Hamburger Menu

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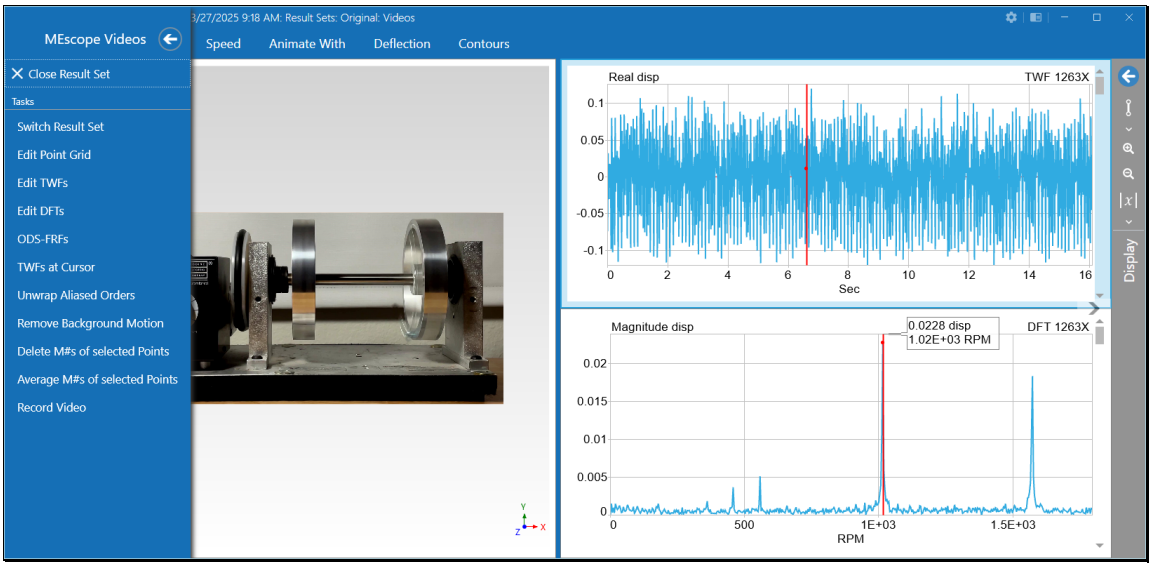
Hamburger Menu

The **Hamburger** menu is located on the ***upper left side*** of the MEscopeVIDEOS window. The **Hamburger** menu contains the **Edit Point Grid**, **Edit TWFs**, and **Edit DFTs Tasks**, which are covered in previous chapters of this manual, but it also contains other **Tasks** which are documented in this chapter.



MEscopeVIDEOS Showing Hamburger Menu on The Left.

Result Sets

The **VTmax** project file in MEscopeVIDEOS can contain ***multiple*** **Result Sets**. A Result Set contains the Point Grid and Data Blocks that were created using some of the commands in MEscopeVIDEOS.

Whenever a new **Point Grid** or Data Block is created, a **new Result Set** is created and added to the currently open **VTmax** project file. When a **Result Set** in the list of **Result Sets** is ***clicked on***, that **Result Set** will open.

Close Result Set

When this **Task** is executed, the currently open **Result Set** is closed, and all the **Results Sets** in the current **VTmax** project are displayed.

Switch Result Set

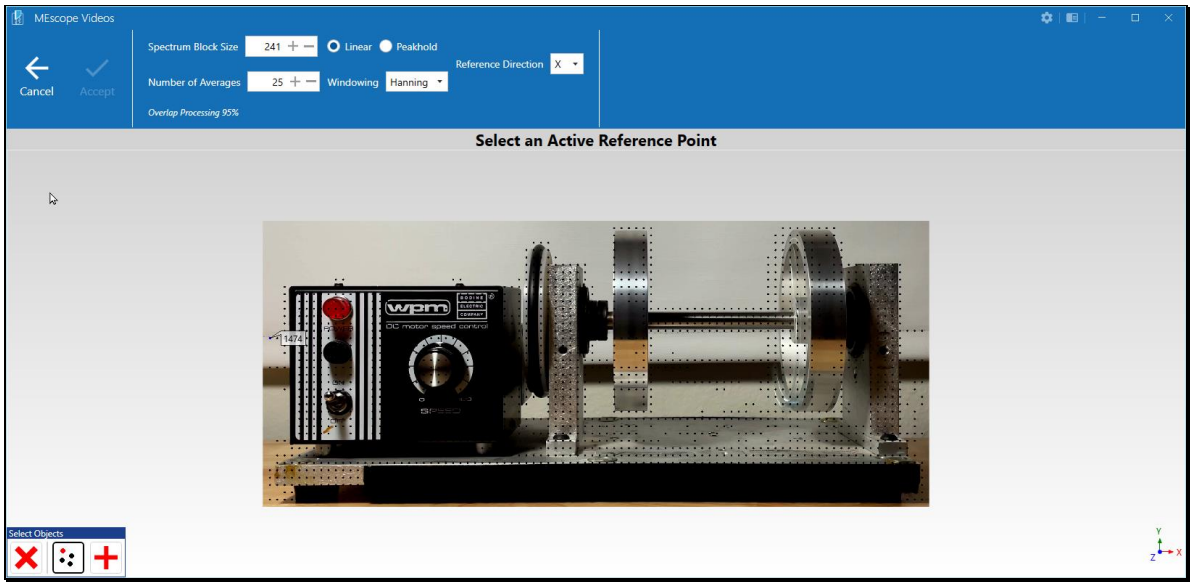
When this **Task** is executed, the list of all the **Results Sets** in the current **VTmax** project is displayed so a different Result Set can be opened by ***clicking*** on it.

