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### T/HIS 19.0



#### T/HIS 19.0 – Contents

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## Improved Window Positioning

Window "Common Border" Dragging





### Window "Common Border" dragging: introduction

When there are multiple windows on a page, it is now possible to change their position and size in a coordinated way. Windows that share a common border now "know about" their neighbours and it is possible to resize all windows sharing that border.

For example:

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### Window "Common Border" dragging: two windows case

To give flexibility about what is dragged, different regions of borders perform different functions and are colour-coded to distinguish them.

To drag just the single border between two windows, use the central pink zone:









### Window "Common Border" dragging: single axis case

To drag the entire single border axis in a given direction between all windows which share that border, use the blue zone (intermediate between centre and corners):







### Window "Common Border" dragging: both axes case

To drag both horizontal and vertical borders between all windows which share those borders, use the green zone (at the corners):







### Window "Snap to grid"

Repositioning a window by dragging it used to move just that window and left it "floating" in its new position. When there are multiple windows on a page, these now occupy a grid of locations and it is possible to move a window from one cell to another, shifting the existing windows up and down as required.

- 1. In the top image W4 in the bottom right corner being dragged up and to the left.
- 2. When the cursor enters W1 its borders light up in blue to show it is the destination window.
- 3. On mouse release W4 "snaps" to W1's position and windows W1 to W3 shuffle down to make space.









## Improved Window Positioning

Changes to Graph Layout





### Changes to Graph Layout Menu – Basic Mode

In D3PLOT and T/HIS 19.0, the Graph Layout menu has changed and has been split into separate **Basic** and **Advanced** modes.

In Basic mode, the menu can be used to select a page layout that is automatically applied to all of the pages.

#### **Automatic Page Layout**

If the layout is set to "Tile Wide" or "Tile Tall" then all Graphs are automatically added to page 1.

In all other layouts Graphs are automatically added to pages and as many pages as needed are created to hold all the Graphs.





#### Changes to Window Layout Menu – Basic Mode

#### Window Order (drag to reorder)

By default, Graphs are added to pages in the order they are created.

#### Window Order (drag to reorder)



#### Window Order (drag to reorder)

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The order of Graphs can be changed by clicking on a row and dragging it up or down the list to a new position.

#### Window Order (drag to reorder)





#### Changes to Window Layout Menu – Basic Mode

Any graphs that have been dragged out onto the desktop are removed from the list (Graphs 3 and 4 in this example).

If graphs are on the desktop, the menu will display additional rows that can be used to add the graphs back into the list so that they are displayed on a page again.

Right-clicking on an **<< Add item >>** row will display a popup menu that can be used to select any graphs currently on the desktop.

In a Linked D3PLOT  $\rightarrow$  T/HIS session, this menu will also display any T/HIS graphs that are currently docked inside D3PLOT windows so that they can be added back onto a page.

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**Advanced** mode works in a similar way to Basic mode except that it controls the settings for the current page only.

In Advanced mode, the layout and content of each page can be set for that page and the order of the items displayed on each page can also be controlled by clicking on an item and dragging it up or down to a new position.







If a page has room for additional Graphs to be added to it then the menu will display additional rows with the first empty row showing **<< Add item >>**.



Right-clicking on **<< Add item >>** will display a popup menu that can be used to select any Graph that is not currently on the page.







Right-clicking on a row containing a Graph will display a popup menu that can be used to remove the Graph from the current page.

Alternatively, the same popup can also be used to change an item to a different Graph that is not already on the current page.

#### Current Page Window Order (drag to reorder)



#### Current Page Window Order (drag to reorder)







In Advanced mode, the **All Pages...** button can be used to display a separate menu that shows the layout and contents of all pages:

—					Page La	ayout						? - 🗆 🗙
Close	ose Page Number											
	All	1	2	3	4	5	6	7	8	9	10	11
Layout	Wide ►	3x3 ►	2x2 ►	2x2 ►	Wide ►	Tall 🕨	Wide •	Wide ►				
		+A	+A	+A	+All	+All	+All	+All	+All	+All	+All	+All
		G1 ►	G1 ►	G6 🕨	G1 ►	G1 ►	G1 ►	G1 ►	G1 ►	G1 ►	G1 ►	Add ►
		G2 ►	G2 ►	G7 ►	G2 ►	G2 ►	G2 ►	G2 ►	G2 ►	G2 ►	G2 ►	
		G5 🕨	G3 ►	G8 🕨	G3 ►	G3 🕨	G3 ►	G3 ►	G3 ►	G3 ►	G3 🕨	
aph		G6 🕨	G4 ►	Add ►	G4 ►	G5 🕨	G4 ►					
ي م		Add ►			G5 🕨	Add ►	G5 🕨					
					G6 ►		G6 ►					
					G7 ►		G7 ►	G7 🕨	G7 🕨	G7 🕨	G7 🕨	
					G8 ►		G8 ►					
		<										







This menu allows the layout and contents of each page to be individually changed.

