iMS Studio Application Overview

Version > 1.3.1.3056

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Overview

This document provides a comprehensive rundown of the features available in the iMS Studio application and best practices.

Note: The iMS Studio application is NOT compatible with the iVSL/iVSA voltage-controlled synthesiser range.

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1 Device Connection

When starting the application, confirming Isomet digital synthesiser connection is the first step. The Isomet digital synthesiser must be powered on and connected before the iMS Studio software is launched. There are two quick methods for confirming this:

1. Check for populated tabs

   Upon opening the application, one quick way to confirm that the Isomet digital synthesiser has connected is to check the available tabs on the right-hand side of the application.

Connected	✓	Calibration Signal Path Clock Gen Player Configuration Sync Data Compensation
Not Connected	✗	Compensation

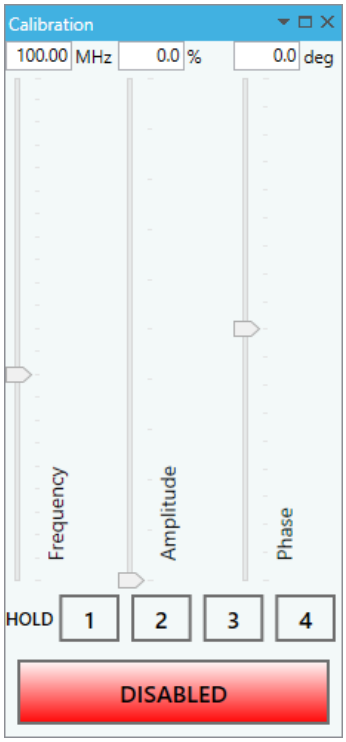
2. Hardware Console

   The Hardware Console is located at the bottom left of the application and can be used to view confirmation of interactions between the software and connected hardware. If the Isomet digital synthesiser is successfully connected, then you will see something resembling the following lines:

```
[7]: Scanning for connected iMS Systems. Please wait. . . .
[8]: Scan returned 1 systems.
[9]: Connected to iMS System iMSP2404:192.168.1.217
```

With no Isomet digital synthesiser connected, the application exposes only functions for the creation and editing of data files.

2 Calibration Mode



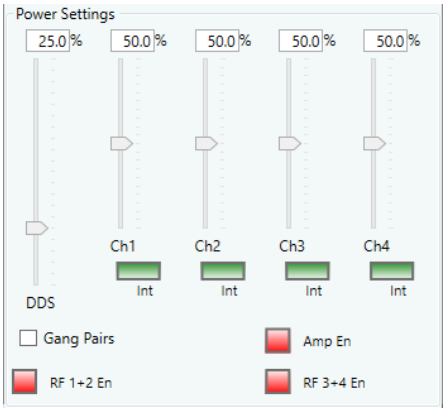
The Calibration tab on the right-hand side of the application provides the most fundamental control over the Isomet digital synthesiser. Users can set frequency, amplitude and phase data for all available channels.

A hold option is provided to allow users to lock the current settings for any channel, thereby allowing separate tones to be set on each channel.

3 Signal Path

Isomet digital synthesisers have a range of signal-conditioning options that can be used to produce the optimum RF output.

3.1 RF Power Settings



The RF Power Settings section controls the Isomet digital synthesiser RF output level and enable states. The DDS Power control sets the overall RF drive level generated by the DDS device. The channel wiper controls set the RF level for each output channel or channel pair, depending on the connected Isomet digital synthesiser configuration.

Channel wipers can use one of two modulation sources. The source is selected using the green button below each channel:

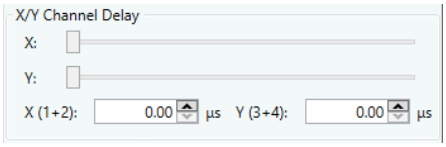
1. Internal (Int)
   Uses the onboard adjustable potentiometer connected to the channel wiper to control the RF level for that channel.
2. External (Ext)
   Uses the external modulation input for that channel. Refer to the product manual for pinout details.