ODS-FRFs

This **Task** calculates a set of **ODS-FRFs** from the **TWFs** in the currently open **Result Set.**

- An **ODS-FRF** is calculated from **output-only** data where the excitation forces cannot or are not measured.
- The **magnitude** of an **ODS-FRF** is the square root of the Auto Power Spectrum (**APS**) of a response, and its **phase** is the phase of the Cross Power Spectrum (**XPS**) between the response and a ***reference response***.
- A set of **ODS-FRFs** can always be calculated for the **TWFs** extracted from a video.
- An **ODS-FRF** has a peak at each machine order or frequency of a resonance.
- A set of **ODS-FRFs** can be curve-fit to extract a set of modal parameters, (resonant frequency, damping, and mode shape).
- A set of **ODS-FRFs** can be ***differentiated*** from displacement units to velocity units, thus providing **ODS's** in velocity units.

When this **Task** is executed, the **ODS-FRF** calculation window is opened, as shown below.



***ODS-FRF** Calculation Window*

To calculate **ODS-FRFs**, a reference **point & direction (a reference DOF)** must be chosen, The interactive Point selection box is open in the lower-left corner of the window.

- ***Click*** on a grid point to select an **active reference** point
- Select a **reference direction** (**X** or **Y**) for the reference DOF

Spectrum Averaging

Spectrum averaging in commonly used to remove extraneous noise for the **ODS-FRFs**. Since the FFT is used to calculate APS & XPS estimates from the **TWF** data, several rules apply,

- The **Spectrum Block Size** (Number of Samples) must be **less than one half** the **TWF** Block size
- When the Spectrum Block Size is ***less than half*** of the **TWF** Block Size, spectrum averaging can be performed.
- A **Hanning** window must be applied to each set of **TWF** data used for spectrum averaging to ***reduce leakage*** surrounding each resonance peak.
- A **Flat Top** window can be applied to each set of **TWF** data used for spectrum averaging to ***widen*** each resonance peak and make its ***peak value more accurate***

Overlap Processing

To get the maximum number of spectrum averages from the **TWF** data, overlap processing is used to calculate each new spectrum average. This can be done up to an overlap percentage of **95%**, meaning that **5%** new samples of **TWF** data are sued for each new spectrum average.

Linear vs Peak Hold Averaging

- **Linear** averaging sums all the spectrum averages together and divides by the number of spectra
- **Peak Hold** averaging saves the maximum magnitude of each spectrum average at each frequency

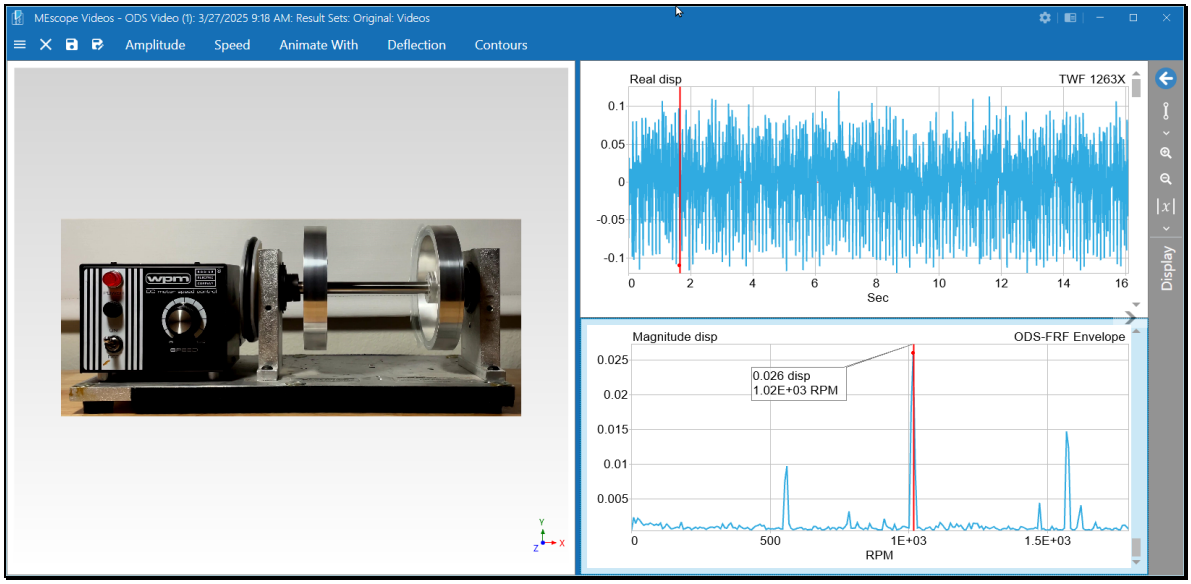
Linear spectrum averaging is commonly used to calculate **ODS-FRFs**.