The options to reorder or change the contents of each page are similar to those in the Window Order section of the Layout menu:

- Drag the buttons in each column up and down to reorder windows and graphs on a page
- Use the popup menus to edit page contents

				Page La	ayout						? -
Page Number											
All 1 2 3 4 5 6 7 8 9 10									11		
Wide •	3x3 ►	2x2 ►	2x2 ►	Wide ►	Tall 🕨	Wide ►	Wide ►	Wide ►	Wide ►	Wide ►	Wide ►
	+A	+A	+A	+All	+All	+All	+All	+All	+All	+All	+All
	G1 ►	G1 ►	G6 🕨	G1 ►	G1 ►	G1 ►	G1 ►	G1 ►	G1 ►	G1 ►	Add ►
	G2 ►	G2 🕨	G7 🕨	G2 🕨	G2 🕨	G2 🕨	G2 🕨	G2 🕨	G2 🕨	G2 🕨	
	G5 ►	G3 🕨	G8 🕨	G3 ►	G3 ►	G3 ►	G3 ►	G3 ►	G3 ►	G3 ►	
	G6 ►	G4 🕨	Add ►	G4 ►	G5 🕨	G4 ►	G4 ►	G4 ►	G4 ►	G4 ►	
	Add ►			G5 🕨	Add ►	G5 🕨	G5 🕨	G5 🕨	G5 🕨	G5 🕨	
				G6 ►		G6 ►	G6 🕨	G6 ►	G6 ►	G6 🕨	
				G7 ►		G7 ►	G7 🕨	G7 🕨	G7 🕨	G7 🕨	
				G8 ►		G8 ►	G8 ►	G8 ►	G8 ►	G8 ►	
	<										
	All Wide ►	All 1 Wide   3x3 +All G1 G2 G5 G6 Add  	All 1 2 Wide • 3x3 • 2x2 • +All +All G1 • G1 • G2 • G2 • G5 • G3 • G6 • G4 • Add • 	All       1       2       3         Wide •       3x3 •       2x2 •       2x2 •         #All       #All       #All       #All         G1 •       G1 •       G6 •         G2 •       G2 •       G7 •         G5 •       G3 •       G8 •         G6 •       G4 •       Add •         Add •       .       .         .<	All 1 2 3 4 Wide A 3x3 A 2x2 A 2x2 Wide A +All +All +All +All G1 A G1 A G6 G1 A G2 A G2 A G7 A G2 A G5 A G3 A G8 A G3 A G6 A G4 Add Add G4 A Add A G5 A G6 A G7 A G7 A G8 A	All       1       2       3       4       5         Wide ▶       3x3 ▶       2x2 ▶       2x2 ▶       Wide ▶       Tall ▶         +All       +All       +All       +All       +All       +All         G1 ▶       G1 ▶       G6 ▶       G1 ▶       G1 ▶         G2 ▶       G2 ▶       G7 ▶       G2 ▶       G2 ▶         G5 ▶       G3 ▶       G8 ▶       G3 ▶       G3 ▶         G6 ▶       G4 ▶       Add ▶       G6 ▶       G1 ▶         G6 ▶       G4 ▶       Add ▶       G6 ▶       G7 ▶         G8 ▶       G7 ▶       G8 ▶       G7 ▶       G8 ▶	All       1       2       3       4       5       6         Wide       3x3       2x2       2x2       Wide       Tall       Wide         +All       +All       +All       +All       +All       +All       +All       +All         (G1       G1       G1       G6       G1       G1       G1       G1       G1         (G2       G2       G7       G2       G2       G2       G2       G2       G2       G3       G3	Page Number         All       1       2       3       4       5       6       7         Wide •       3x3 •       2x2 •       2x2 •       Wide •       Tall •       Wide •       Wide •         H       1       +All       +All	Fige Layou         Page Number         All       1       2       3       4       5       6       7       8         Wide +       3x3 + 2x2 + 2x2 + Wide + Tall + Wide + Wide + Wide + Wide +       Mide + Wide + Wide + Wide + Wide +       Wide +       Wide +       Wide + Wide + Wide +         +All       +All	Page Number         All       1       2       3       4       5       6       7       8       9         Wide +       3x3 + 2x2 + 2x2 + Wide + Tall + Wide + HAll       +All       +	Page Number         All       1       2       3       4       5       6       7       8       9       10         Wide •       3x3 •       2x2 •       2x2 •       Wide •       Tall •       Wide •       Mall #All       #All #All #All #All #All #All #All #All



