



LOGIQ™ Techniques

Contrast Enhanced Ultrasound

The LOGIQ E10 Series is designed for compatibility with most commercially available ultrasound contrast agents. Availability of these agents is subject to government regulation and approval. Contrast imaging should be performed within the approved indications for use of the contrast agent used in the exam.

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The purpose of this guide is to introduce users to Contrast Enhanced Ultrasound on the LOGIQ™ E10 series. This guide will review the user interface, CEUS parameters, and system set up for performing contrast exams.

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Getting Started

Press contrast on Console

Digital TGC should be down center



If necessary, to change the contrast gain use the B rotary Gain control to provide a slight background visual brightness

The monitor will display a dual image with Low MI B-Mode Reference Image on the left and the contrast image on the right.



Contrast Imaging Acquisition

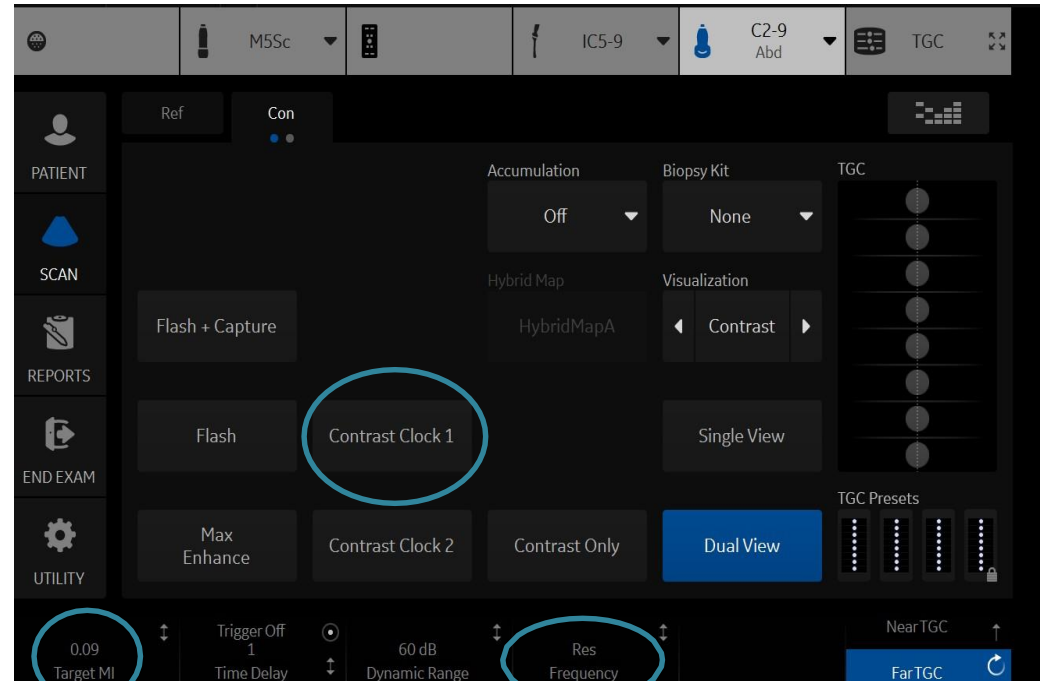
Consider a non-injection practice scan prior to agent administration: Identify a good acoustic window, scan parallel to lesion avoiding out of plane imaging, keep lesion as close as possible to transducer, and ask patient to breathe as lightly or shallow as possible during acquisition keeping lesion in view.

Administer contrast per manufacturer packaging instructions

- ✓ At the end of injection, select Contrast Clock 1 on the Touch panel
- ✓ Press Mark Cine Key at bottom of trackball key to start cine acquisition
- ✓ Press Print Key to end acquisition and save clip.



During cine acquisition, do not attempt to switch to another mode or probe. This will stop cine acquisition



