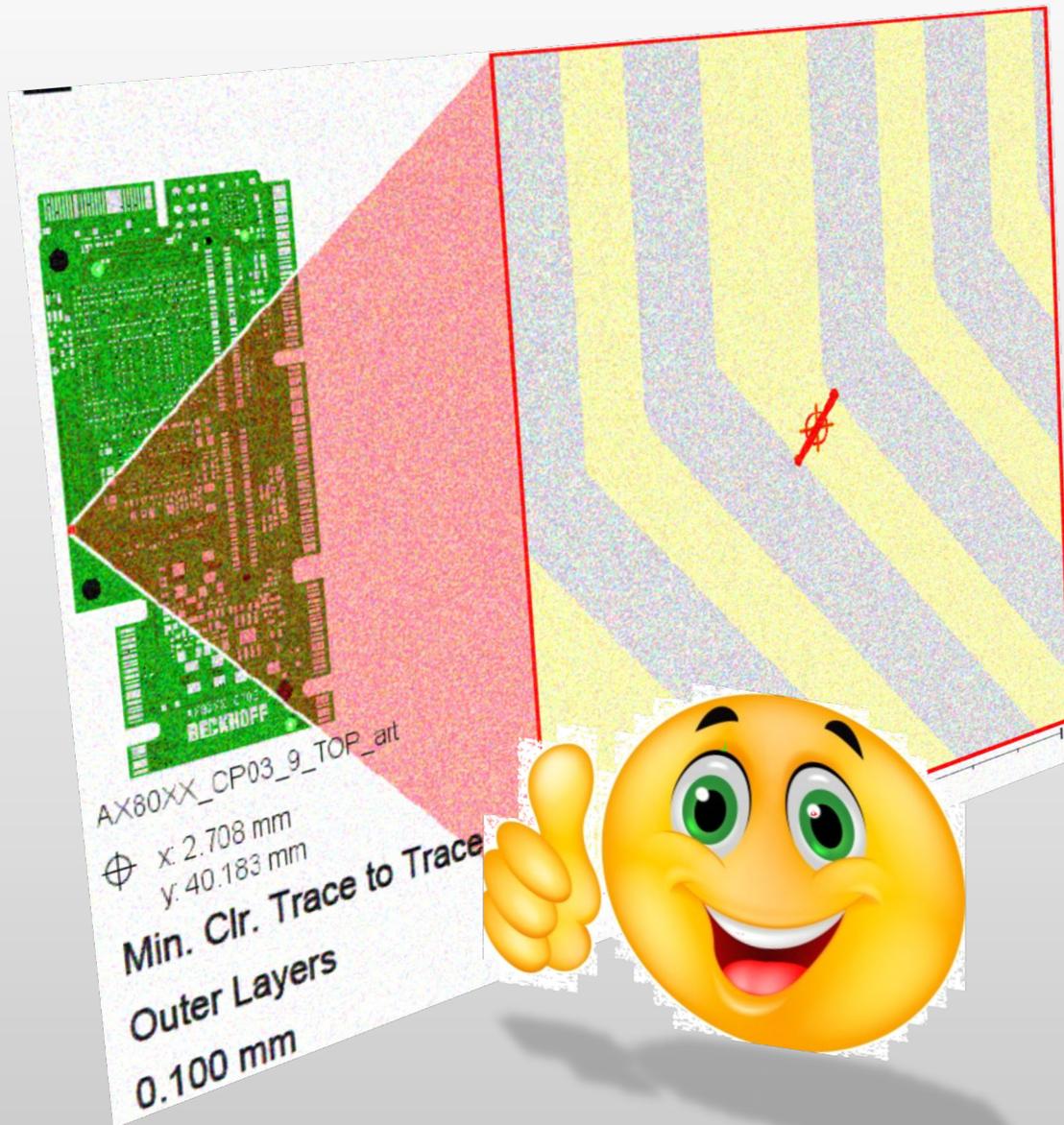
- All trace widths are also copper widths...
- But not all copper widths are trace widths



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New features – Minimum Clearance Trace to Trace

NEW 



New QED feature – **Min. Clearance Trace to Trace**

- The closest distance between any two traces
 - ❖ Min. Trace to Trace info is a key parameter for assessing the manufacturability of a board and hence crucial for accurate quoting
 - ❖ Etching, plating and QC departments are helped enormously with accurate location info on critical trace clearances

- ❖ Establishing what the minimum clearance between 2 traces on a board is, is essential for both quoting and manufacturing...

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New features – Minimum Clearance Trace to Trace

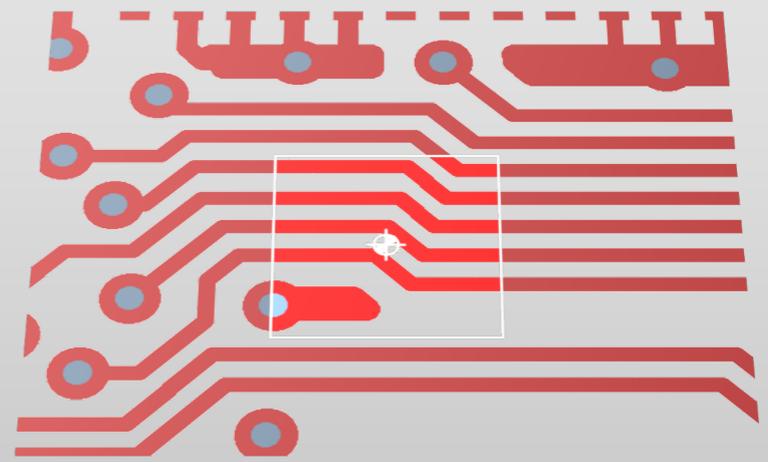
NEW 

Copper Layer Minima & Area - Original							
File	Pos.	Min. Copper Width	Min. Critical Copper Width	Min. Trace Width	Min. Critical Trace Width	Min. Clr. Copper to Copper	Min. Clr. Trace to Trace
		mm	mm	mm	mm	mm	mm
jdp7588_0_1	1	0.058	0.105	0.150	0.150	0.148	0.152
jdp7588_0_2	2	0.132	0.222	0.222	0.222	0.729	>0.500

Check	Count
Linewidth	204
Ring	681
Clr. to Copper	768
Clr. to Copper Track-Track	768
Clr. to Copper Pad-Track	593
Clr. to Copper Pad-Pad	518
Clr. to PTH	49
Clr. to NPTH	65
Clr. to Outline	19
Clr. Same Net	893
Copper Width	204
Critical Copper Width	764
Trace Width	111
Critical Trace Width	768
Clr. Trace to Trace	0
Hole in SMD	0
Hole in BGA	9
Clr Drill	512
Drillspan Clearance	0
Clr. Drill to Outline	108

- Available on QED PDF, both on a per-copper layer basis as well as in the consolidated summary section
- Available in Checkpoint Review as a separate check
- Available in QED XML

```
<MinGapTraceTrace threshold="0.5">0.152</MinGapTraceTrace>
```



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New features - Job submit option "Keep original registration"

NEW

Submit New Job

Standard Parameters

Data file(s)