Accept Button

When the parameters have been chosen for calculating the **ODS-FRF**s.

- ***Press*** the **Accept** button

When the **ODS-FRFs** have been calculated, the **Point Grid**, and the **TWF** & **ODS-FRF** Data Blocks are saved in a **new Result Set** and displayed together, as shown below.



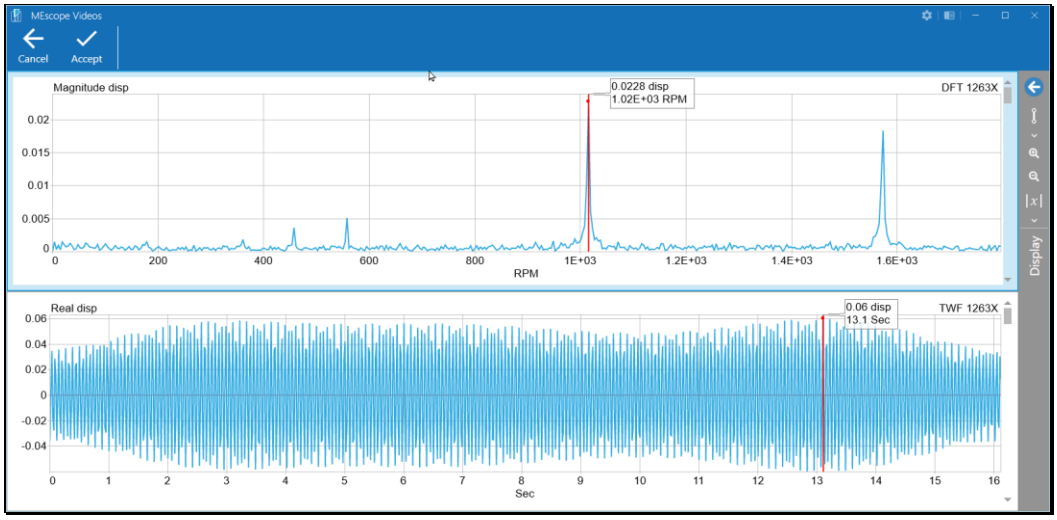
***ODS-FRF** Data Block Displayed on Lower-Right.*

TWFs at Cursor

When this **Task** is executed, a new window will open, as shown below. The ***upper display*** shows the **DFT** (or **ODS-FRF**) Data Block, and the lower display shows the **TWFs** at the cursor position in the upper display.

The **TWFs** are calculated as the **Inverse FFT** of the data at **Line** or **Peak** cursor, or in the band of **Band** cursor.

- ***Click & drag*** the cursor in the ***upper display*** to show the **TWFs** in the ***lower display***



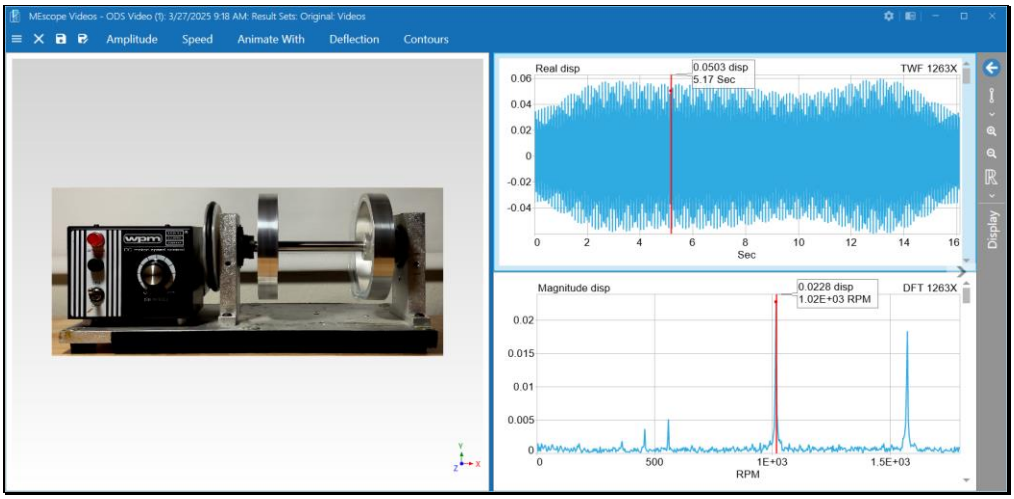
TWFs at Cursor Window.

Accept Button

To save the **TWFS at the cursor** in a new Result Set,

- ***Press*** the **Accept** Button

The **ODS** animation will resume with sweep animation through the newly calculated **TWFs** at the cursor, as shown below.



Sweep Animation Through TWFs at the Cursor

Unwrap Aliased Orders

Unlike an **FFT** analyzer or a digital data acquisition, no anti-aliasing filters can be applied to a video before it is recorded.

Since anti-aliasing filters are not applied to a video recording, all frequencies between **Fmax** (one half of the **fps** recording rate of the video), and **2 x Fmax**, (the **fps** recording rate of the video) are folded back around Fmax, and appear as peaks in the **DFTs** or **ODS-FRFs.**

Machine Orders

In a video recording of a rotating machine, its **DFTs** will typically have a large peak at its running speed (in RPM). This is called the First Order. Depending on the frequency span of the **DFTs**, more peaks will appear at 2x, 3x, etc. of the first order. These are called the second order, third order, etc.