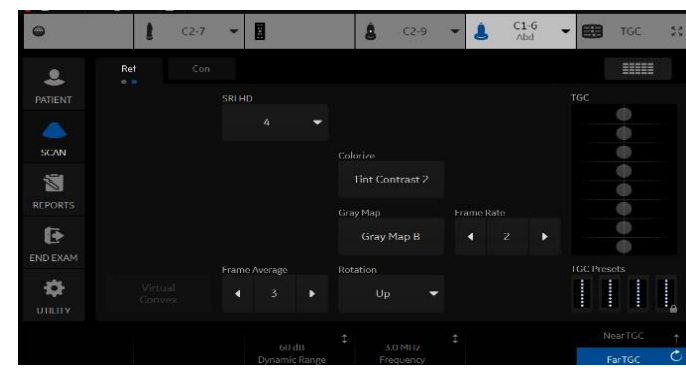
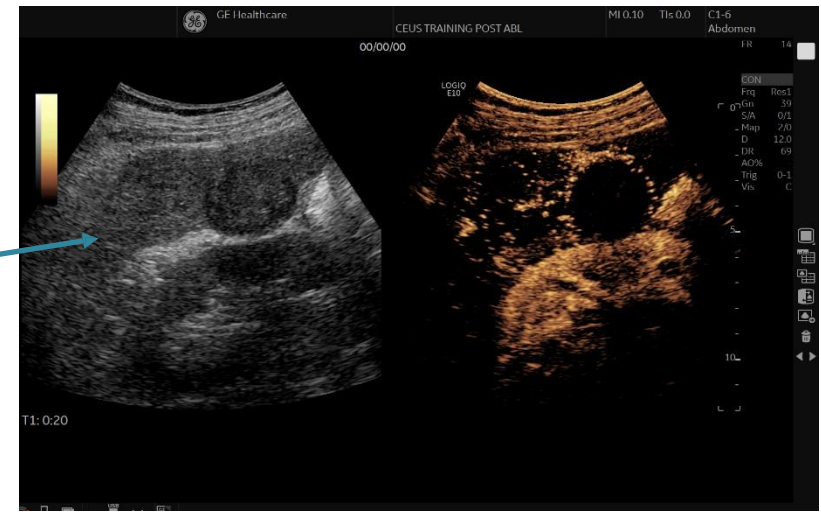
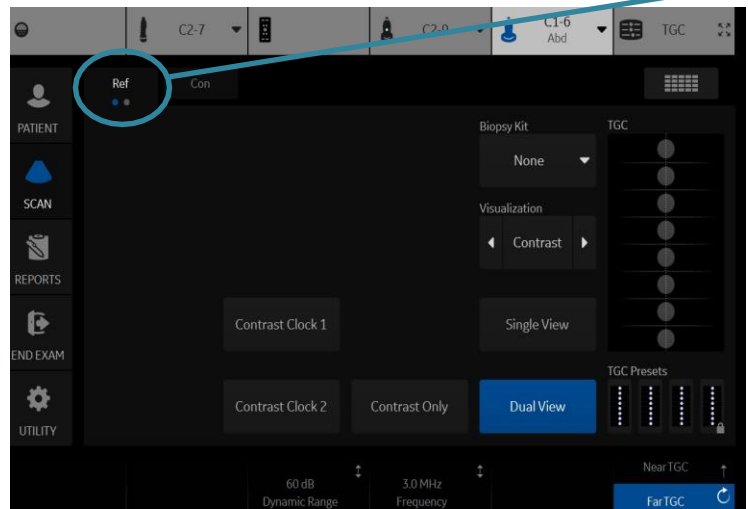
To change MI

To change Frequency

Note: Print key configurations can be set up specific to a customer's workflow. See Page 7, 11 and 12