Multiple Jobs:

Priority: **3 (Normal)**

Tolerance File: **none**

Tool Diameter Adjustm...: **none**

Tool Table: **none**

Buildup Required:

Keep Ori. Registration:

Pref. Import Format:

Password:

PCB Thickness:

SolderMask Color:

Legend Color:

Surface Finish:

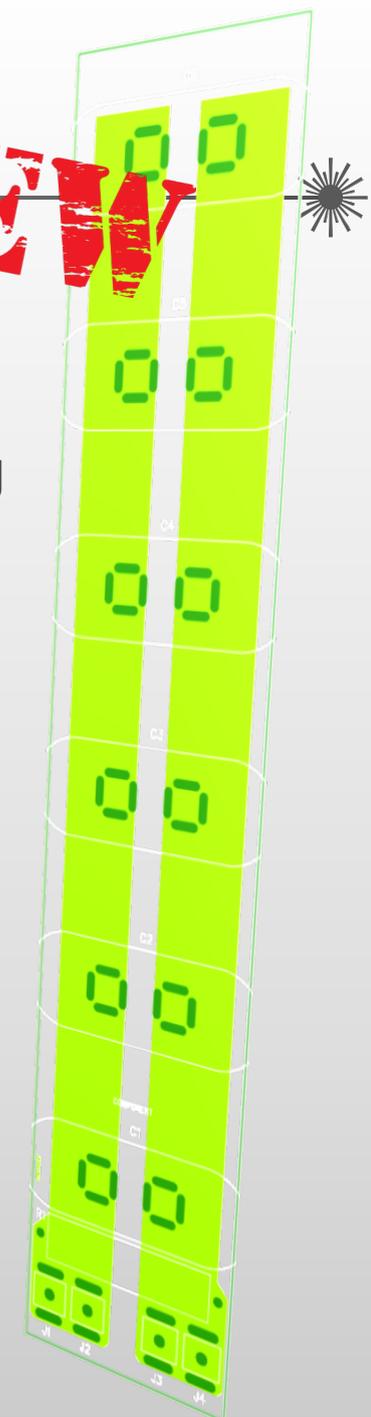


Run-time option to switch layer registration on/off during job submit

- Speed up data input by switching off layer registration when you know the layers are already registered
- Easy workaround when the registration process upsets an already registered job. This may happen with highly symmetrical or low-info boards.
- Switched off automatically on Gerber X2 files with the attribute:



`%TF.SameCoordinates*%`



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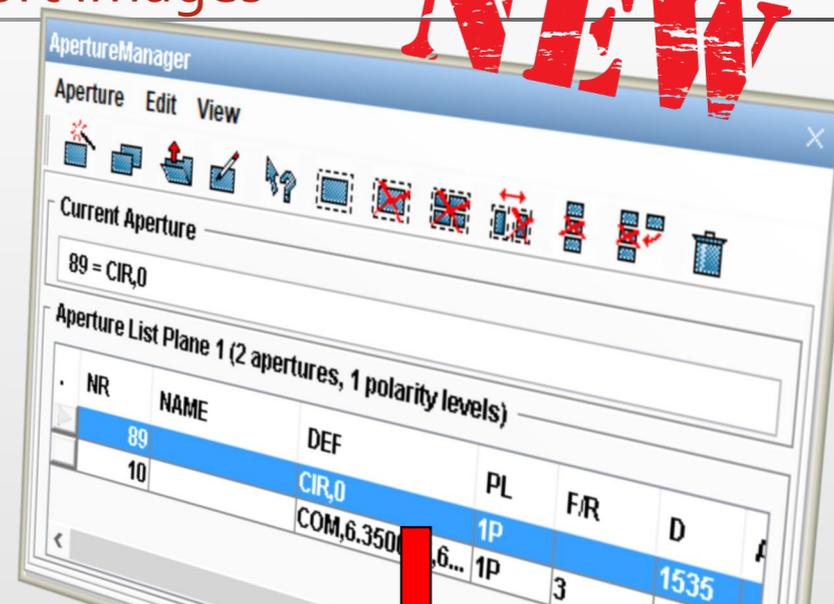
New features - Zero size apertures display on PDF report images

NEW

➤ Visualization of Gerber zero-sized data on the QED PDF report



- ❖ Items that are not part of the physical PCB like an outline or registration targets sometimes are drawn with an “invisible” pen (an aperture of size 0)
- ❖ Even entire layers like drill drawings have been known to be “hidden” in that way...
- ❖ This may make you miss important manufacturing information like tolerance values on drill holes...
- ❖ V2018.09 makes this information visible and places it on its PDF drawings fully automatically
- ❖ Never miss a single instruction or important detail again, even if it has been drawn with a non-visible, zero-sized circle aperture in a Gerber layer...



	Drill Size. (MM.)	No. of Holes
AAA		
G	A 0,200	138
	B 0,750	9
A	C 0,850	5
A	D 1,016	50
A	E 2,300	2
A	F 2,950	2
	G 3,500	6
G	H 4,200	4
A		
A		
CCCCC		

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New features – UTF-8 support for new Integr8tor installations

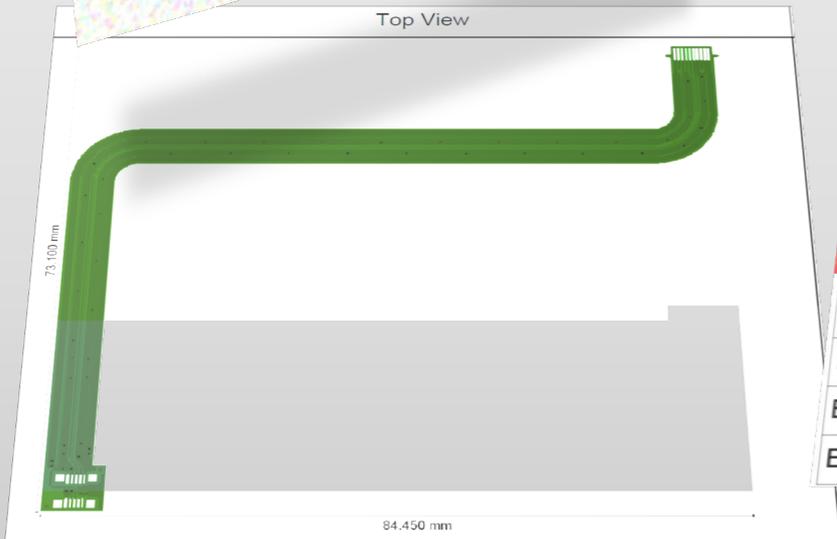
NEW



- UTF-8 support throughout the entire Integr8tor workflow
 - ❖ Provide your customers with professional-looking QED material with correct use of diacritical marks and make a first-class impression on your Central European, Baltic or Far-East customer base
 - ❖ Smoothen communication and avoid misunderstandings or questions back, due to incomplete or incomprehensible customer names, contact names, article references, Email addresses, ...



