



DTReplay

by Drastic Technologies®



Control panel for DTReplay software. It includes a list of camera channels (Cam 01-04) with their respective timecodes. A central playback area shows a timecode of 00:00:00:00 and various playback controls (play, stop, fast forward, etc.). To the right, there is a table of event records.

Event Record Time	Time of Day	Mark Type
00:00:00:00	06:01:02:50	trap
00:00:00:00	06:01:05:20	run
00:00:00:00	06:01:07:50	face
00:00:00:00	06:01:07:15	face
00:00:00:00	06:01:07:28	end of play
00:00:00:00	06:01:05:21	trap
00:00:00:00	06:01:12:15	trap
00:00:00:00	06:01:14:25	run
00:00:00:00	06:01:16:22	face
00:00:00:00	06:01:11:05	end of play



**Multichannel Capture, Event Marking,
Slow Motion Cueing and Replay**

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Operator Manual



DTReplay



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DTReplay

DTReplay™ is a digital sports replay system specifically designed for the highest possible quality instant sports replay and referee analysis. Its primary purpose is to record multiple video feeds and camera angles throughout the entire game and provide an absolutely clear video output of any point in the game from any recorded input. To aid in finding points of interest and analyzing specific events, all four channels are run in perfect sync, so a play watched on the main feed can be instantly viewed from any other feed at the exact same point in time. Single frames can even be switched between to provide the exact position of player/ball/line/etc at the exact same instant in time. To further speed the finding of events, the referee or a second person can mark events by pressing a button as the play occurs. These marks can be brought up instantly on the video output by the referee from any of the video feeds.

The **DTReplay™** system consists of the following components:

1. The **DTReplay™** Digital Disk Recorder (3U rack mount)
2. The video input/output breakout box (1U rack mount rear)
3. Cables between the rack mount units
4. Technicians/Operator's monitor (1024x768 LCD)
5. Referee's monitor (720x486 - within 800x600 LCD)
6. Video capture monitor (720x486 NTSC, 720x576 PAL)
7. DVD burner which captures the referees monitor for training purposes
8. Referee's Jog/Shuttle/Mark controller
9. Optional secondary mark controller
10. Optional Jumbotron/ESPN Box/FoxNet capture cabling

The operation of **DTReplay™** is designed to be as simple as possible. Once the system has been installed in the replay booth, the procedure for running it is as follows:

1. Power on **DTReplay™** DDR, monitors and DVD capture
2. Place a new recordable DVD in the DVD recorder
3. Before the game, press the record button on the **DTReplay™** DDR (the red X) and on the DVD recorder
4. Wait 5 seconds for records to initiate and press the follow 'Goto Current - #' on the referee's controller
5. {Enjoy the game, mark events, watch replays}
6. Stop the DVD recorder, finalize and remove the disk.

7. Turn off the **DReplay™** DDR by pressing and releasing the power button quickly
8. Turn off the monitors, make DVD duplicates, etc

The Operator/Technician's Interface Setup

The screenshot displays the DReplay™ operator interface. The top left shows a large live video feed of a hockey player in a white jersey with 'STATE' and the number '12' on it, holding a stick. To the right of this is a vertical stack of three smaller video feeds showing different camera angles of the same game. Below these is a control panel with several sections:

- Cameras:** A list of four cameras (Cam 01 to Cam 04) with checkboxes and timecodes. Cam 01, 02, and 03 are checked and show a time of 00:07:29. Cam 04 is unchecked and shows 00:00:00:00.
- System Status:** CPU Usage 25%, Memory Used (300 MB), and Buffer Status 2%.
- Time and Playback:** A central digital clock shows 00:00:00:00 with 'DF' and '0%' indicators. Below it are playback controls (stop, play, pause, fast forward, rewind) and a progress bar.
- Recording Controls:** Buttons for 'Record', 'Stop E-E', 'Reset', 'Configure', 'Restart', and 'Close'. The 'Record' button includes a 'From' field set to 00:00:00:00 and a 'GO' button.
- Event Log Table:** A table with columns for Event Record Time, Time of Day, and Mark Type. The last row is highlighted in blue.