Contrast Imaging User Interface

Press 'Con' or 'Ref' Button to adjust contrast or reference image parameters

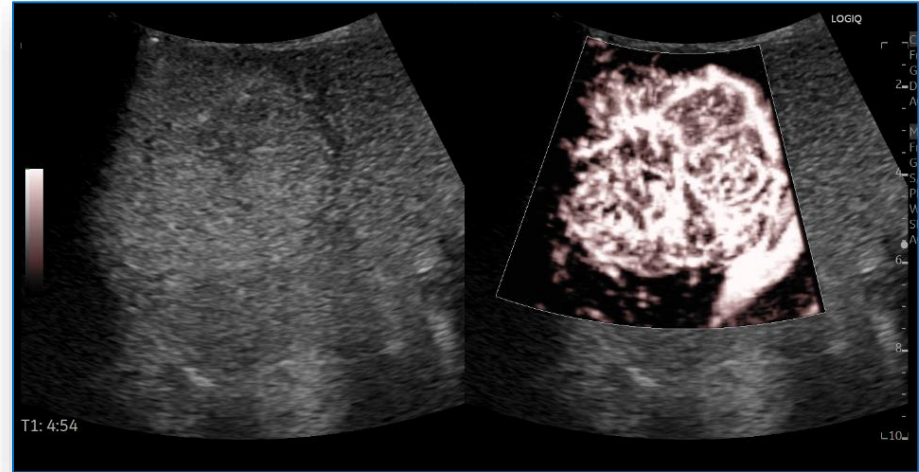
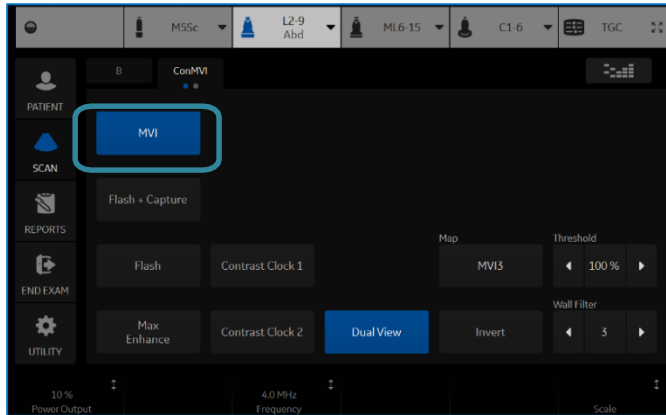


Note: Swipe to see additional parameters on 2nd page

Contrast Imaging User Interface- MVI

Provides user with an additional feature to assess perfusion through a lesion with higher spatial resolution and sensitivity

- While in Contrast package, select MVI on touch panel
- Contrast MVI Map, Frequency and Scale can be adjusted as needed
- Flash, Flash + Capture, Max Enhance are available in contrast MVI

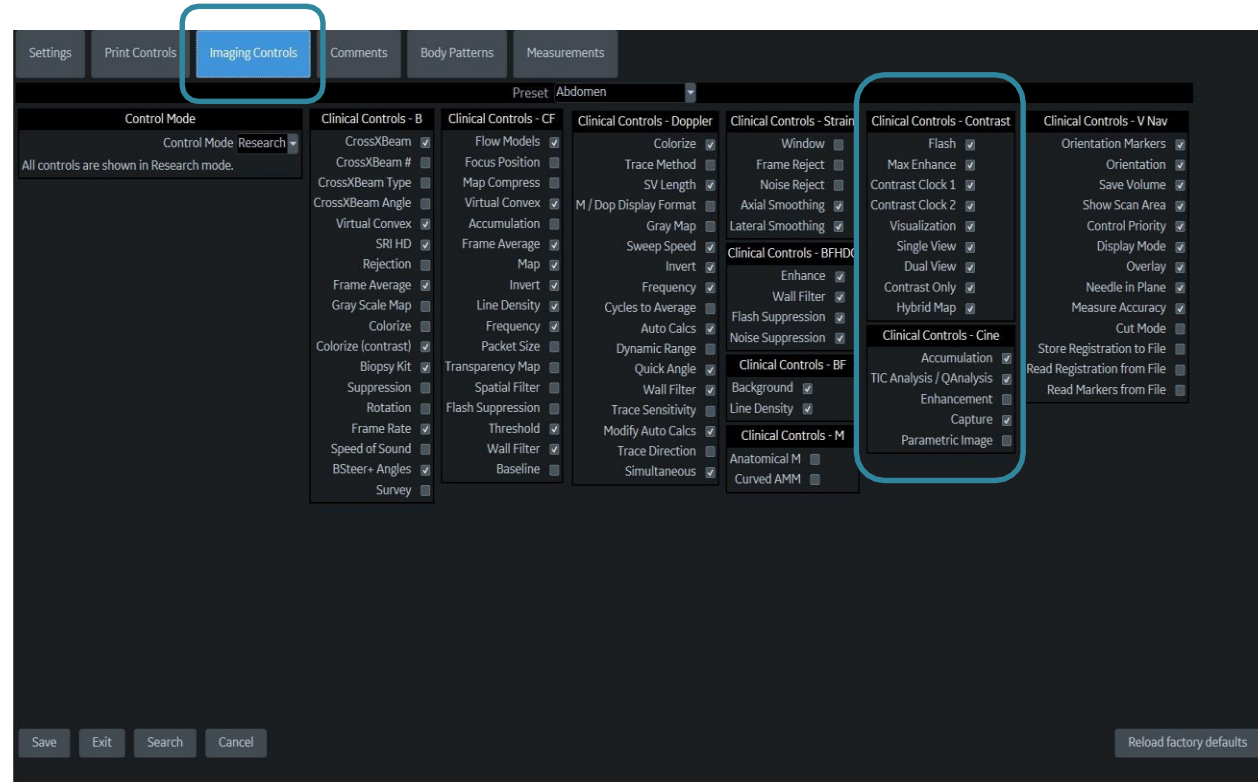


Note: Additional Parameters for Contrast MVI are available on 2nd page of Touch panel including Radiantflow™