Note: Some older models do not support individual channel modulation.

Control	Function
Gang Pairs	Links channels 1+2 and 3+4 so each pair shares the same value.
Amp En	Enables or disables the RF amplifier output.
RF 1+2 En	Enables or disables RF output for channels 1 and 2.
RF 3+4 En	Enables or disables RF output for channels 3 and 4.

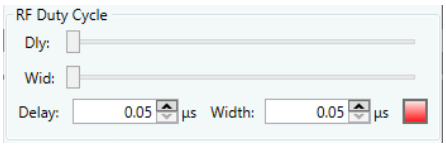
Note: Amplifier enable is required for iMS devices connected to RFA Amplifiers and iCSA devices producing RF power > 7W.

3.2 Channel Delay



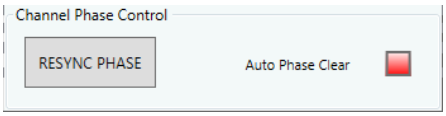
The channel delay control offsets the timing of one RF channel or channel pair relative to another. Its primary use case is X/Y deflector operation, where the acoustic response of the two axes may need to be time-aligned. It can also account for timing differences introduced by the acousto-optic device, RF cabling, or amplifier path.

3.3 Duty Cycled



The duty cycled control enables pulsed RF operation instead of continuous RF output. It defines the proportion of each cycle for which the RF output is active. Typical use cases include pulsed optical output, reduced average RF power, reduced heat loading, and synchronised output windows.

3.4 Channel Phase Synchronisation



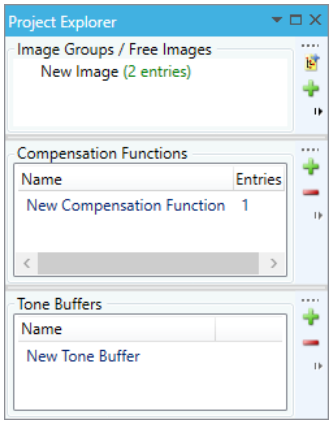
The channel phase synchronisation controls manage the phase relationship between RF output channels. This is used in applications where multiple channels must maintain a known phase relationship, such as multi-axis acousto-optic systems or phase-sensitive optical setups. The iMS Studio application provides the following options:

1. RESYNC PHASE
   Carries out a single phase resync when pressed.
2. Auto Phase Clear
   Configures the device to carry out periodic phase resyncs.

   Note: This will impact the maximum playback speed.

4 Project Explorer

The project explorer shows all the Image files, image groups, Compensation tables, and Tone buffers that are in the project. It allows for the creation, renaming and deletion of each type of file.



Note: Image groups include a sequence by default however sequences cannot be played from the application at this time.

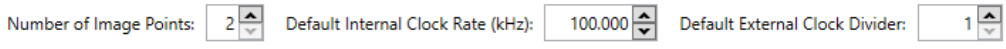
5 Image Mode

Images are central to the Isomet digital synthesiser product range. Images are made up of a collection of data points known as FAPs (**F**requency, **A**mplitude and **P**hase), as well as one digital and two analogue sync values. The data within an image point is played simultaneously, and the Isomet digital synthesiser progresses through the points at the specified clock rate. Images can be created with sequential or random patterns.

5.1 Creating and deleting an image

Images can be created and deleted using the ✚ & ▬ buttons in the Project Explorer. Selecting an image opens it in the main window. A standard image comprises four frequency, amplitude and phase points, one per channel, as well as a digital sync bit and two analogue sync values at each point. Together, these values comprise a single image point (row). For single- or dual-output devices, only the relevant channels need to be used; for example, for a single-channel device, only channel 1 needs to be populated.

At the bottom of the main editing window, you will see 3 controls when editing an image. These are specification of the number of image points, clock rate (ignored if using clock Gen, or external clock), and the default external clock divider.



The maximum number of points is Isomet digital synthesiser-specific and depends on the memory available. See the product datasheet for memory capacity. The iMS Studio application is capable of creating images in excess of one million points.