## Filtering and Correlation

**Bessel Filter** 





#### **Bessel Filter**

- A **Bessel** filter operation has been added to the **Automotive** menu of T/HIS.
- A Bessel filter is a type of linear filter with a maximally flat group/phase delay (maximally linear phase response), which preserves the wave shape of filtered signals in the passband.

- Tool	ls							
Read Write			Curves		Models			
Edit	Style	e	Properties		Images			
Operate	Math	ıs	Automotiv	e	Seisr	nic		
Macros	FAS	T-TCF	Title/Axes		Display			
Settings	Mea	sure	Groups		Grap	hs		
Command	Command Fil Units		JavaScript		Datum			
All None	G1 ►	All G1 None						
<< Undock Automotive ? >								
< Undock	¢	Autor	notive			? X		
< Undock	C180	Autor C600	notive C1000	В	UT	? 🗙 BUT(p)		
C60 FIR	c C180 HIC	Autor C600 HIC(d)	notive C1000 3ms CLIP	B	UT XC	? × BUT(p) VC		
< Undock C60 FIR ASI	C180 HIC THIV	Autor C600 HIC(d) NIJ	notive C1000 3ms CLIP TTI	B E NO	UT XC R (y)	? X BUT(p) VC NOR (x)		
< Undock C60 FIR ASI REG	C180 HIC THIV VEC	Autor C600 HIC(d) NIJ VEC(2d)	notive C1000 3ms CLIP TTI ACU	B E NO	UT XC R (y) DR1	? X BUT(p) VC NOR (x) COR2		
<< Undock C60 FIR ASI REG COR3	C180 HIC THIV VEC WIF	Autor C600 HIC(d) NIJ VEC(2d) BES	notive C1000 3ms CLIP TTI ACU	B E NO CC	UT XC R (y) DR1	? X BUT(p) VC NOR (x) COR2		





- The Bessel filter can be used in the same way as the existing Butterworth filter, with its "Cut-off frequency" and "Filter order" options.
- For T/HIS 19.0, a maximum filter order of 10 is supported.

C60	C1	80	C600	C1000	BUT	BUT(p)		
FIR	H	С	HIC(d)	3ms CLIP	EXC	VC		
ASI	TH	IV	NIJ	TTI	NOR (y)	NOR (x)		
REG	VE	C	VEC(2d)	ACU	COR1	COR2		
COR3	W	IF	BES					
Copy S	Style f	from	Input to O	utput Curve	•			
Always	s regu	laris	e curves b	efore filterir	ng			
0.10000E	0.10000E-03 New X axis interval (dt)							
1000.0		Cut	off frequer	ncy (Hz)				
	1	Filte	er order (in	teger)				
Apply		Out	put: % (	highest+1)				
Group 1:#	Group 1:#0 All None Visible(P) Pick							
Filter	Filter Show Groups Key in: ?							
#1 : (M1) Accel x - Node 3003263 : (loaded)								





Here is an example of a node acceleration curve before and after a 3rd order Bessel filter with a cut-off frequency of 1000 Hz is applied:







## Filtering and Correlation

MADM Correlation Tool





#### MADM Correlation Tool

Included in T/HIS 19.0 as a JavaScript is the MADM Correlation Tool. The minimum area discrepancy method (MADM) is ideal for correlation between LS-DYNA simulations and physical tests when **force** versus **deflection** is the relationship of interest, and offers benefits over other correlation methods that focus on parameters versus time.

The MADM Correlation Tool was developed in collaboration with the University of Coventry <sup>[1][2]</sup>.