Contrast Imaging Presets


To set up the touch panel menu for Contrast Controls:

1. Press Utility on the touch panel to display the monitor's set up menus
2. Select Application on the touch panel
3. Select Imaging Controls on the upper tab of the monitor
4. In the Preset dropdown menu, select the correct Preset
5. In the Control Mode dropdown menu, select Clinical
6. In the Clinical Controls-Contrast column, check Contrast Clock 1 and Dual View and any other control you want to display. Other checkboxes should be blank
7. Select Save
8. Select Exit



Utility>Applications>Imaging Controls

User Interface Parameter	Definition	Clinical Use
Contrast Clock 1&2	Use when injection is started. There are two areas on the screen where the Contrast Clock displays: on the image and on the lower left-hand portion of the display. The timer on the image freezes when you freeze the image (the timer updates when you unfreeze the image). However, the timer located on the lower, far left-hand portion of the display continues to display over a freeze, probe change, mode change, multi image, and zoom. Select again to turn contrast clock off.	Contrast Clock shows time of injection. Continues to run until user selects again to turn off. Useful in showing times correlating to vascular phases.
Frequency (AM)	Res, Pen, Gen (Amplitude Modulation) Extracts Fundamental component of the bubble. Cancels the linear responses (tissue) and then the non-linear responses (bubble) are extracted. ✓ Better tissue suppression and penetration	Res -Best for superficial lesions or thin patients. Use when most resolution is needed Gen -Best for most cases where some penetration is needed and maintain good resolution Pen -Use when patient is larger, or lesion is deep and penetration is needed
Frequency (PI)	Hres (Phase Inversion) Extracts Harmonic component of the bubble. Cancels the fundamental (i.e. linear) responses and then the non-linear harmonic responses are extracted ✓ Less tissue suppression and higher Spatial Resolution	Use on shallow lesions Hres provides higher spatial resolution More tissue is seen so the enhancement of the micro bubble and tissue can be seen together
Target MI (Mechanical Index)	Correlates with Acoustic output when doing a contrast study. Provides an automated adjustment of the acoustic output to keep the specified target MI value	Increase MI for deep lesion when need more penetration. Decrease MI in cases where bubble destruction is seen.
Accumulation	Accumulation detects the maximum signal at each pixel from the entire cine loop.	Useful in assessing perfusion and wash-in (arterial phase)
Trigger/Time Delay	The Contrast Trigger scans images at set intervals, delaying imaging according to the time delay that you specify. Time Delay: select the interval of the timer triggered acquisition	Change Time delay to extend frame interval time. Extending interval frame time will decrease amount of data stored within a long cine loop.