ďiačřitičš
diacritics



QED Report		Integr8tor	
Name	080158_čěž.zip	Id.	821 - QED With Image Data
Report Generated on	Sep 28, 2018 11:16:30 AM	Customer	PCB Benešov as
Board Id	Plošné spoje dvoustranné	Contact Person	Ing. Tomáš Macha
Email	mach-to@awos.cz		



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Enhancements



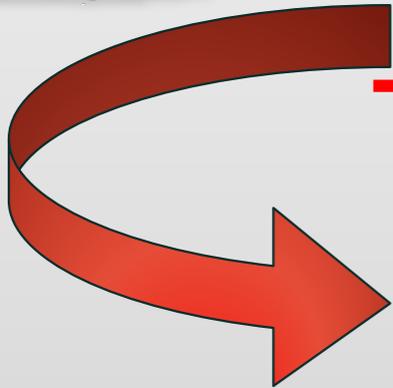
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Enhancements – Min. Same Net Spacing

- Upgrade of the Min. Same Net spacing information on the QED PDF report



- ❖ Same Net Spacing minimum values are amongst the most critical parameters, not only for quoting but even more so for fabrication
- ❖ Overlooking a critical Min. Same Net Spacing value may lead to incorrect production setup or worse, to costly production scrap...
- ❖ V2018.09 makes Min. Same Net Spacing values eminently visible in the Summary section of the QED PDF, along with all other vital product parameters
- ❖ Min. Same Net Spacing now features a link to a detailed image with valuable location information on the board
- ❖ Checkpoint supports Min. Same Net Spacing in case further references are needed



ENHANCED



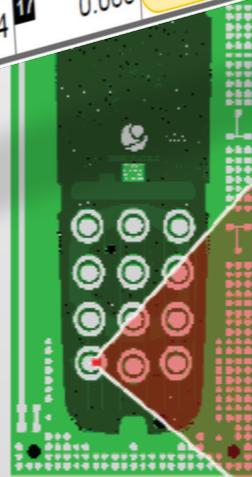
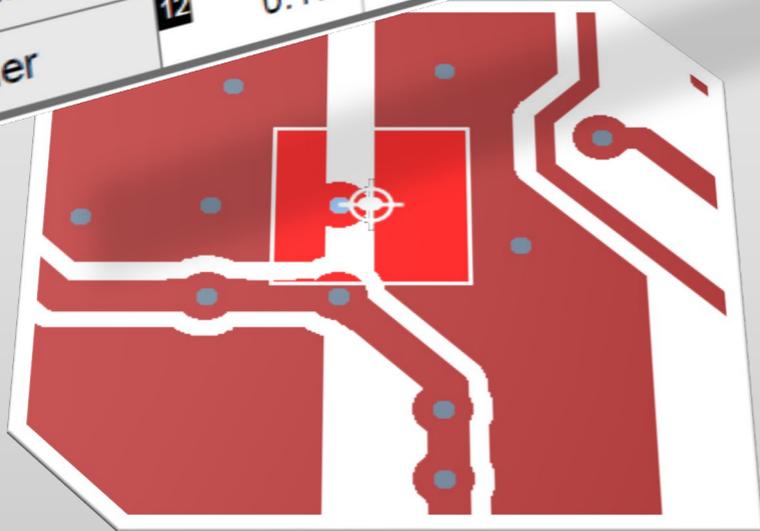
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Enhancements – Min. Same Net Spacing

ENHANCED

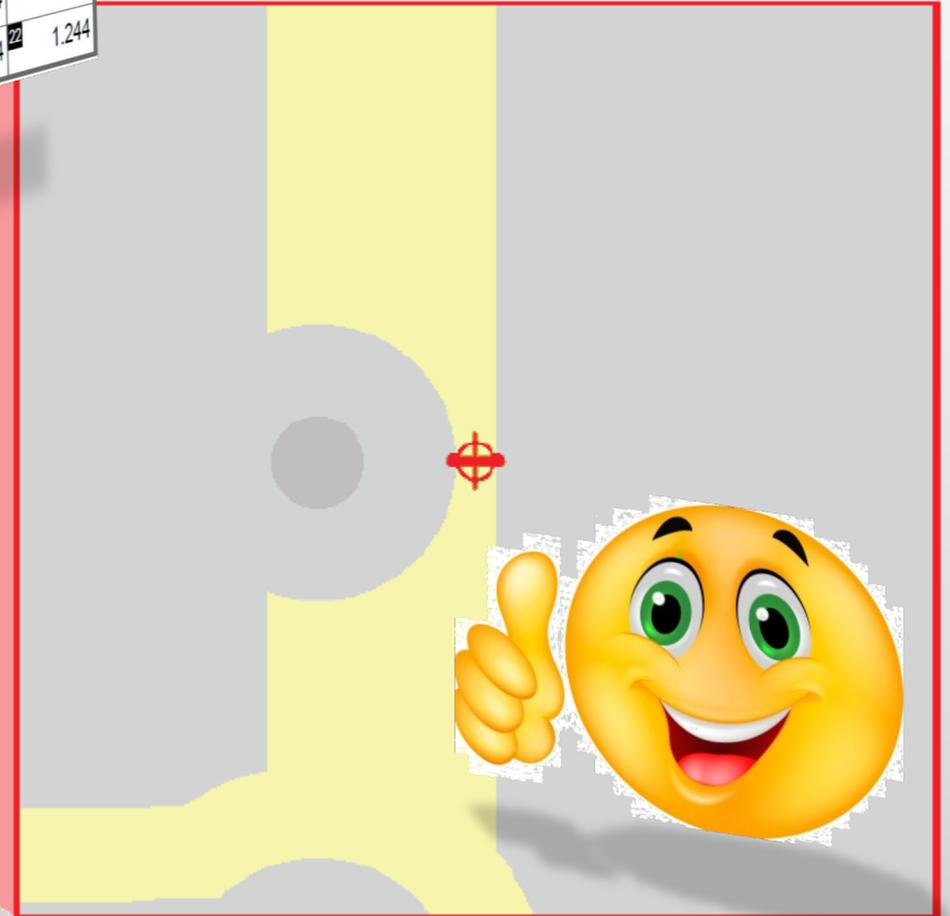
Summary - Copper Layers - Original

Layer Type	Min. Copper Width	Min. Critical Copper Width	Min. Trace Width	Min. Critical Trace Width	Min. Cr. Copper to Copper	Min. Cr. Trace to Trace	Min. Same Net Spacing	Min. Copper to Copper to NPTH Cr.	Copper to NPTH Cr.	Copper to Outline Cr.
Outer	1 0.100	2 0.100	3 0.100	4 0.100	5 0.049	6 0.049	7 0.067	8 0.054	9 0.199	10 0.124
Inner	12 0.100	13 0.100	14 0.100	15 0.100	16 0.054	17 0.065	18 0.046	19 0.049	20 0.199	21 0.124
										22 1.238
										23 1.244



ip3
 ⊕ x: 17.928 mm
 y: 23.44 mm

**Min. Same Net Spacing
 Inner Layers
 0.046 mm**



1 mm

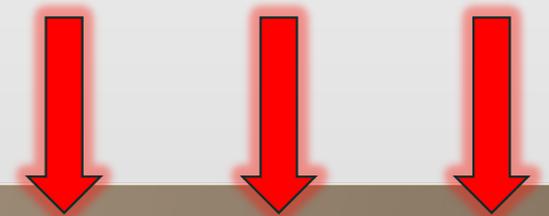
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Enhancements – Extended Edge Connector information