Event Record Time	Time of Day	Mark Type
00:00:00:00	09:01:03:00	
00:00:00:00	09:01:05:20	snap
00:00:00:00	09:01:07:00	run
00:00:00:00	09:01:07:15	throw
00:00:00:00	09:01:07:28	end of play
00:00:00:00	09:01:09:21	
00:00:00:00	09:01:12:15	snap
00:00:00:00	09:01:14:26	run
00:00:00:00	09:01:16:22	throw
00:00:00:00	09:01:19:05	end of play

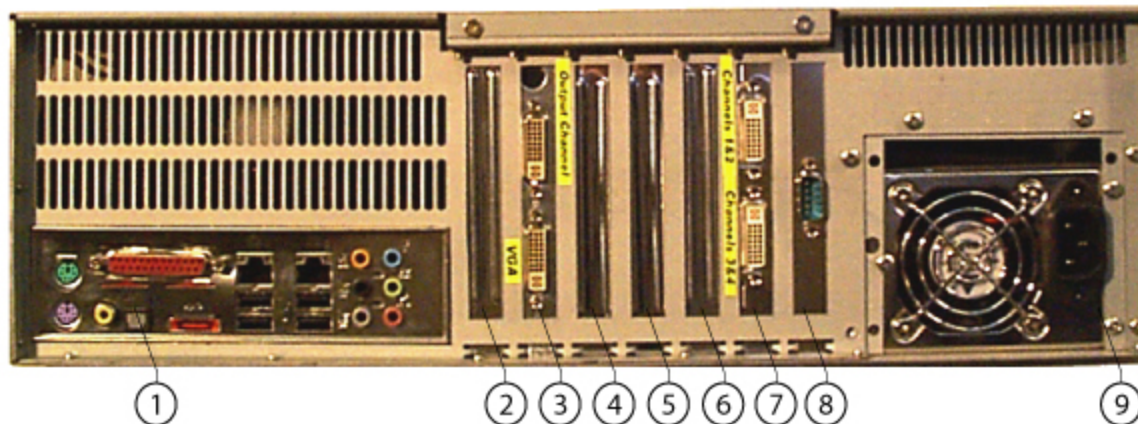
The main **DReplay™** interface

Connecting the Unit



Front of the **DTReplay™** DDR unit

The **DTReplay™** system is a 3RU rackmount chassis with a 1U breakout box. There are connections for a keyboard and mouse, which are not absolutely required, but are recommended. For ease of use, the front of the unit should be accessible. This provides access to the power button and the front panel controller which includes the record start (the red x). Once running, it is best to block access to the front panel if possible, to prevent an accidental power down. The stop function is protected by a secondary key press requirement to prevent accidental stop commands.



Rear of the **DTReplay™** DDR Unit

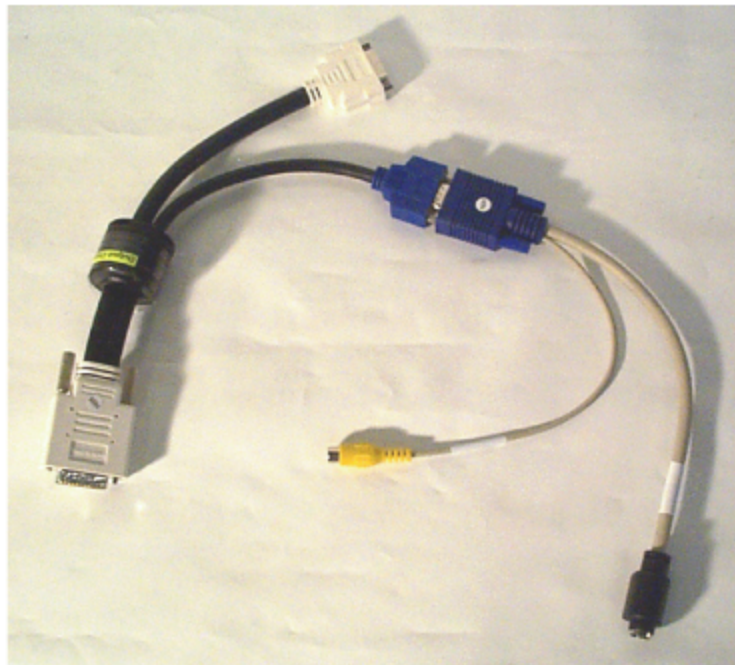
The order of connectors from left to right facing the rear of the unit, as pictured above, is:

1. Main computer connectors (keyboard, mouse, USB, network, etc)
2. (blank)
3. Main Monitor (lower), Referee Monitor (upper) & Video Output

4. (blank)
5. (blank)
6. (blank)
7. Cameras In, 2 Upper, 2 Lower
8. Sony 9 Pin Control (Optional)
9. Power supply (A/C in)

To begin, connect the keyboard and mouse to the purple and green DIN connectors on the left side of the unit. Connect the two jog/shuttle controllers to the USB ports under the network RJ-45 port. Connect the network cable if you are using a network to collect stats. Connect the primary/technicians/operator's 1024x768 monitor to the lower DVI connector marked **VGA** (left most, bottom DVI connector above). If your monitor does not have a DVI connection, use the DVI to 15 pin D-Sub adapter provided to connect to your monitor.

The upper DVI connector on the left (above the primary monitor), requires an adapter cable to split the referee VGA/DVI output and the video output. The cable is pictured below:



Adapter cable

Plug the male DVI into the lower connector on the output card. Make sure the S-Video/Composite cables are connected to the output cable. The DVI connector on the cable goes to the Referee 800x600 monitor, or if one is not

available, the S-Video or Composite can be sent to a video monitor for the Referee. The S-Video or Composite is connected via an RCA->BNC cable to the connector on the breakout box.

The remaining two DVI connectors on the card on the right connect via standard DVI cables to the breakout box. They should be marked as 1&2 and 3&4. The cables and the DVI connectors on the 1RU breakout box will be marked with the same labels. These are straight through cables and should be connected from the card to the breakout box.



Breakout box

To connect the cameras, follow the 'Video #' order specified on the 4 BNC inputs on the left side of the breakout box (above, #1 - #4). The DVD recorder, and optional referee video monitor, should be connected to the BNC on the right side of the breakout (#5). If you have S-Video connections, they can be cabled directly to the cable split at the card.

Operations Overview

Once the unit is properly connected and powered on, the software should automatically boot and display the screen above at 1024x768@60Hz. If for any reason the software does not automatically boot, it can be started from the **DTReplay™** icon on the desktop.

Run DTReplay™

As soon as the software starts, you should see the input of each of the connected cameras in the monitor above the GUI. If not, please check the incoming connections. If they are not visible here, they will not record.

Configuring Event Marks

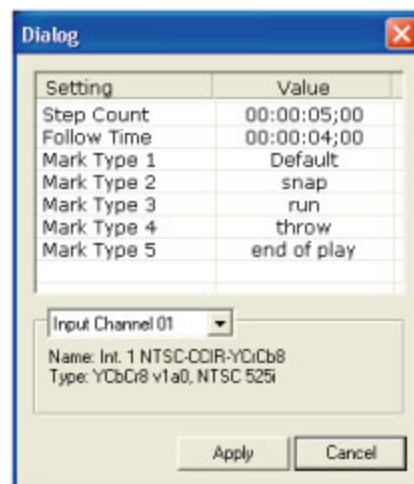
To replay events, the operator will need to mark the point at which the event starts. This will allow the system to quickly cue to the event for playback. The marks used are configured in advance to reflect the common events occurring in the activity the operator is capturing. In a sports event for example, the operator can set up the marks for specific play elements that occur repeatedly.

Press the **Configure** button to open the **Configure** dialog box.

Mark 1 is by default marked N/A, and cannot be changed. Each time the operator presses **Mark 1**, a mark will be placed which has a blank in the **Mark Type** column of the **Mark Index Display**. For each subsequent mark, the

placed which has a blank in the **mark type** column of the **mark index display**. For each subsequent mark, the operator may select the text in the field to the right of the **Mark** number, and type in a short identifier for the type of event described. This identifier will be placed in the **Mark Type** column of the **Mark Index Display** every time the corresponding button on the **Index marker Controller** is pressed.