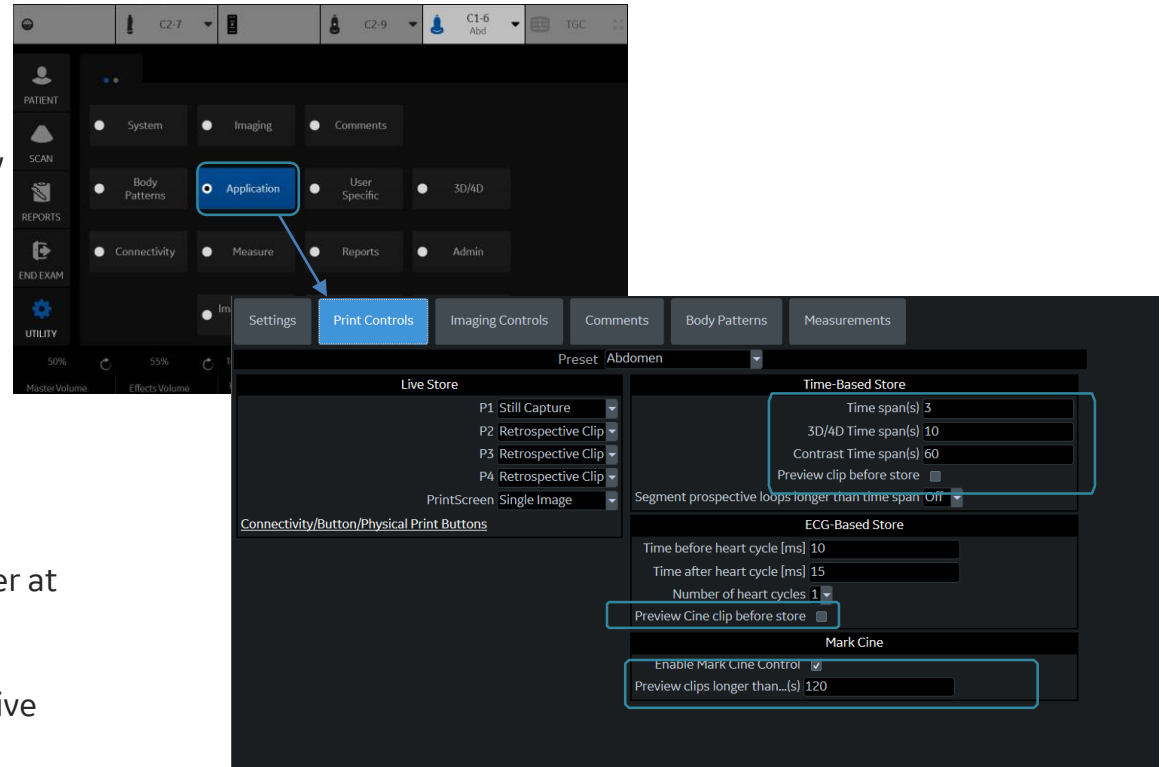
User Interface Parameter	Definition	Clinical Use
Single/Dual View	Single: Displays the active contrast image only Dual: Displays the active contrast image and the reference image simultaneously	User preference on viewing just the B-mode, Contrast and dual image.
Contrast Only	Only transmit and receive the acoustic power signal for the contrast-enhanced image.	User preference to only view contrast image at a higher frame rate
Visualization	<ul style="list-style-type: none"> • Contrast. Displays the contrast-enhanced image. • Tissue. Displays the tissue image. • Hybrid Contrast. Displays the contrast image and tissue image in overlay 	View only in B-Mode or Contrast if preference. Hybrid Contrast imaging enhances perfusion through a lesion or region of interest.
Flash	<p>Sets the acoustic output at %100. This control provides quick transition to High MI imaging. This allows the user a quick one-button push to destroy the agent. To change default Flash time go to Utility>Imaging>Con</p>  <p>Note: When using Contrast MVI, an increase in Flash Frames may be needed due to the high Frame rates when using the MVI flow mode</p>	Useful when the user is interested in bubble replenishment during wash-in.
Flash + Capture	The Flash increases the Acoustic output to 100%. Capture starts a cine with accumulation.	Assesses new bubble arrival and shows perfusion in a Cine Capture clip.
Max Enhance	Sets the acoustic output at %100. This control provides quick transition to High MI imaging. This allows the user a quick one-button push to destroy the agent and keep the power output high until user decides to decrease by selecting Max enhance again	May be used prior to 2 nd injection to break all micro bubbles

Contrast System Set-Up

To Set Up Cine Loop configuration:

Press Utility on the Touch Panel to display the set-up menus on the monitor

1. Select Applications on Touch Panel
2. Select Print controls on the upper tab of the monitor
3. Change Time span to 30 or 60 for contrast time Span (Set up in case of Retrospective Clip)
4. Uncheck preview clip before store
5. Change preview clip store to a value over at least 120
6. Check the Enable Mark Cine Control checkbox (Mark Cine will be a Prospective clip)
6. Select Save
7. Select Exit