[1] Bastien, C., Diederich, A., Christensen, J., & Ghaleb, S. (2021). Improving Correlation Accuracy of Crashworthiness Applications by Combining the CORA and MADM Methods. Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering. <u>https://journals.sagepub.com/doi/10.1177/09544070211069666</u>





<sup>[2]</sup> Peres, J, Bastien, C, Christensen, J & Asgharpour, Z 2019, 'A Minimum Area Discrepancy Method (MADM) for Force Displacement Response Correlation', Computer Methods in Biomechanics and Biomedical Engineering, vol. 22, no. 11, GCMB-2018-045, pp. 981-996. <u>https://doi.org/10.1080/10255842.2019.1610745</u>

#### MADM Correlation Tool

To access MADM, open the JavaScript panel and select MADM  $\rightarrow$  **MADM Correlation Tool**. Further help and academic references can be found in

the MADM window.

-	MADM Correlation Tool			2 🗆 🗙
		MADM re	eference	Help
	Simulation (model) data			
Simulation curve:			Pick	Select
	Experimental (test) data			
Data generation:	Specify average/lower/upper curves			T
Average curve:			Pick	Select
Lower corridor:			Pick	Select
Upper corridor:			Pick	Select
	Calculation parameters			
MADM parameters:	n = [1		m = 2	
	Calaviata			
	Calculate			
	Results			
A_mo	odel = MADM	_1,2 =		
A_lov	ver =	R =		- 1
A up	per =			_







## HDF





- T/HIS 19.0 has some new support for reading HDF files. We plan to develop HDF support further.
- The version of HDF currently supported is HDF5.
   HDF4 files require external conversion to HDF5
   before they can be read into T/HIS. We have
   provided an HDF4 to HDF5 Converter Tool to
   facilitate this see the T/HIS manual for details.
- Currently we support Float datatypes within Atomic datasets and Float datatypes within Compound datasets.
- Upon selecting a valid HDF file, a basic menu allows you to browse the file contents.

<< Undock	Read	? >	
LS-DYNA	Groups	Keyword	T/HIS Curve
Bulk Data	Keyboard	CSV	Screen
ISO	LS-PREPOST	DIAdem	NASTRAN
CURVOUT	Equation	HDF	

-	HDF Panel	? <b>-</b> 🗆 🗙
Read		
Filename:		





#### The panel opens with "Plot with X points" mode selected by default.



Selecting a dataset will map an adjacent dataset box displaying the contents of the dataset.





For a 1D or 2D dataset the dataset box will give a listing of Columns (see previous slide) but for a 3D dataset you first need to select the Level and then the Column:

-	HDF Panel		? <b>-</b> 🗆 🗙 -		HDF Panel		? <sup>–</sup> 🗆 🗙
Read				Read			
Filename:	C:\SOURCE\hdf5_dir\examples\python\v	l3plot_qd.h5	E F	Filename: C	SOURCE\hdf5_dir\examples\pythor	n\d3plot_qd.h5	
Y-Axis /float_data  elem_shell_dele elem_shell_rest elem_shell_rest	/ elem_shell_results Level 1 Level 2 Level 3 Level 4 Level 5	X-Axis /float_data/ elem_solid_deletion_ elem_solid_results node_acceleration node_coordinates node_displacement	celeration	Y-Axis /float_data/  elem_shell_deletio elem_shell_results elem_shell_results elem_solid_deletio	elem_shell_results Column 1	X-Axis /float_data/ elem_solid_deletion_ elem_solid_results node_acceleration node_coordinates node_displacement	node_acceleration         Column 1         Column 2         Column 3         Column 4         Column 5
	<ul> <li>Plot with X points</li> <li>Index</li> </ul>			(	<ul> <li>Plot with X points</li> <li>Index</li> </ul>	Apply	Column 6





For a Compound dataset, the dataset box lists the dataset labels. If a row is greyed out then it does not contain a supported datatype.

-	HDF	Panel	? <b>-</b> □×
Read			
Filename:	C:\SOURCE\hdf5_dir\examples	NASTRAN\2dof.h5	
Y-Axis		X-Axis	
/NASTRAN/RESU  EIGENVECTOR GRID_WEIGHT	ILT/N EIGENVECTOR D X Y Z RX PY	/NASTRAN/RESULT/N  EIGENVECTOR GRID_WEIGHT	GRID_WEIGHT ID MO S MX XX VV
	<ul> <li>Plot with X points</li> <li>Index</li> </ul>	Apply	





• Rather than plotting against X points, you can select "Index" to plot Y data against the index number of each Y point:



- For now, FAST-TCF is not supported for HDF (any HDF curves will be skipped).
- As we develop it further, please send us any feedback you have on HDF support.