ENHANCED ✨

➤ Edge connectors are an important cost driver, particularly when they require an expensive surface finish

- ❖ Integr8tor’s Edge Connector analysis has been extended to provide additional information including:
 - The number of edge connector fingers
 - The largest edge connector finger in the collection
 - The surface of the edge connector fingers
- ❖ Listed for top, bottom and as job grand total



Copper Areas - Original

Side	Total	Free				Edge Connector Fingers	Edge Connector Finger Size	Edge Connectors
		Solder Mask (dm ²)	Silver Mask (dm ²)	Yes	dm ²			
Top (incl. 1/2 plated hole)	3.5559	0.5187	0.8361		82	0.711 x 4.191	0.0269	
Bottom (incl. 1/2 plated hole and routs)	3.0931	0.4096	0.7271		82	0.711 x 4.191	0.0282	
Total (incl. plated holes and routs)	5.9889	0.9283	1.5632		164		0.0551	

Edge Connectors

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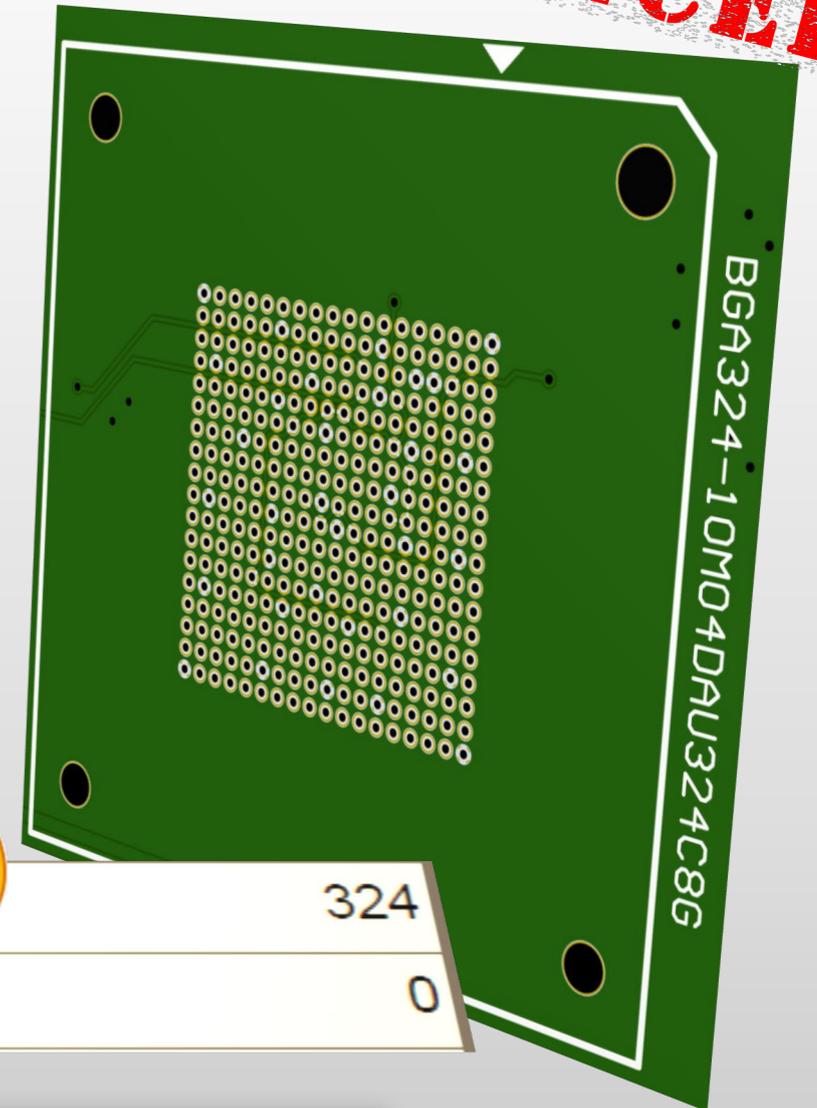
Enhancements – BGA recognition enhancements

ENHANCED

➤ Integr8tor's intelligent BGA recognizer now supports fully drilled BGAs

❖ A vast arsenal of thousands of BGA components now picked up and recognized fully automatically

Provide your Sales with accurate quoting information and cut out the element of surprise for your CAM department



BGA Pads	BGA Min. Pitch	All Tracks in BGA Centered	BGA Drilled
	mm		❖
324	0.800	Yes	Yes
0			
324	0.800	Yes	Yes

BGA Pads Top	324
BGA Pads Bottom	0

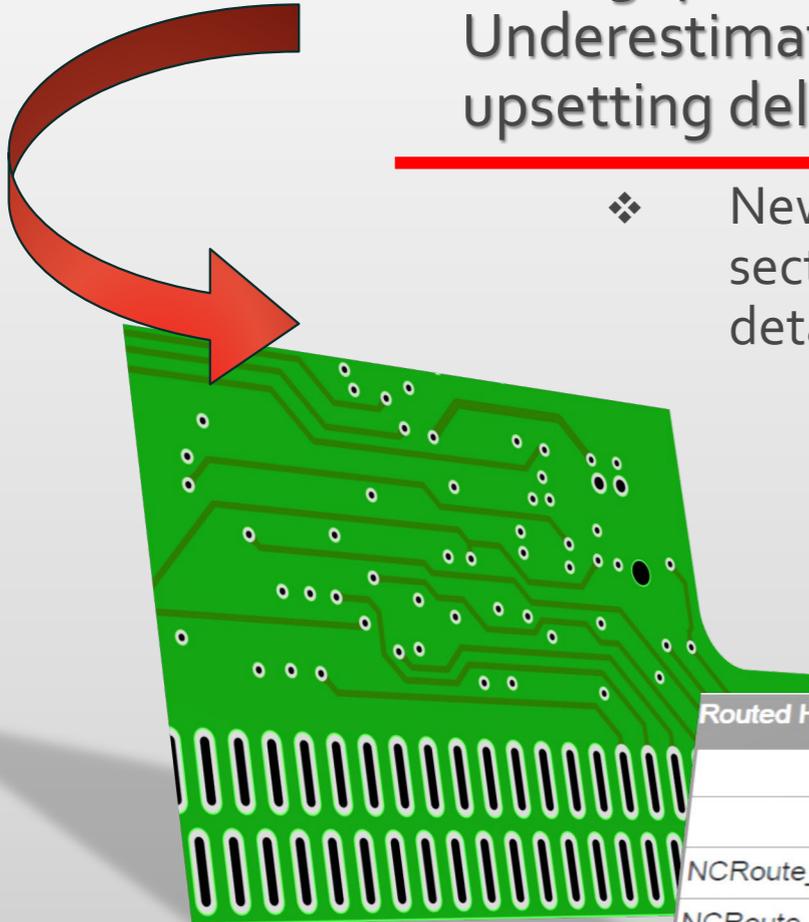
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Enhancements – Rout/Nibble extended information

ENHANCED

- Nibbling/routing of a large number of slots can jeopardize the throughput in the drill/rout department. Underestimating this aspect of production may end up upsetting delivery times as well as customer relationships...