Utility > Applications > Print Controls

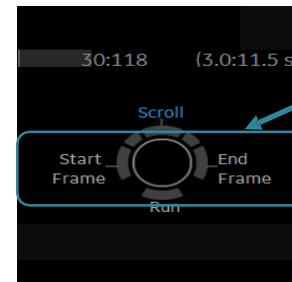
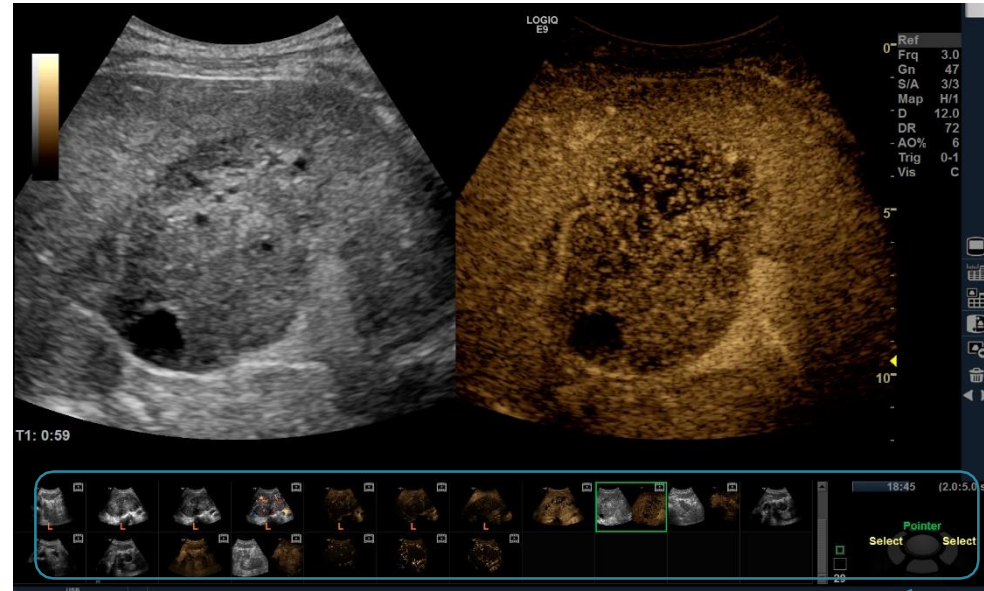
Note: Before starting Contrast exam, send over a long clip to PACs to test the system

Contrast Clip Storage

After a contrast exam has ended, long cine clips can be segmented into smaller clips prior to being sent over to PACs

Please follow these tips to segment clips.

1. Recall contrast clip by selecting thumbnail
2. Turn off pointer around trackball, then scroll will appear on the upper trackball key
3. Use trackball to scroll for desired frame within the contrast clip
4. Select Start Frame on Left Trackball Key
5. After selecting the start frame, Scroll to the desired end frame by using trackball
6. Select End Frame. Clip Segment will then Play.
7. Use Print key to Store.

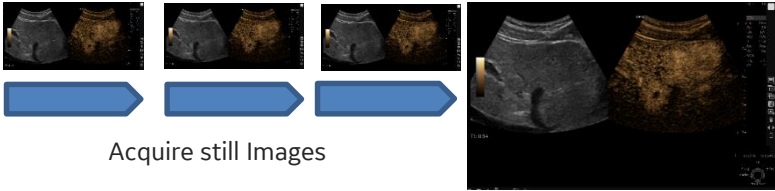


Note: Using a Large/Xlarge Image Display area or widescreen display can increase the file size of the contrast

Still Capture Feature Workflow

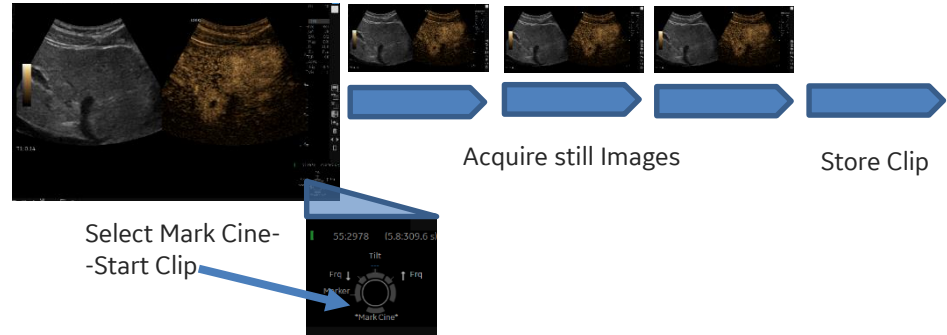
Still Capture Feature enables users to store a still image without affecting Mark CINE loop start/end and Retrospective / Prospective clip store during a contrast Exam. This is useful when a single image acquisition is desired during the Arterial, Portal Venous, or Late Phase of a contrast Exam.