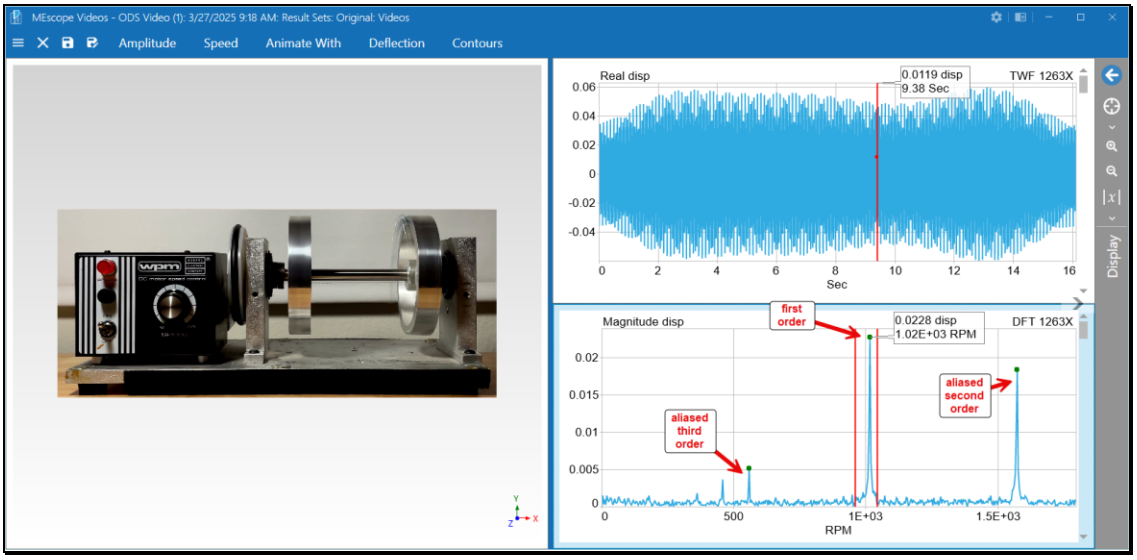
If the higher orders of a machine are at frequencies between Fmax and 2 Fmax, those frequencies will fold around Fmax and appear as lower frequency peaks in the DFTs.

Aliased Orders

If the cursor is positioned on the first order of a machine, all its aliased orders will be displayed with **red dots** on them.

- Turn on the **Peak** cursor on the **DFTs**
- Turn **Aliased Orders On**

The aliased order peaks will be displayed with **red dots**, as shown below.



*Rotating Machine **DFT** Showing First Three Orders.*

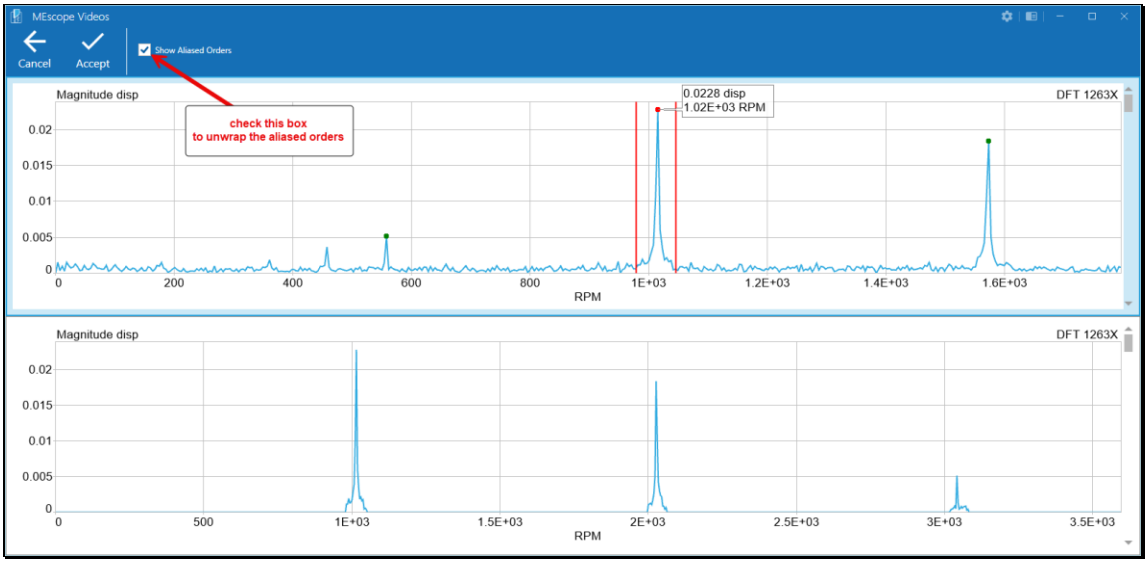
Since the first order is at **1020 RPM**, the second order should be at **2040 RPM** and the third order at **3060 RPM**. Both the second and third orders are in the frequency span **1800 - 3600 RPM**. Therefore, the **DFTs** can be unwrapped to show these two higher orders at their correct frequencies.