In the following diagram the operator has set up the marks as follows:



Mark Type 1 - Default
Mark Type 2 - snap
Mark Type 3 - run
Mark Type 4 - throw
Mark Type 5 - end of play

Every time the operator presses the **Mark Type 3** button on **the Index Marker Controller**, the **Mark Type** column will display "run" for that event mark (along with the time code location of the event start and the time of day the mark was made).

Press **Apply** to confirm any changes you have made. Close the **Configure** dialog box.

From this point forward all playback control can be exercised via the **Jog Shuttle Controller** described below, using the **Index Marker Controller** to set marks.

Start Recording

To start the game, select the checkboxes next to the active cameras on the left side with the mouse (Cam01, Cam02 etc.). The example image (the Main **DTReplay™** interface) has 3 cameras selected. If the system is configured for less than 4 inputs, some cameras will appear grayed out and will not be selectable. Press the **Record** button to start recording. Each camera's time code should go green, to indicate it is recording, and the time code should start rolling.

Marking Events

At the beginning of each event the operator will want to place a mark to provide quick access for replay. Once the mark types have been configured, the operator should be made aware of the setup, and the event types that will require a mark to enable quick access for playback.

Each of the buttons on the **Index Marker Controller** corresponds to a mark type the operator has set up in the **Configure** dialog box. Pressing that button will place that mark type in the **Mark/ Index Display** along with time of day and time code location within the recording at which the mark was made.

The operator may press each of the buttons to confirm their settings, and easily clear the list. To clear the list, press the **Reset** button.

Replaying Marked Events

To replay an event, the operator may select the event by scrolling through the list with the **Jog/ Shuttle Controller** to highlight the event. Alternately the operator may select the item using the mouse to click on its row in the **Mark Index Display**. Once selected, the operator may use the shuttle and transport controls to review the event.

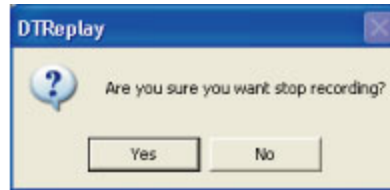
The **Jog/ Shuttle Controller** offers playback in a number of modes. The **Shuttle Wheel** on the controller allows the operator to shuttle through the clip at various speeds to arrive at a good start location for playback. The **Forward Play** button allows the operator to play through the selected clip at normal speed.

The Transport Controls offered on the Control Surface provide controls analogous to a professional VCR including frame advance or step back, 5 seconds forward or reverse, play forward or reverse fast forward or reverse etc. These are operated by mouse click and may not be used much once the operator is familiar with the Jog/ Shuttle Controller.

Stopping the Record

Once the game has ended, the operator will want to stop the current capture in progress. Pressing the **Stop** button does not immediately however stop the recording. Instead the operator is prompted to confirm that they are stopping the recording *intentionally*. This feature is intended to prevent accidental stoppage of the recording in progress.

The following prompt is offered:

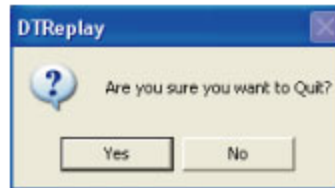


Press the **Yes** button to stop the recording. Otherwise, press **No** and the recording will continue uninterrupted.

Closing DTReplay

Once the game is over, the operator will want to close **DTReplay™** and pack up the gear. Pressing the **Close** button does not immediately however close **DTReplay™**. Instead the operator is prompted to confirm that they are closing the application *intentionally*. This feature is intended to prevent the system from being inadvertently shut down.