Using Still Capture feature with Retrospective Clip

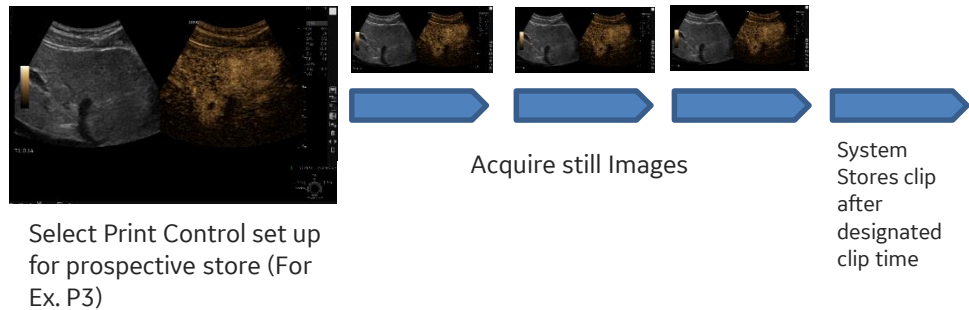


Select Print Control set up for Retrospective store. (For Ex. P2) Last amount of designated time of cine gauge will be stored.

Using Still Capture feature with Mark Cine



Using Still Capture Feature with Prospective Store



Note: Still Capture Clip Store feature can be used during any type of exam. This feature is not specific to Contrast package.

Still Capture Feature Set-Up

Two separate Print Controls will need to be set up; One to acquire still images and One to acquire clip

- Select Utility>Application>Print Controls
- Specify Print Control in drop down as 'Still Capture' (For Ex. P4)
- Designate another Print Control as Single Image, Prospective Clip or Retrospective Clip. This will depend on what your current workflow is for acquiring clips.

Configure data flow

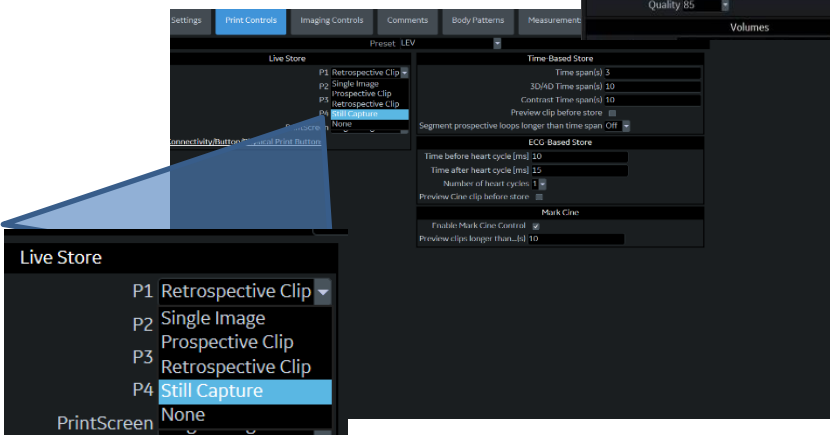
- Select Utility>Connectivity>Button
- Move 'Copy Data Flow' over to 'Printflow View' for each assigned Print Control button
- Uncheck 'Add Multiframe Data'



Take Still Capture during Clip Store (Mark Cine, Prospective, or Retrospective)

- Select designated Print Control or Mark Cine to start Cine clip or Prospective Store. For Ex. Prospective > P2
- Select designated Print Control to store still capture image as needed. For Ex. Still Capture>P4

***Note: When Mark cine is first selected, Cine Gauge will appear Green. After initial single capture image store, gauge will turn gray but clip will remain running in the background.**



Tips

- Use feature when performing contrast exam and a single image needs to be acquired during clip storage
- Uncheck "Preview Clip before store"
- Under mark cine, change length of preview clip to at least 200

References:

Dietrich, C., et al. (2020) Guidelines and Good Clinical Practice Recommendations for Contrast-Enhanced Ultrasound (CEUS) In the liver Update 2020 WFUMB in cooperation with EFSUMB, AFSUMB, AIUM, AND FLAUS. Ultrasound in Medicine & Biology., Vol. 00, No. 00, pp. 1-26, July 2020

“AIUM Practice Parameter for the Performance of Contrast-Enhanced Ultrasound Examination”. Journal of Ultrasound in Medicine 2020; Volume 39, Issue 3: P421-429 March 2020



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