- ***Press*** Unwrap Aliased Orders

The Aliased Orders window will be displayed as shown below.

Show Aliased Orders Box

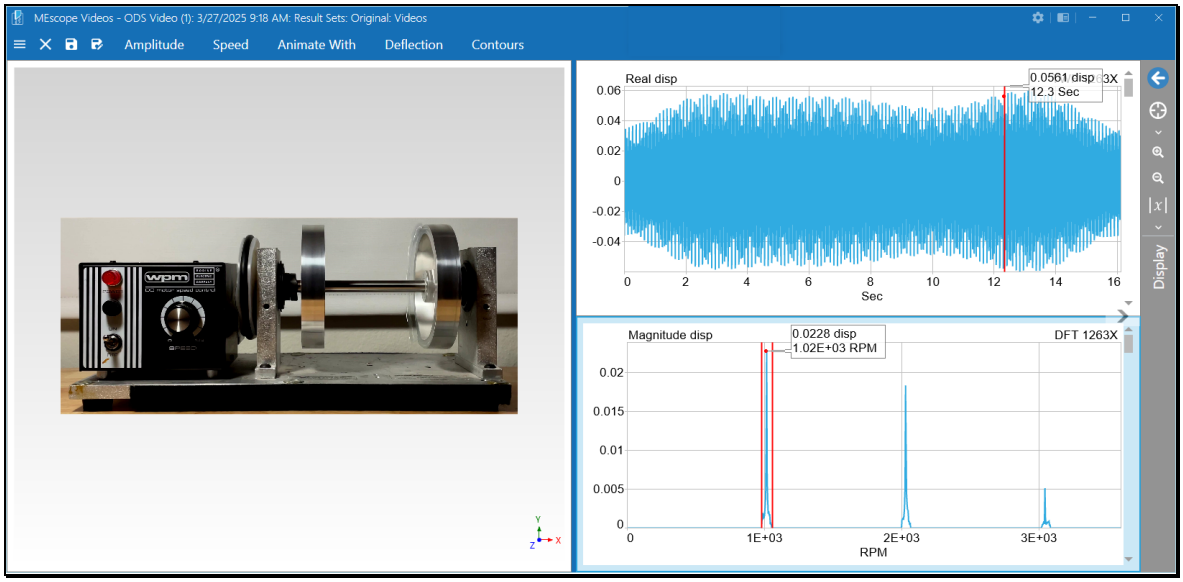
- ***Check*** the **Show Aliased Orders** box to display the Unwrapped Orders.



Unwrapped Aliased Orders

Accept Button

- ***Press*** the **Accept** button to create a **new Result Set** with a **DFT** Data Block of unwrapped orders as shown below.



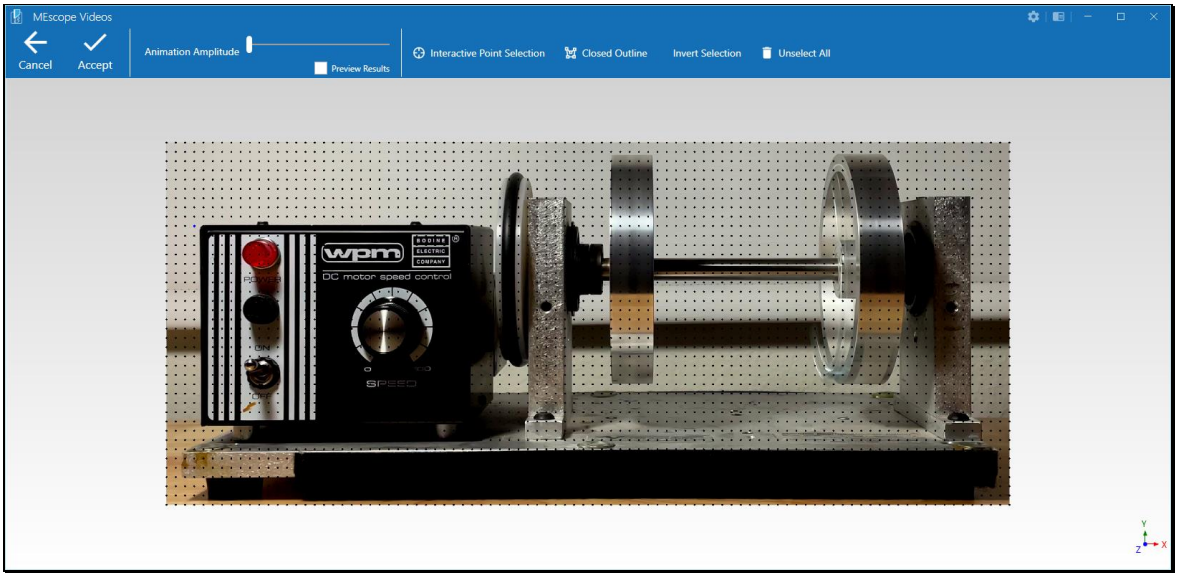
New Result Set Showing Unwrapped Orders.

Remove Background Motion

This **Task** is used to remove background motion captured in a video. It removes background motion by ***averaging together*** the X & Y data of the **M#s** linked to each of the ***selected*** **grid points** and ***subtracting that average motion*** from all the **TWFs** in the **TWF** Data Block.