The following prompt is offered:

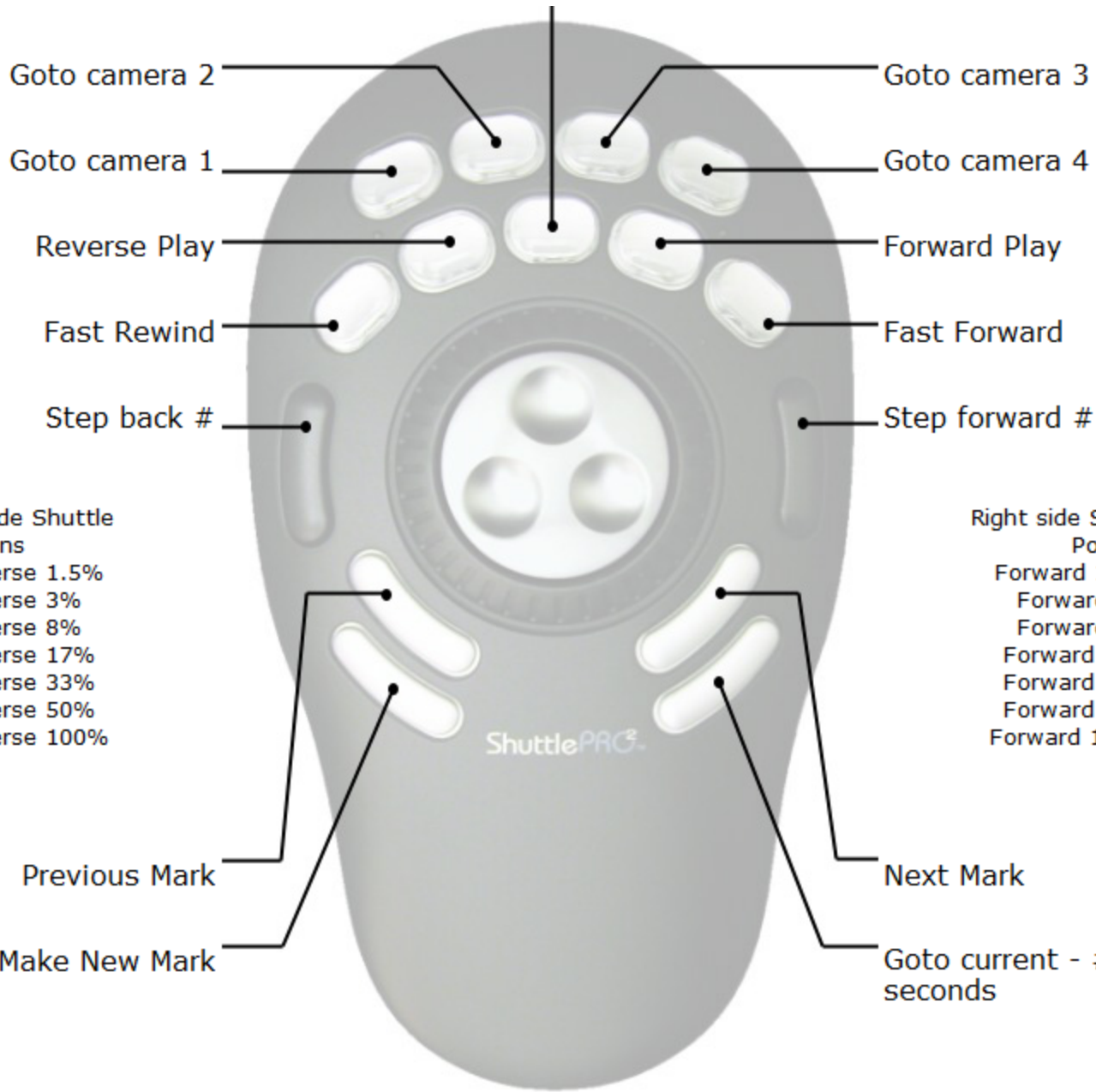


Press the **Yes** button to close **DTReplay™**. Otherwise, press **No** and continue working with **DTReplay**.