- ❖ New handy summary line in the QED PDF Routed Holes section makes the board totals readily available with full details on
 - the total amount of slots
 - the cumulated slot length
 - the total number of expected nibble hits

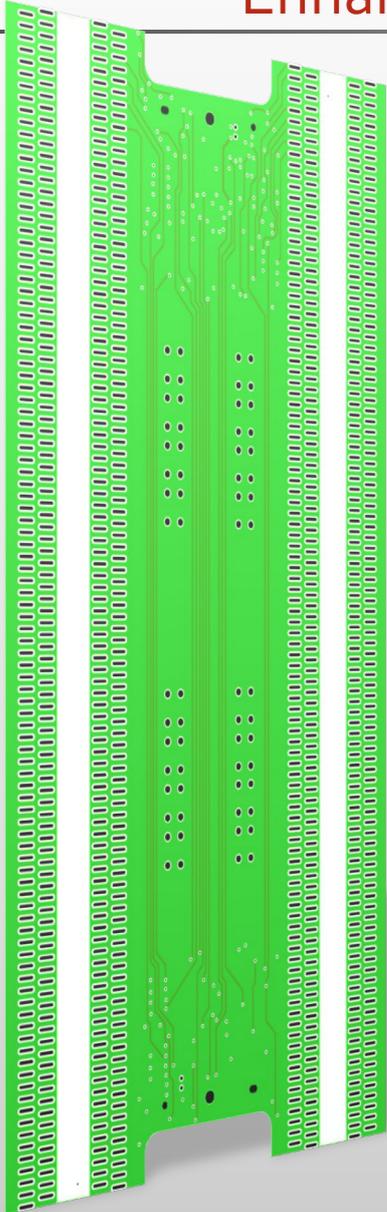


File	Hole Nr.	Instances	X Size mm	Y Size mm	Draw Length mm	Nibble Count
NCRoute_rou	1	1	1.800	0.800	1.000	17
NCRoute_rou	2	1	3.821	4.801	7.101	33
All		2			8.101	50

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Enhancements – Rout/Nibble extended information

ENHANCED



- ❖ The sections Routing tools and Routed holes have been added to QED XML for fully automatic processing of all rout/nibble related board information

```
<RoutCharacteristics id="original">  
  <RoutGroup layerOrGroupRef="NCRoute_rou">  
    <RoutUse drillToolRef="6" type="non-plated" endDiameter="0.800" moves="1" length="1.000" nibbleCount="17" />  
    <RoutUse drillToolRef="7" type="non-plated" endDiameter="2.000" moves="4" length="7.101" nibbleCount="33" />  
  </RoutGroup>  
</RoutCharacteristics>
```

```
<RoutedHolesCharacteristics id="original">  
  <Instances>2</Instances>  
  <Length>8.101</Length>  
  <NibbleCount>50</NibbleCount>  
  <RoutedHolesGroup layerOrGroupRef="NCRoute_rou">  
    <RoutedHole id="1" instances="1" xSize="1.800" ySize="0.800" length="1.000" nibbleCount="17" />  
    <RoutedHole id="2" instances="1" xSize="3.821" ySize="4.801" length="7.101" nibbleCount="33" />  
  </RoutedHolesGroup>  
</RoutedHolesCharacteristics>
```

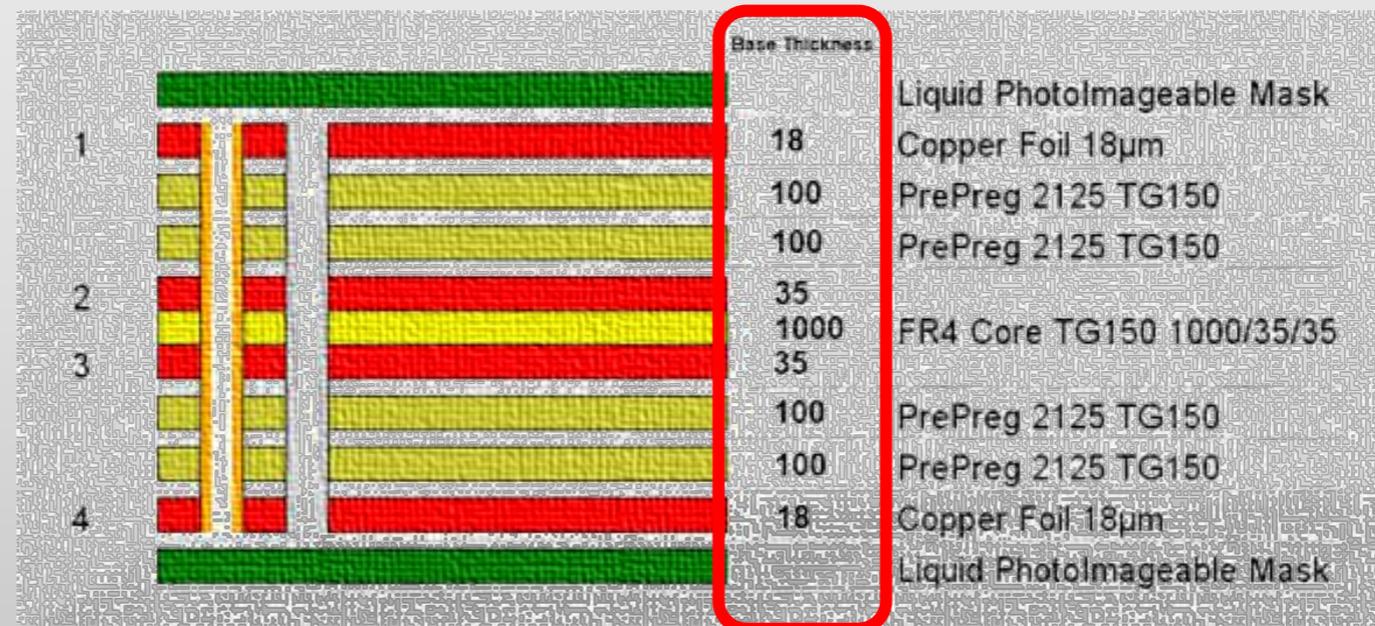


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Enhancements – Material base thickness in stack-up image

ENHANCED

- The correct choice of materials and thickness is essential in achieving the finished board specification
- ❖ Extra material base thickness info facilitates easy cross-checking between **Ustack-based** material information and customer requirements
- ❖ Reduces the risk of costly, inadvertent material mix-up



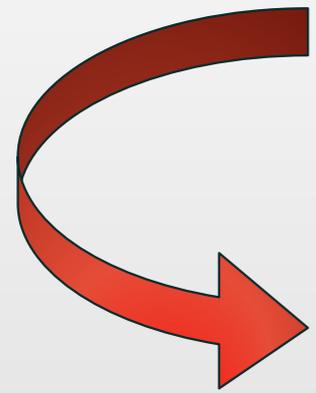
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Enhancements – Min. copper width for DFM Classes/Review