If the **TWFs** linked to the ***selected*** points contain the same background motion, those **TWFs** will contain ***essentially no motion*** after the **Accept** button is ***pressed*** in this **Task**, and all the other points will have the average background motion subtracted from their linked **TWFs**.

When this **Task** is executed, the following window is opened



Remove Background Motion Command.

Preview Results

- ***Check*** the **Preview Results** box to start the **ODS** animation from the ***active*** **TWF** or **DFT** Data Block.

Animation Amplitude

- Slide the **Animation Amplitude** bar ***to the right*** to increase the animation amplitude so that the motion of all the points in the **Point Grid** is clearly visible

Interactive Point Selection

When this button is ***depressed,*** the **Interactive Point Selection** box is displayed in the ***lower-left corner*** of the window. Using the controls in the box, ***select*** all the background points to have their X & Y motion averaged together.

Closed Outline

When this button is ***depressed***, you can draw a closed polygon around the background points to select them.

Invert Selection

When it is easier to select all the points on the test article that you wish to retain the motion of, this function can be used to ***select*** points on the test article and then invert the selection to ***select*** the background points.

Unselect All

This function is used to start the background point selection process over again.

- ***Press*** this button to unselect all the points in the **Point Grid**

Remove M#s of Selected Points

This **Task** removes the **TWFs** and **DFTs** that are linked to ***selected*** grid points from their respective Data Blocks.

It requires that you ***select*** points using the same controls as the **Remove Background Points Task**, but it only deletes the **TWFs** and **DFTs** that are linked to the ***selected*** points in the **Point Grid**. By removing the **TWFs** and **DFTs** linked to the ***selected*** points, the number of **M#s** in those Data Blocks is reduced, making it easier to work only the **M#s** linked to the remaining points of interest.

When all the **TWFs** and **DFTs** linked to ***selected*** grid points are removed, those points will no longer be deflected during **ODS** animation.

Refer to the **Remove Background Points Task** for instructions on using this **Task**.

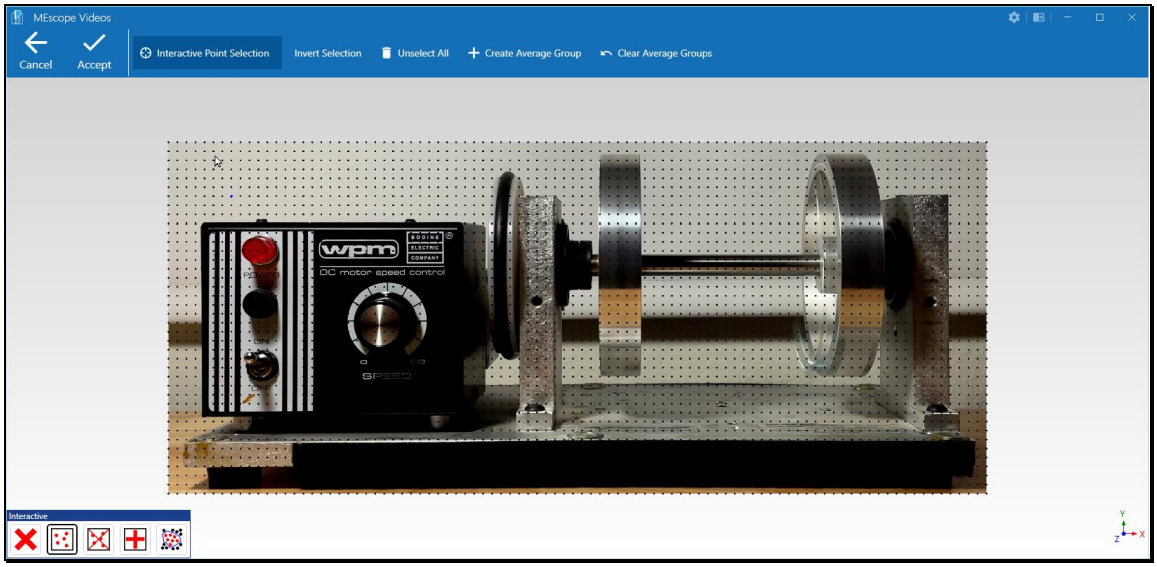
Average M#s of Selected Points

This **Task** allows you to calculate the average motion of multiple groups of ***selected*** points in the **Point Grid** and replace their motion with the average motion.

This Task requires that you ***select*** points using the same controls as the **Remove Background Points Task** but only replaces the motion in each group of ***selected*** points with the ***average motion*** of each group of points.

Refer to the **Remove Background Points Task** for instructions on selecting grid points.

When this **Task** is executed, the following window is opened.



*Average **M#s** of Selected Points Window.*

Interactive Point Selection

Refer to the **Remove Background Points Task** for details.