Reference

The Jog/Shuttle Controller

Pause



Goto camera 2

Goto camera 3

Goto camera 1

Goto camera 4

Reverse Play

Forward Play

Fast Rewind

Fast Forward

Step back #

Step forward #

Left side Shuttle Positions

- 1 Reverse 1.5%
- 2 Reverse 3%
- 3 Reverse 8%
- 4 Reverse 17%
- 5 Reverse 33%
- 6 Reverse 50%
- 7 Reverse 100%

Right side Shuttle Positions

- Forward 1.5% 1
- Forward 3% 2
- Forward 8% 3
- Forward 17% 4
- Forward 33% 5
- Forward 50% 6
- Forward 100% 7

Previous Mark

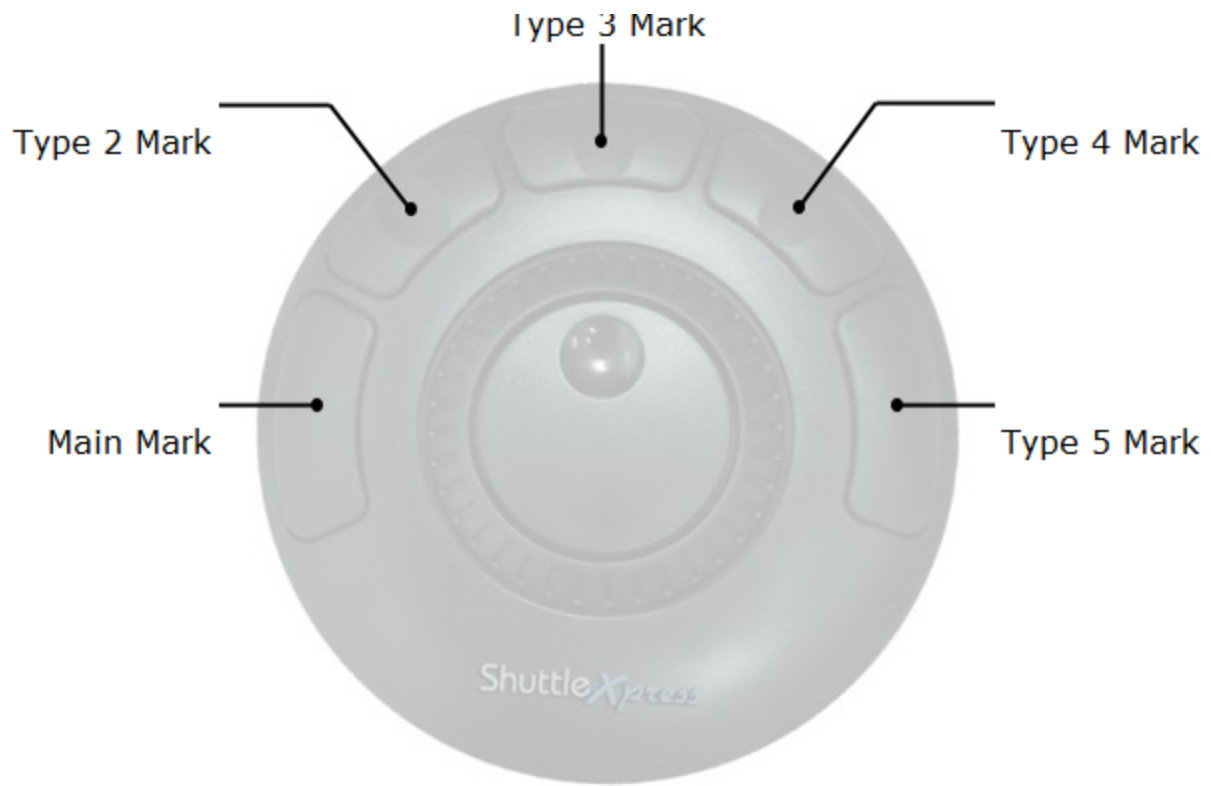
Next Mark

Make New Mark

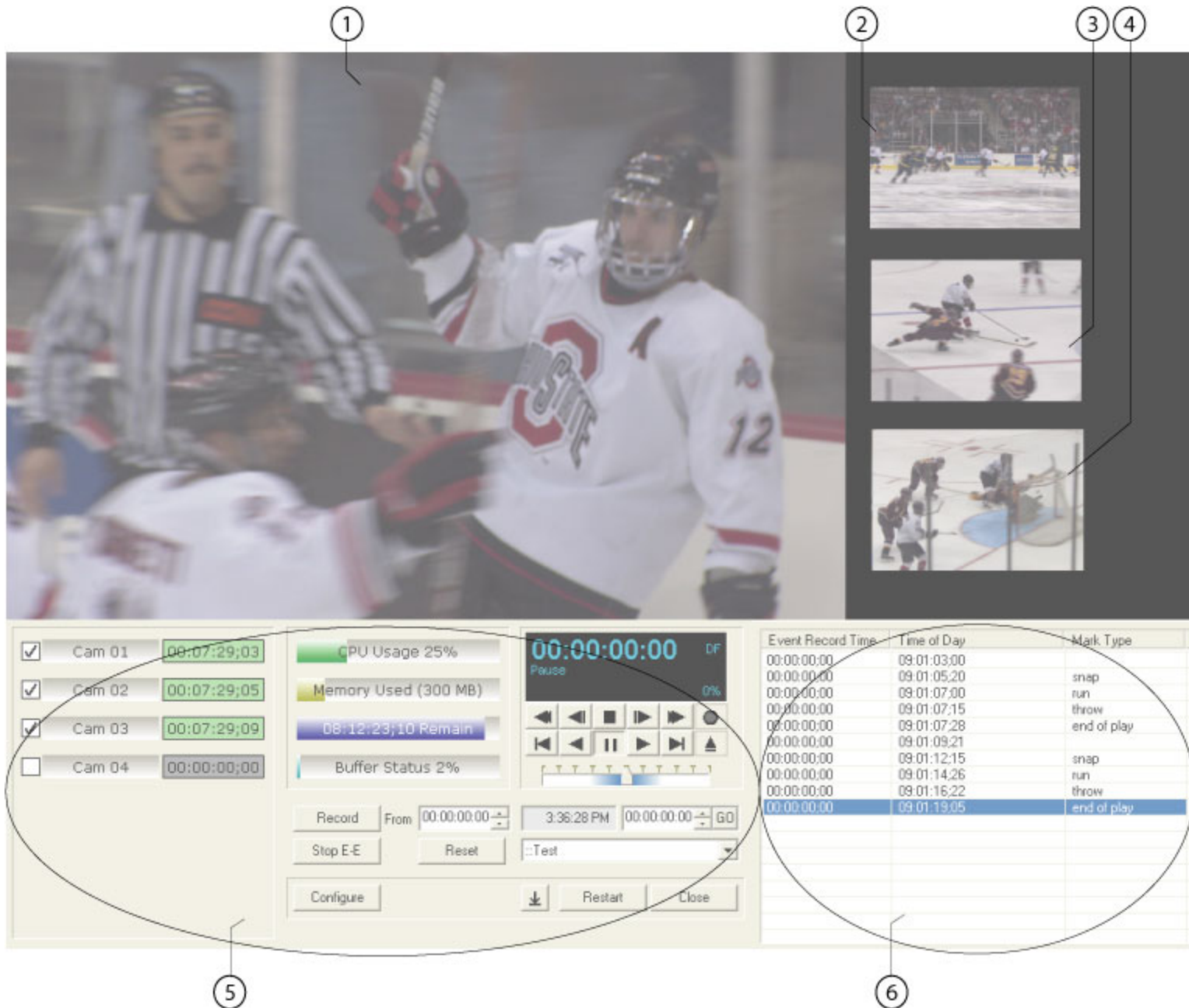
Goto current - # seconds

ShuttlePRC3

The Index Marker Controller



Main Interface Overview

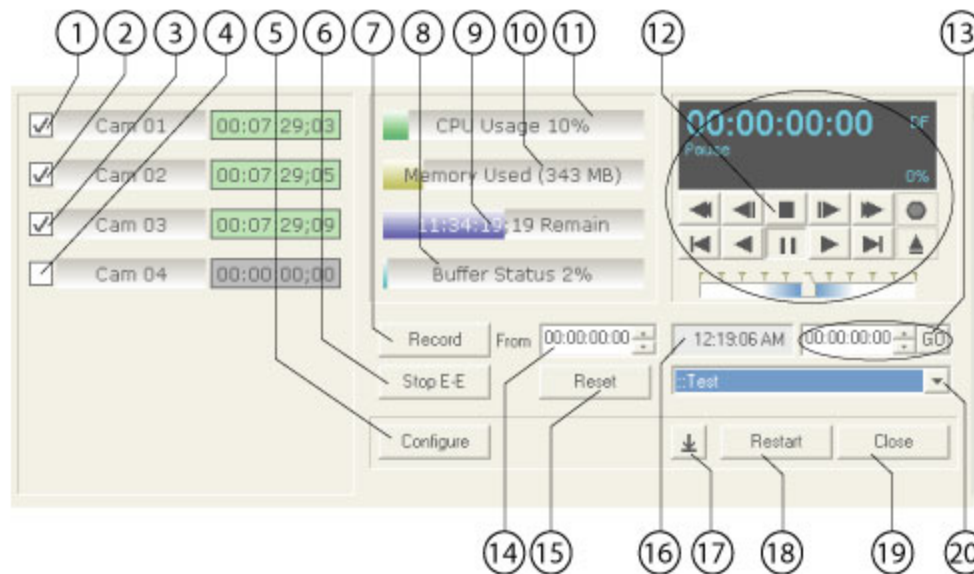


The main DTReplay™ interface

- 1 Primary (Camera 1) Monitor
- 2 Camera 2 monitor

- 2 Camera 2 monitor
- 3 Camera 3 monitor
- 4 Camera 4 monitor
- 5 Control Surface
- 6 Mark/Index Display

Control Surface

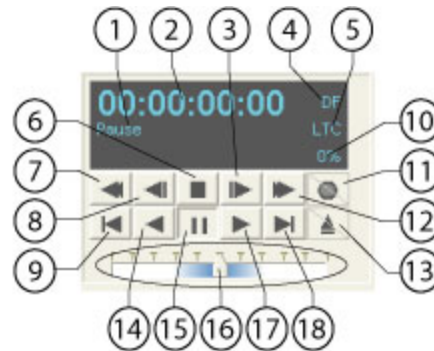


DTReplay™ Control Surface

1	Camera 1 section	Camera 1 enable/disable checkbox, buffer load indicator (meter displayed under Cam 01), (input) status and current record time (record and control status indicated by the background: green when recording, white in stop, gray if not available).