The maximum clock rate is also determined by the Isomet digital synthesiser's capabilities, with the majority capable of more than 2.9 GHz.

5.2 Creating an image group

Image groups are a container that is used to group multiple images together. This is particularly useful when creating image sequences. Image groups can be created using the & buttons.

While sequences can be designed in iMS studio there is currently no way to play a sequence using the application. Only individual images can be selected and played from the iMS Studio application.

5.3 Renaming an image or group

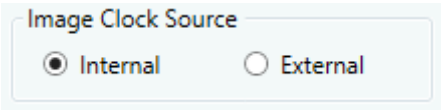
Images and groups can be renamed by double clicking in the current name.

Note: Take care, as clicking and dragging will copy the selected image.

6 Player Configuration

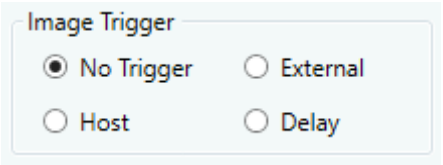
Player Configuration controls how an image is played by the Isomet digital synthesiser. It defines the clock source, trigger behaviour, repeat settings, delay timing, compensation use and frequency resolution.

6.1 Clock Source



source	Description
Internal	Uses the image clock rate set in iMS Studio.
External	Uses an external clock input to advance image points.

6.2 Trigger source



source	Description
No Trigger	Starts playback without waiting for a trigger.
External	Starts playback from an external trigger input.
Host	Starts playback from the software host control.
Delay	Starts playback after a configured trigger delay.

6.3 Image repeats

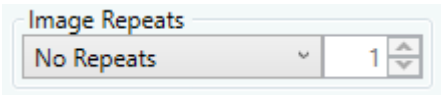
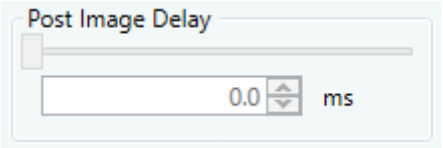


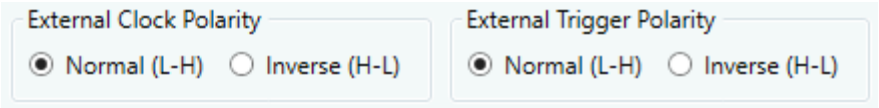
Image repeats sets how many times the selected image is played. It is used for single-pass playback, fixed repeat counts, or continuous repeated output.

6.4 Post image Delay



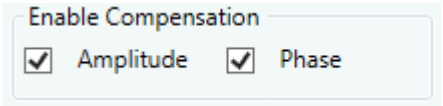
Post image delay adds a delay after an image finishes before the next repeat or playback action begins. It is used to create a controlled gap between image outputs.

6.5 Clock & trigger polarity



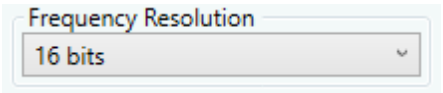
Clock and trigger polarity controls set the active edge or logic sense for clock and trigger inputs. They are used to match the synthesiser inputs to the connected timing source.

6.6 Compensation Enable



Compensation Enable controls whether loaded compensation data is applied during image playback. It is used when a compensation LUT should modify amplitude, phase, or sync output values.

6.7 Frequency Resolution



Frequency Resolution selects the frequency resolution used during image playback. Frequency values are quantised according to the selected resolution, allowing playback precision to be matched to the connected Isomet digital synthesiser hardware and the image memory requirements of the application.

Setting	Description
16 bits	Uses 16-bit frequency resolution.
24 bits	Uses 24-bit frequency resolution.
32 bits	Uses 32-bit frequency resolution.

Note: Only resolutions supported by the connected Isomet digital synthesiser hardware are displayed.