Invert Selection

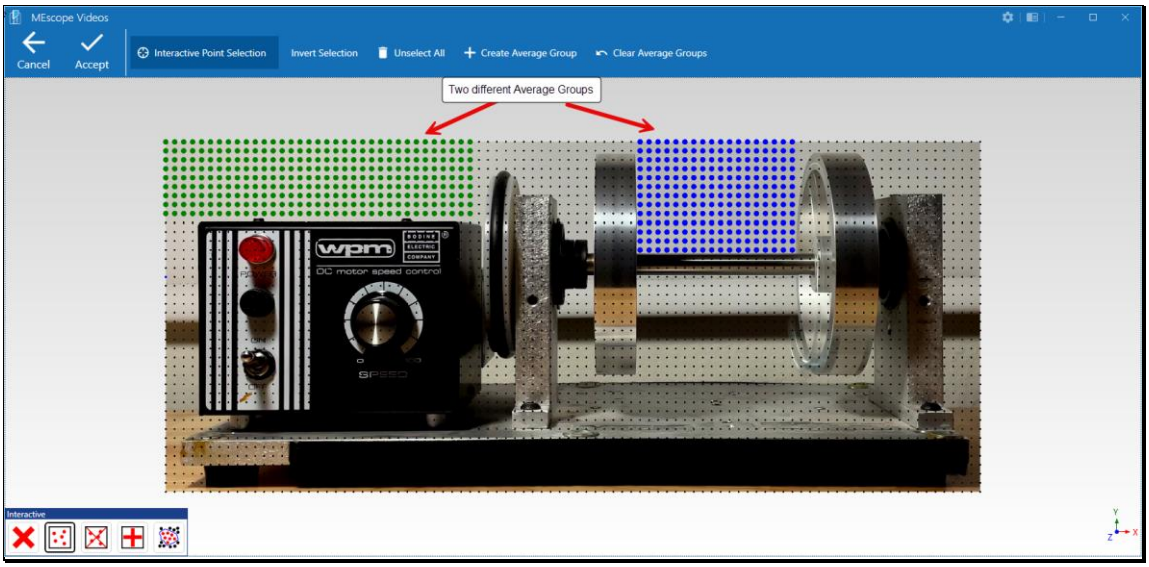
Refer to the **Remove Background Points Task** for details.

Unselect All

Refer to the **Remove Background Points Task** for details.

Create Average Group

After some points are selected, clicking on the command will change the color of the selected points and display them using larger dots. Two Average Groups are shown below.



Two Average Groups of Selected Points.

Clear All Average Groups

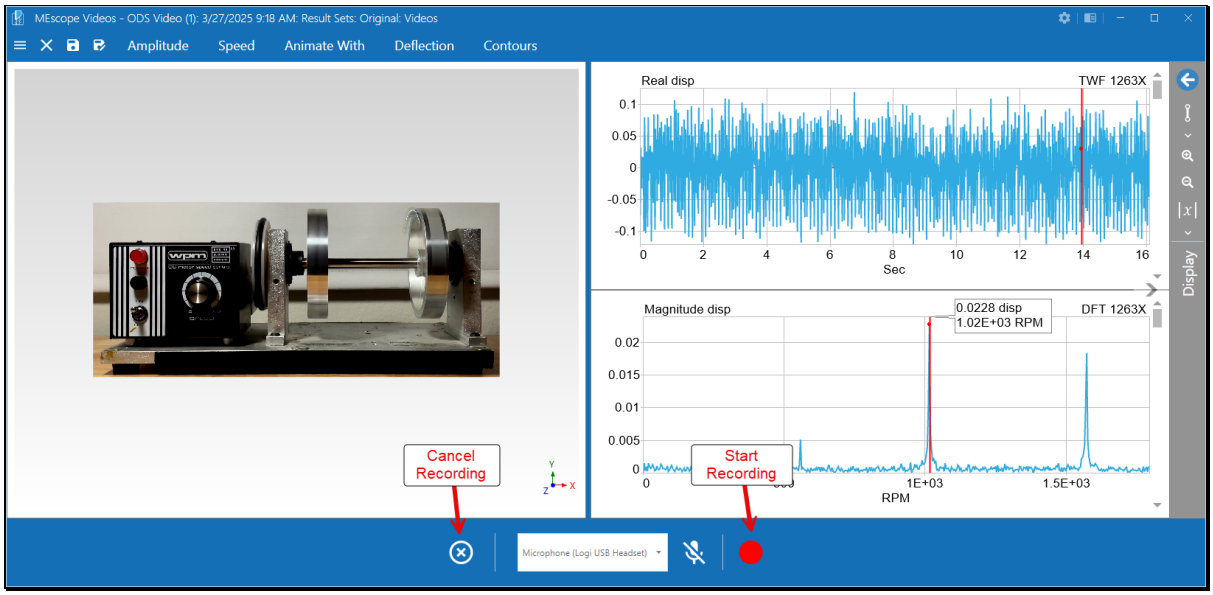
Clears all the **Average Groups** from being used by this **Task**.

Accept Button

When this button is ***pressed***, all the X & Y motion of the **M#s** linking to the points in each **Average Group** are averaged together and the X & Y motion for each point is replaced with the average motion of the group.