ENHANCED

- DFM Classes/Review(*) are extremely handy tools to fit incoming designs into manufacturability classes automatically
- Min. copper width is a common criterium that pushes designs from one class to the next

- ❖ DFM easily accesses any copper width analysis result and takes it into account to help establish the appropriate manufacturing class



DFM Classes - Original			Standard						Advanced			
			3	4	5	6	7	8	9	10	11	12
Track & Gap	min Clearance (Track-Track / Track-Pad / Pad-Pad)	0.147	300.000	200.000	150.000	120.000	100.000	100.000	85.000	75.000	60.000	<
	min Track Width / min Thermal Gap	0.025	300.000	200.000	150.000	120.000	100.000	100.000	85.000	75.000	60.000	<
Ring for IPC Class 2	min Outer Layer Annular Ring	0.190	200.000	175.000	150.000	120.000	100.000	100.000	75.000	75.000	60.000	<
	min Inner Layer Annular Ring		225.000	200.000	175.000	145.000	125.000	125.000	100.000	100.000	85.000	<
Aspect Ratio	max aspect ratio for Plated hole	5.300	3.200	3.600	4.000	4.600	5.300	6.400	6.400	-	-	-
Drill - Cu	distance Plated hole to Plated hole	0.421	750.000	600.000	500.000	410.000	350.000	350.000	285.000	275.000	230.000	<
	distance Non-plated hole to Cu on inner layers		IAR + 25	<								
	distance Non-plated hole to Cu on outer layers		350.000	300.000	250.000	200.000	200.000	200.000	150.000	100.000	75.000	<
Cu Thickness	maximum total Cu thickness that can be etched (no minimum)		105.000	70.000	60.000	50.000	35.000	35.000	20.000	15.000	15.000	<
Solder Mask	solder mask annular ring & track overhang	0.010	150.000	100.000	75.000	60.000	50.000	50.000	42.500	37.500	30.000	<
	solder mask solderweb	0.020	200.000	150.000	125.000	100.000	100.000	100.000	87.000	87.000	75.000	<

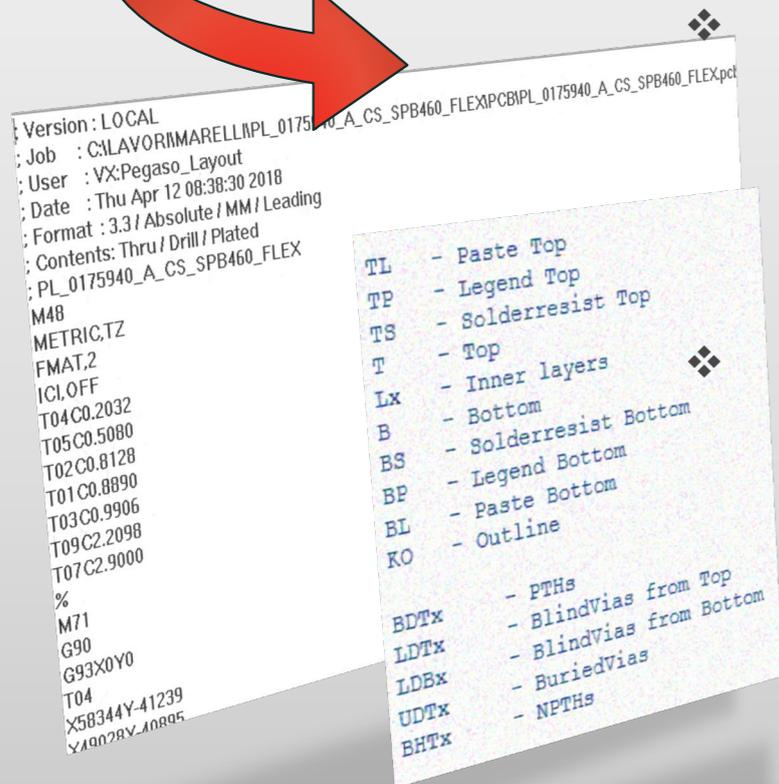
* licensed Integr8tor option

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Enhancements – Improved drill format and stack-up recognition

ENHANCED

- Correct automatic stack-up is the cornerstone of an accurate analysis and speedy results
- Drill format recognition and correct span definition play an equally important role in this automated process



V2018.09 comes with the largest Integr8tor knowledge base so far to help you achieve the highest possible percentage of fully automatic stack-up assignments and drill file format recognitions

Installs and loads automatically after software installation and server startup...



INITIAL	RENAMED	FUNCTION
40-A026016_SRT.gbx	zzyxxx41	mgl
40-A026016_L01.gbx	zzyxxx01	fluid
40-A026016_L02.gbx	zzyxxx02	fluid
40-A026016_L03.gbx	zzyxxx03	fluid
40-A026016_L04.gbx	zzyxxx04	fluid
40-A026016_L05.gbx	zzyxxx05	mixed
40-A026016_L06.gbx	zzyxxx06	mixed
40-A026016_L07.gbx	zzyxxx07	fluid
40-A026016_L08.gbx	zzyxxx07	fluid
40-A026016_SRB.gbx	zzyxxx32	fluid
40-A026016_DD.N.exc	zzyxxx51	fluid
40-A026016_DDP.exc	zzyxxx60n	mgl
40-A026016_BOL.gbx	zzyxxx60	unplated
40-A026016_DL0.gbx	zzyxxx38	drill
40-A026016_DTN.txt	zzyxxx35	cad_outline
40-A026016_DTP.txt		drillmap
Beiblatt_LP.pdf		document
		document
		document

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Enhancements – Gerber X2 data flow extensions

ENHANCED

- The richness of the Gerber X2 format automates the quotation, engineering and pre-CAM processes to the full, with more jobs running from start to finish without interruption
- Integr8tor now offers these fine new benefits on X2 jobs...