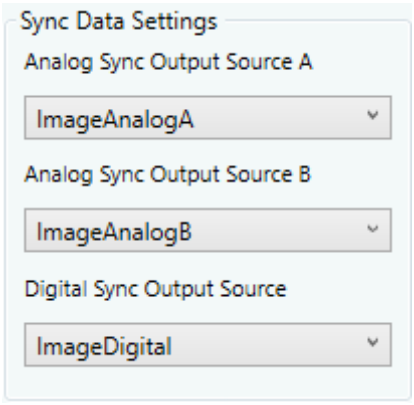
Note: Higher frequency resolutions provide finer frequency control but increase the amount of image data that must be stored and transferred.

7 Synchronous Data

The Sync Data tab configures analogue and digital synchronisation outputs generated by the Isomet digital synthesiser. These outputs may be used to monitor internal signal parameters, observe image playback data, or provide synchronisation signals for external equipment such as oscilloscopes, cameras, data acquisition systems and motion controllers.

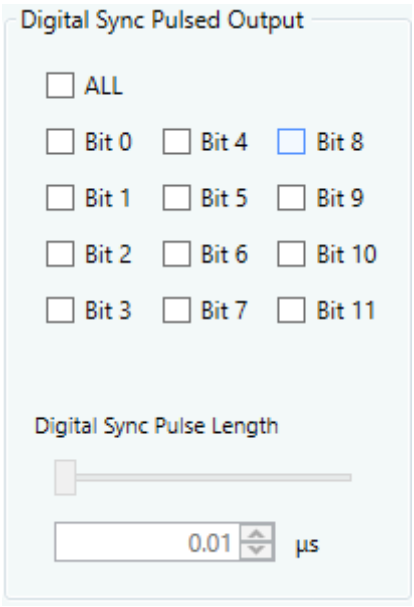
Synchronization outputs can be sourced from channel frequency, amplitude, phase, compensation lookup data, or image playback data.

7.1 Sync Output Source



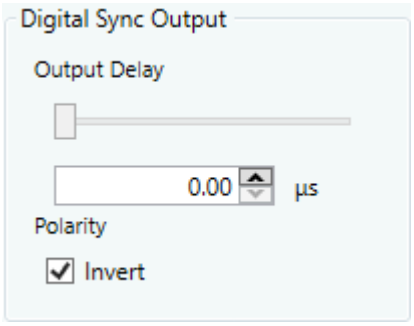
Source	Description
FrequencyChx	Frequency value of Channel x.
AmplitudeChx	Compensated amplitude value of Channel x.
AmplitudePreCompChx	Uncompensated amplitude value of Channel x.
PhaseChx	Phase value of Channel x.
LookupFieldChx	Compensation lookup table output associated with Channel x.
ImageAnalogA	Analog A value from image playback data.
ImageAnalogB	Analog B value from image playback data.
ImageDigital	Digital value from image playback data.

7.2 Digital Sync Pulsed Output



Determines which digital synchronization outputs generate pulses rather than continuous logic levels. When pulse mode is enabled, the selected output generates a pulse of configurable duration whenever the selected synchronization event occurs.

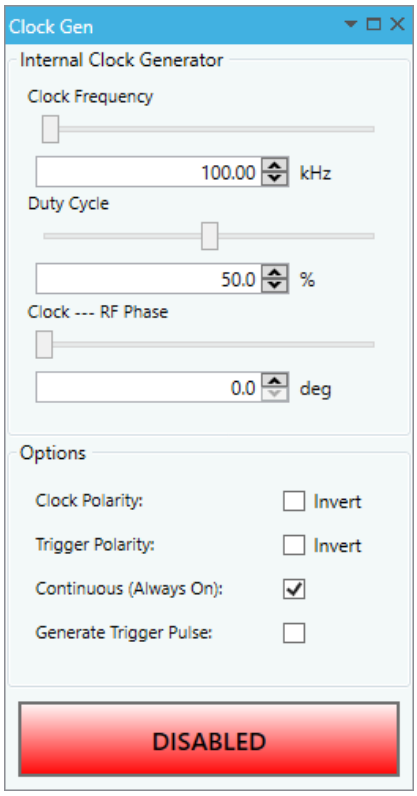
7.3 Sync digital Output Delay and Polarity



Output Delay adds a programmable delay between the synchronization event and the digital output signal.