Record Video

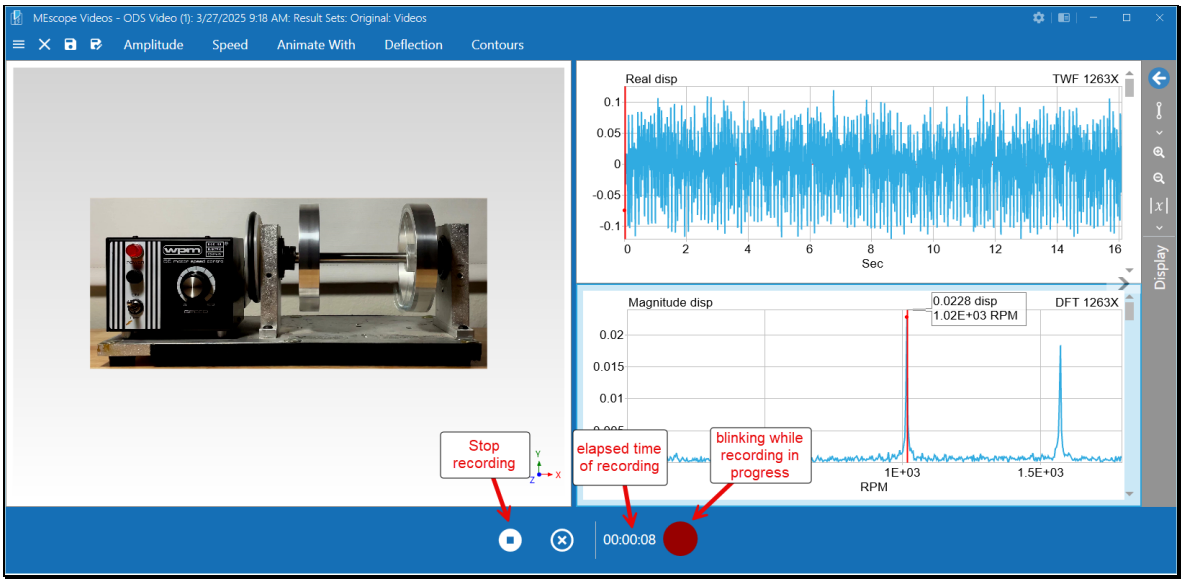
When this **Task** is executed, recording controls are displayed ***at the bottom*** of the MEscopeVIDEOS window, as shown below.



Record Video Controls

Start Recording Button

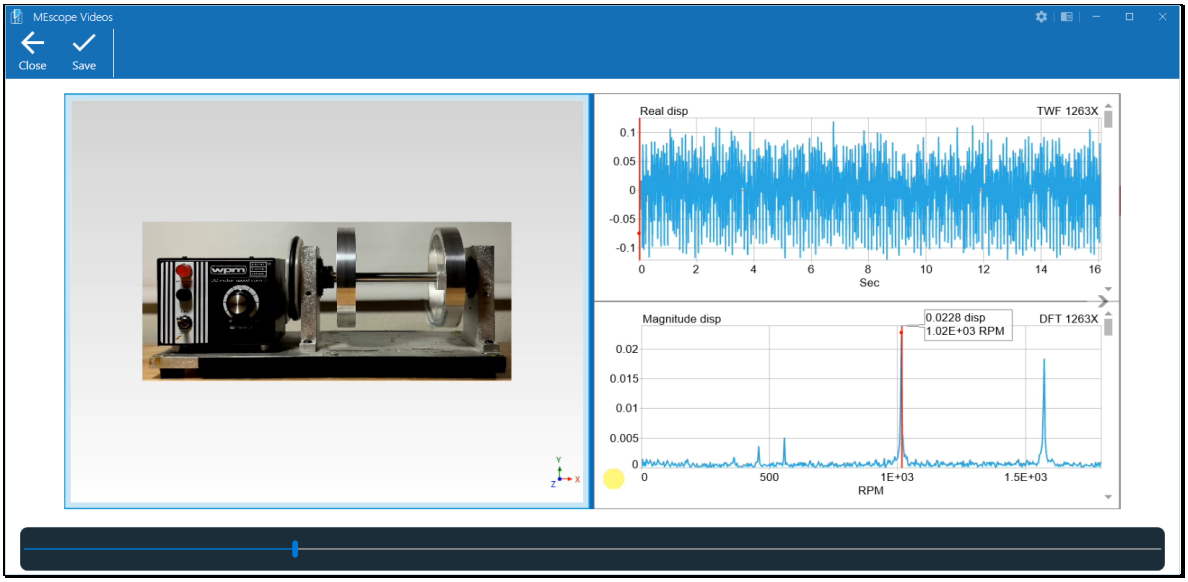
When the ***red button*** is ***pressed***, recording of a video of the MEscopeVIDEOS window will begin, and the controls ***at the bottom*** of the window are replaced with new controls, as shown below.



Controls During a Video Recording.

Stop Recording Button

When the **stop recording** button is ***pressed***, recording of the video is stopped and the video is played back in a new window, as shown below.



Video Playback Window.

Save Button

When the **Save** button is ***pressed***, the Windows **Save As** file dialog box will open, allowing you to save the video recording in MP4 file format on your computer.

Close Button

- ***Press*** the **Close** button to return to **ODS** animation in the MEscopeVIDEOS window.

Reprocess Raw Video

This Task will appear in the Hamburger menu when the raw video is still available from the same location where it was originally stored on your computer. When this Task is executed, MEscopeVIDEOS will open the Video Wizard and you an reprocess the raw video over again.