## **REPORTER** Integration





### Automatic update of DEFAULT\_DIR and DEFAULT\_JOB



#### In REPORTER, job uses variables automatically

If you open REPORTER from D3PLOT or T/HIS and capture an item, the values of DEFAULT\_DIR and DEFAULT\_JOB are now automatically updated to match the current model in D3PLOT or T/HIS (previously you would have had to edit the hardwired filenames manually). This makes it easier to set up your template to run for different models.

DATE	String	Current date	Yes	None	2	
DEFAULT_DIR	Directory	Reporter default directory		None	2	C:\models\FrontCrushDemo
DEFAULT_JOB	File(basename)	Reporter default jobname		None	2	front_crush_demo
REPORTER_HOME	Directory	Reporter home directory	Yes	None	2	C:\Oasys 19 Ni htly
REPORTER TEMP				None		C:\Users\alasd: ir.parkes\Local

#### Model file path and filename from T/HIS automatically





## Improved Support for LS-DYNA Results





#### \*CONTROL\_ENERGY

plastic, elastic, damage:

- In the Global menu, support has been added for six new \*CONTROL\_ENERGY components, for new parameters MATEN, DISEN and DRLEN.
- The MATEN options are also added in the Part menu.
- The internal energy is split into three different energies –





MPE - Mat Plastic energy MEE - Mat Elastic energy MDE - Mat Damage energy



#### Discrete Beam

- Support has been added to the Discrete Beams menu for 15 new components including forces and moments.
- The component names have been modified to be in a local co-ordinate system (Axial, S, T).

XD - Relative Axial displacem
D - Relative S - Displacemen
D - Relative T - Displacemen
XR - Axial rotation
R - Rotation in S
R - Rotation in T
NAX - Relative Axial force
RNS - Resultant S - Force
RNT - Resultant T - Force
/IAX - Axial moment
IS - Moment in S
/IT - Moment in T
XX - Axial Direction X
XY - Axial Direction Y
XZ - Axial Direction Z
SX - S - Direction X
SY - S - Direction Y
SZ - S - Direction Z
X - T - Direction X
Y - T - Direction Y
Z - T - Direction Z





Joints

• A new Cylindrical sub-type has been added to the Joints menu, with16 new components as shown:

PDF - P damping force

RSF - R stiffness force

RDF - R damping force

ZSF - Z stiffness force

ZDF - Z damping force

EN - Total joint energy

PTF - P total force

RTF - R total force

ZTF - Z total force







#### Joints

	TX XIOICC
<ul> <li>In the Joint subtype, a new energy component has been added.</li> </ul>	FY - Y force
	FZ - Z force
	FM - Force Magnitude
	MX - Moment in X
	MY - Moment in Y
	MZ - Moment in Z
	MM - Moment Magnitude
	EN - Energy
<ul> <li>For the Generalized subtype, the coordinate system has been</li> </ul>	XD - X displacement
changed to V.V. 7 from whi thata wai. The corresponding	DXD - d(X)/dt
changed to X ,Y ,Z from phi, theta, psi. The corresponding	XSF - X stiffness force
lavaScript tags have been modified accordingly	XDF - X damping force
javasenpe tags nave seen moanted accordingly.	XTF - X total force
	YD - Y displacement
	DYD - d(Y)/dt

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FX - X force

### Subsystems

 Support has been added to the Subsystem menu for four new Mass and Inertia sub-types, with 26 new components as shown:



P31 - Principal Directions Row P32 - Principal Directions Row P33 - Principal Directions Row





## JavaScript





#### Memory use in JaDe

 The JavaScript debugger now shows how much garbage collection memory is being used by a script.







- The JavaScript engine now implements the console API (as specified in <u>https://console.spec.whatwg.org</u>) so functions such as console.log(), console.warn() etc are now usable.
- Output is sent to the console window on Windows and the terminal window on Linux.





#### Other JS API changes

- The special encoding comment at the beginning of a script now supports Shift-JIS as an encoding.
- ECMAScript 6 Modules are now supported in T/HIS. Both static and dynamic imports are supported.
- A new function Colour.GetFromName has been added to return a colour value (integer) for a core colour or user colour from its name.





## Search Box





#### Search Box

- Previous versions of T/HIS included a Quick Find button which has now been made more prominent in the form of a search box located on the top bar.
- The existing keyboard shortcut (#) can still be used too.



Oasys T/HIS Q <Search>

M



Save search settings to oa pref file

#### **Contact Information**

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