Polarity Controls the active polarity of digital synchronization outputs.

8 Clock Gen



Several Isomet digital synthesisers offer the ability to generate and output a clock and trigger signal for synchronising external devices.

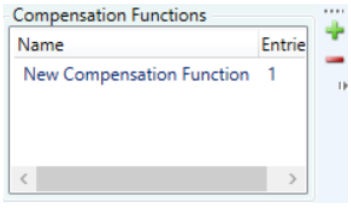
The Clock generator tab allows control over this process with options for output polarity, duty cycle and phase offset (from RF phase).

Note: Enabling Clock generation will ignore any external clock and any image specific clock settings.

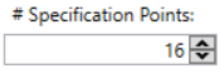
9 Compensation Functions

Compensation tables are central to producing uniform AO scans. Compensation tables are structured around frequency. The tables hold per frequency values for amplitude, phase, digital sync, and analogue sync. The main use case for compensation is to accounts for non-linearities in the amplifiers and Acousto-optic device ensuring a consistent deflection across scans.

9.1 Creating a compensation table



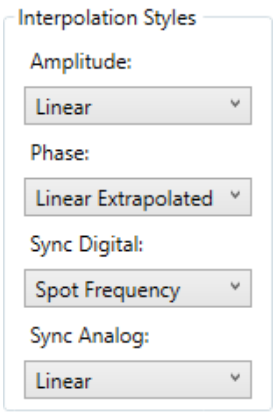
Compensation tables can be created and deleted using the ➕ & ➖ buttons in the project explorer. Selecting a compensation table will open it in the main window.



On the right-hand side of the main window the user can select the number of specification points (frequency specific points) to include in the table. In general, 16 points are more than sufficient for most applications.

To aid tuning, you can enable the calibration tone output and then select a row in the compensation table. Each time a row is selected, its values will update the calibration values, meaning that the value can be seen at the output of the synthesiser and the flatness of the acousto-optic device can be assessed.

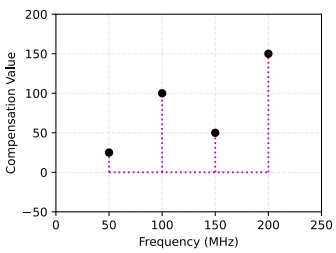
9.2 Interpolation styles



There are 5 interpolation styles available when exporting compensation tables that can be applied to each variable. On the right hand side of the main window there are several selection boxes allowing the selection of an interpolation type for each control value.

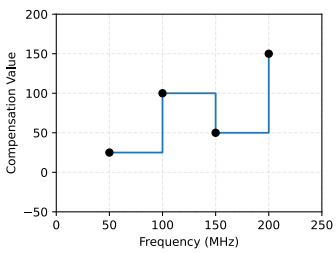
Note: It is recommended to start with 'Linear' and change if necessary.

1. SPOT



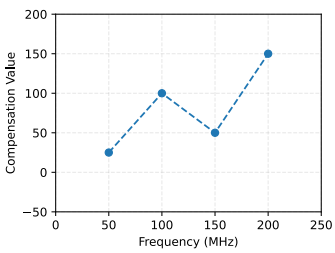
Value is applied only at the exact specified frequency. All other frequencies remain unchanged.

2. STEPPED



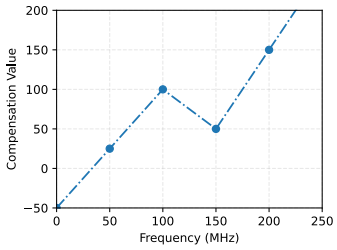
Value applies at or above the specified frequency until the next control point becomes valid (zero-order hold).

3. LINEAR



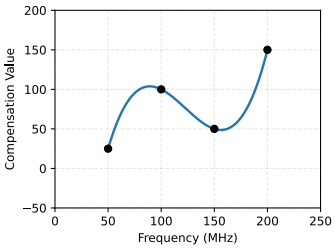
Linear interpolation between points. Endpoint extrapolation is constant (value is held outside the range).