- ❖ **Layer registration**

Gerber X2 files can state that they are in register with each other using the File Attribute

```
%TF.SameCoordinates*%
```

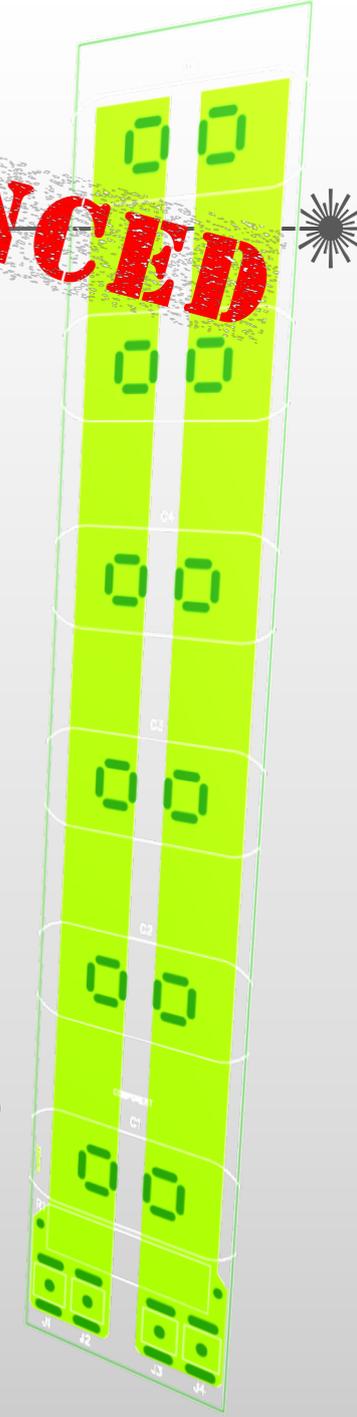
If this info is available, V2018.09 will skip layer registration during input, bringing faster and more accurate results

- ❖ **Outline detection**

Gerber X2 files can express their function within the stack-up using the File Attribute

```
%TF.FileFunction,
```

V2018.09 actively uses layers with a .FileFunction "Profile" in the outline determination process



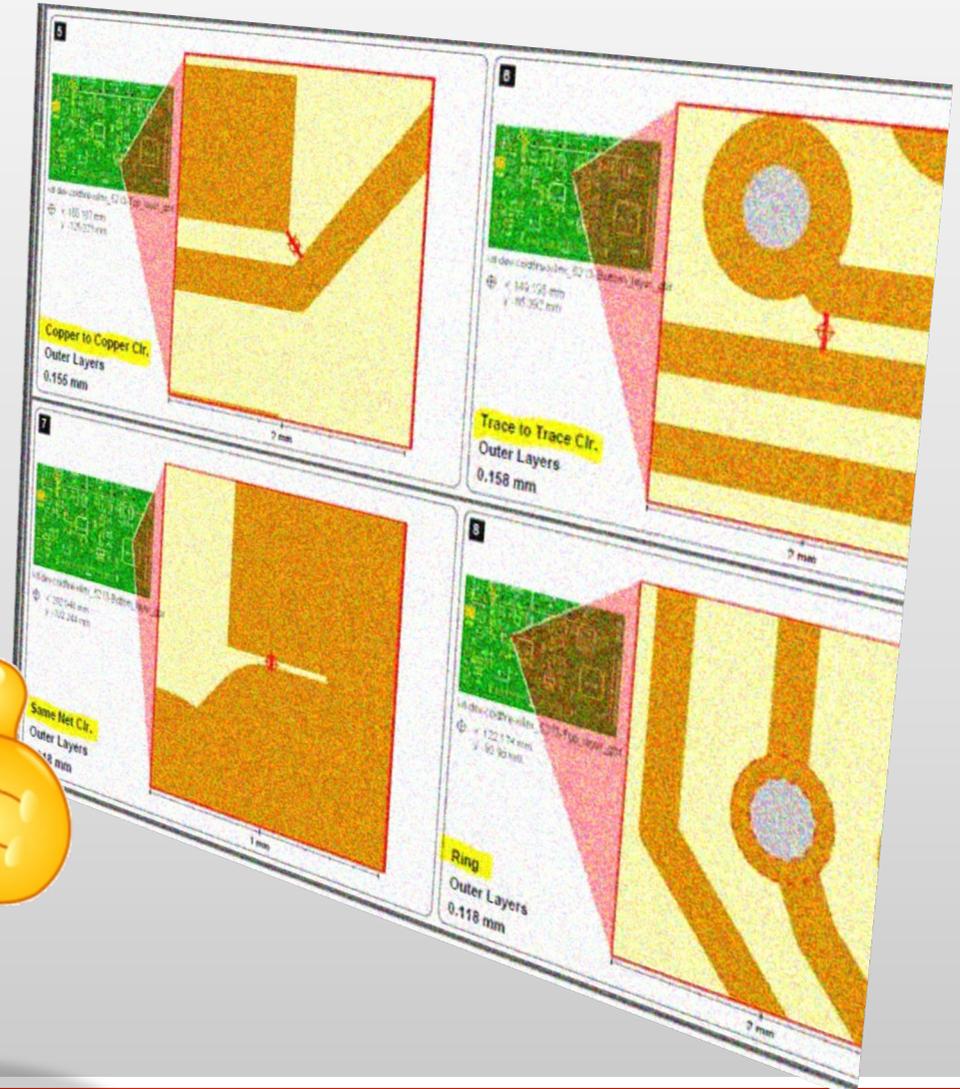
Integr8tor v2018.09

Enhancements – Various industrializations

ENHANCED ✨

➤ More intuitive and logical QED PDF report structure

- ❖ Accurate information, the way you expect it, in the place you expect it...
- ❖ Have a closer look at the reworked sections...
 - Summary – General
 - Summary – Copper layers
 - Summary Minimum Design Characteristics – Locations
 - Routed Holes
 - Copper Areas
 - ...

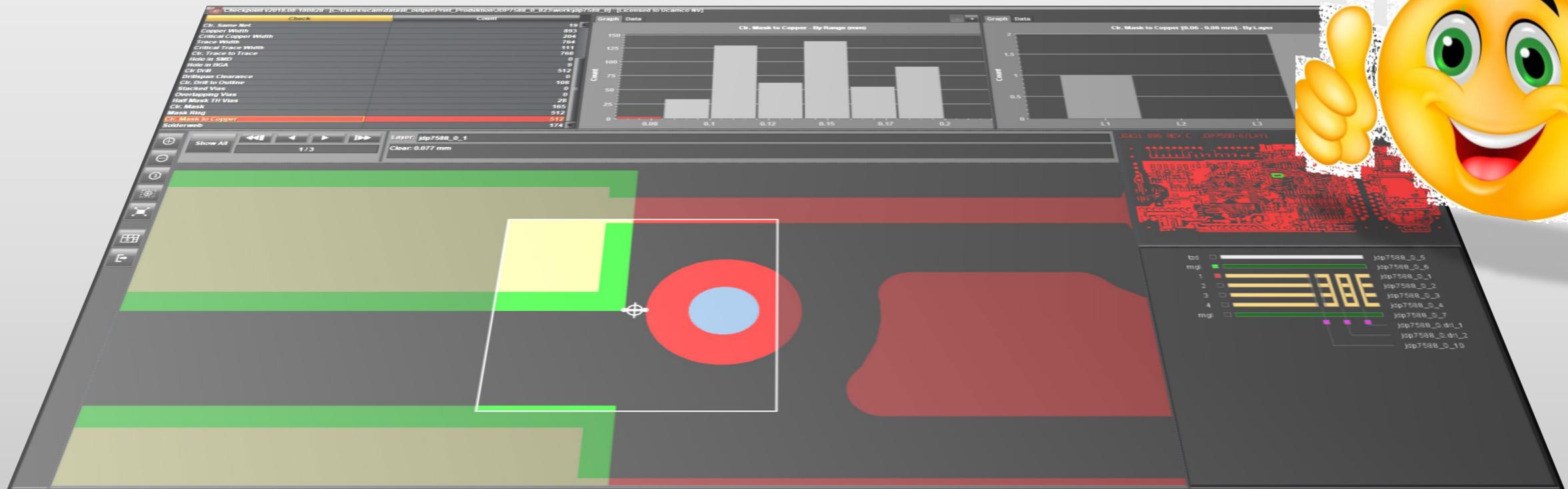


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Enhancements – Various industrializations

ENHANCED ✨

- Smoothened installation of local Checkpoint clients
 - ❖ Local Checkpoint clients require local license file information and environment variable setup at the time of installation
 - ❖ V2018.09 looks after this for you for a hassle-free installation and minimal disruption

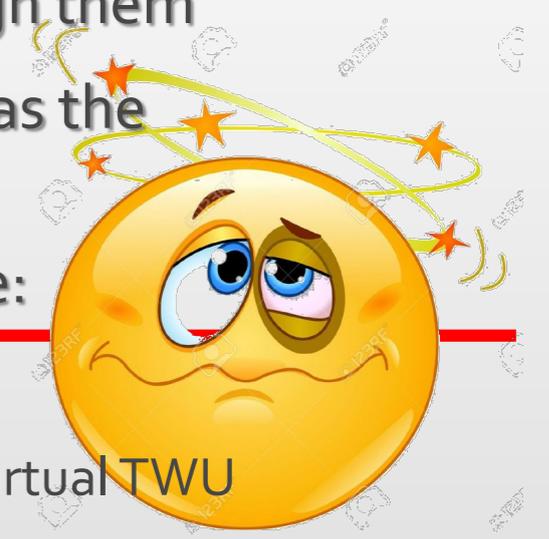


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Enhancements – Job Flow Control Extensions

ENHANCED

- Job Flow Control* is Integr8tor's powerful programming and scripting tool to set up alternative routes and automatically steer jobs through them
- Job Flow Control is used to achieve full automation or to serve as the backbone for an interactive quotation web site
- For better flow control the following additions have been made:
 - ❖ Netcompare functionality has been added to the Work-Up stage
 - ❖ A new 'realTray' variable indicates the real tray behind common/virtual TWU



```
// Explicit continuation (Edit in Cockpit or Design Analysis) unless moved to DA
if (! "TDA".equals(realTray)) {
  if ((numGerber > 0) && (numDrills >= 1) && (numCoppers > 2) && (numIPC == 0 || ! bNetCompareIsOk)) {
    System.out.println("Redirecting to Input Review");
    vOut.add("nextTray=TIR");
  }
  else
  {
    System.out.println("Proceeding with Analysis");
    vOut.add("nextTray=TDA");
  }
}
```



* licensed Integr8tor option



Integr8tor

v2018.09

Code Fixes



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Code fixes



We have taken great care in fixing the items below for you and hope this will contribute to an even better user experience...

- ❖ Copper width could be incorrect in case of multiple solder masks per side
- ❖ Ambiguous contours sometimes were generated in the clean job output
- ❖ Open job from Integr8tor could fail if afjobqueue_custom_table is not present
- ❖ PDF files containing attachments were listed twice in the file list section in cockpit
- ❖ The list of possible import formats offered during job submit contained formats for which the license had already expired, causing “no license” workflow interruptions
- ❖ The presence of an extremely high number of tiny isolated draws with only a few microns in diameter could cause jobs to fail during PDF image generation



Integr8tor v2018.09

Code fixes

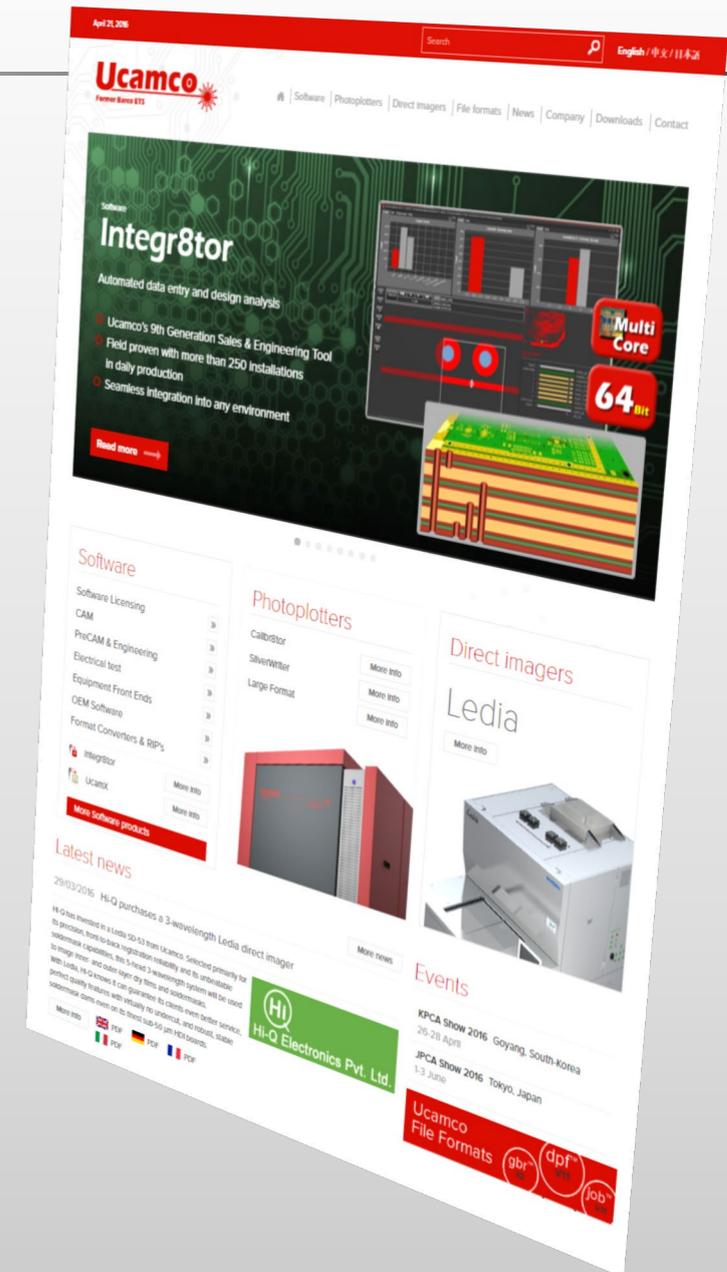


- ❖ A layer subclass set manually in Job Editor after a Ustack session did not always find its way into the clean job when a layer rename script was used
- ❖ Under circumstances, the shipping panel image generated on the PDF report did not match the operator's choice made in Panel Optimizer result.
- ❖ The presence of blind/buried drill spans had the potential to upset the correct order of the Summary Sequence Section on the QED PDF report
- ❖ Some PDF report fields were not correctly updated when moving a job between 2 passive trays

Integr8tor v2018.09

General information

- The installer can be downloaded from <ftp://ftp.ucamco.com/Integr8tor>
- We recommend that you install this update at your earliest convenience
- For any further questions you may have, please contact our local business partner or the Ucamco helpdesk
- We thank you for choosing a Ucamco product



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