4. LINEAR EXTRAPOLATED



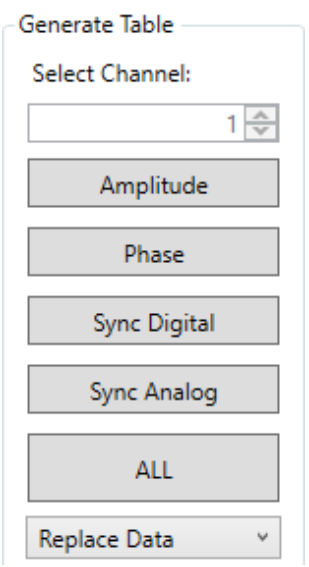
Linear interpolation between points. Extrapolation beyond endpoints continues the end slopes.

5. CUBIC B-SPLINE



Cubic B-spline interpolation uses all points to generate a smooth curve throughout the entire range.

9.3 Generating LUTs



In order to apply compensation to an Isomet digital synthesiser's output, it must first be generated as a LUT. There are two types of LUT within the iMS SDK:

1. Global LUT
   A Global LUT is a file containing one compensation table that applies to all channels.
2. Channel Scoped LUT
   A channel-scoped LUT is a file that contains a compensation table for each output channel.

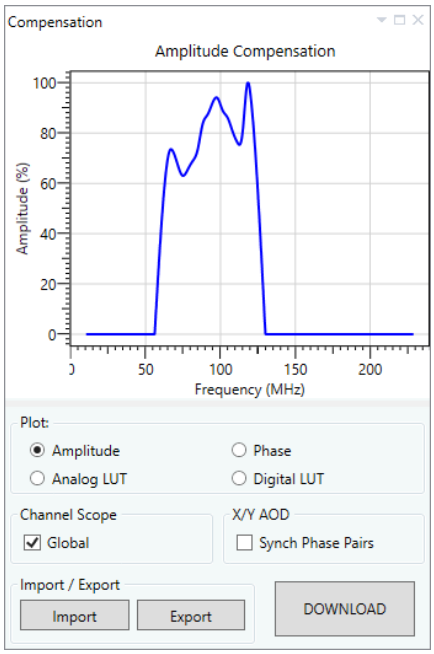
By default, the iMS Studio application is configured for global LUT. The generate table section allows each compensation value to be passed to the compensation tab for use.

If compensation is channel scoped, then a channel must be selected as the target. The user can then select Amplitude, Phase, Sync Digital, Sync Analogue, All, or any combination of them and the data will be applied to the compensation tab.

There are 2 application methods available when generating a Look up table:

1. Replace All Data
   This overwrites any data currently held with the new data.
2. Multiply By
   Multiplies the current data by the new data.

9.4 Compensation tab



The Compensation tab, located on the right-hand side of the application, is where compensation LUTs are generated, imported, exported and downloaded to the Isomet digital synthesiser.

Plot

The tab provides plot of the compensation table values. Selecting one of the options in the 'Plot' section will display those values in the graph.

Channel Scope

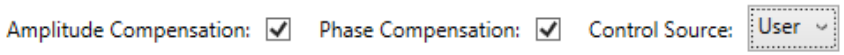
Allows control over the current LUT's scope: global or per-channel.

X/Y AOD

Applies the same phase compensation to channels 1–2 and 3–4, keeping both channel pairs phase-matched for dual-axis deflector operation.

10 Tone Buffers

Tone buffers are a point-by-point playback method that can store up to 256 predefined four-channel RF tones, allowing the Isomet digital synthesiser to instantly switch between them without requiring image playback. Each point in a tone buffer is made up of a frequency, amplitude and phase point per channel.



There are three controls at the bottom of the page. The first two allow phase and/or amplitude compensation to be disabled so that it does not affect the tone buffer output. The Source Control option allows the user to select the control source that will select the active tone.

source	Points	Description
User	256	Tone selected in the iMS Studio Application
External	128	Tone selected using binary logic on profile pins 1-4
Extended External	256	Tone selected using binary logic on profile pins 1-4 + GPIO 1-4

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