2	Camera 2 section	Camera 2 enable/disable checkbox, buffer load indicator (meter displayed under Cam 02), (input) status and current record time (record and control status indicated by the background: green when recording, white in stop, gray if not available).
3	Camera 3 section	Camera 3 enable/disable checkbox, buffer load indicator (meter displayed under Cam 03), (input) status and current record time (record and control status indicated by the background: green when recording, white in stop, gray if not available).
4	Camera 4 section	Camera 4 enable/disable checkbox, buffer load indicator (meter

		displayed under Cam 04), (input) status and current record time (record and control status indicated by the background: green when recording, white in stop, gray if not available).
5	Configure button	Press to open the Configure window, which allows the operator to set up event marking and actions.
6	Stop E-E button	Press to stop all recording channels and force them to e-e.
7	Toggle Record button	Toggle between record and not recording – the button displays Record (when in stop) and Stop (when in record).
8	Buffer Status field	Displays playback channel buffer status including a meter in aqua.
9	Time Remaining field	Displays the amount of time the operator can record given the drives available to the system and the flavor of video used including a meter in blue.
10	Memory Used field	Displays the amount of memory used including a meter in ochre.
11	CPU Usage field	Displays the amount of processor usage/load including a meter in green.
12	Transport Controls section	Upper section displays the state of the playback channel. Lower section offers transport controls for playback
13	Go To section	The field allows the operator to enter a time code location via the keyboard. Pressing the Go button seeks to that point.
14	From section	Displays the start time code location of the recording.
15	Reset button	Press to clear the information from the Mark Index Display field, and removes any Go To and From information the operator may have entered.
16	Time of Day field	Displays the current time of day based on the internal system clock. This is the time used to populate the Mark Index Display - Time of Day field.
17	Minimize button	Press the Minimize button to enter Reduced View , which reduces the Control Surface and Mark Index Display , allowing the maximum monitor space for the video images.
18	Restart button	Press to restart the application.
19	Close button	Press to close the application.
20	Camera Selector pulldown menu	Use the pulldown menu to select between available cameras for playback.

Transport Control/ Display



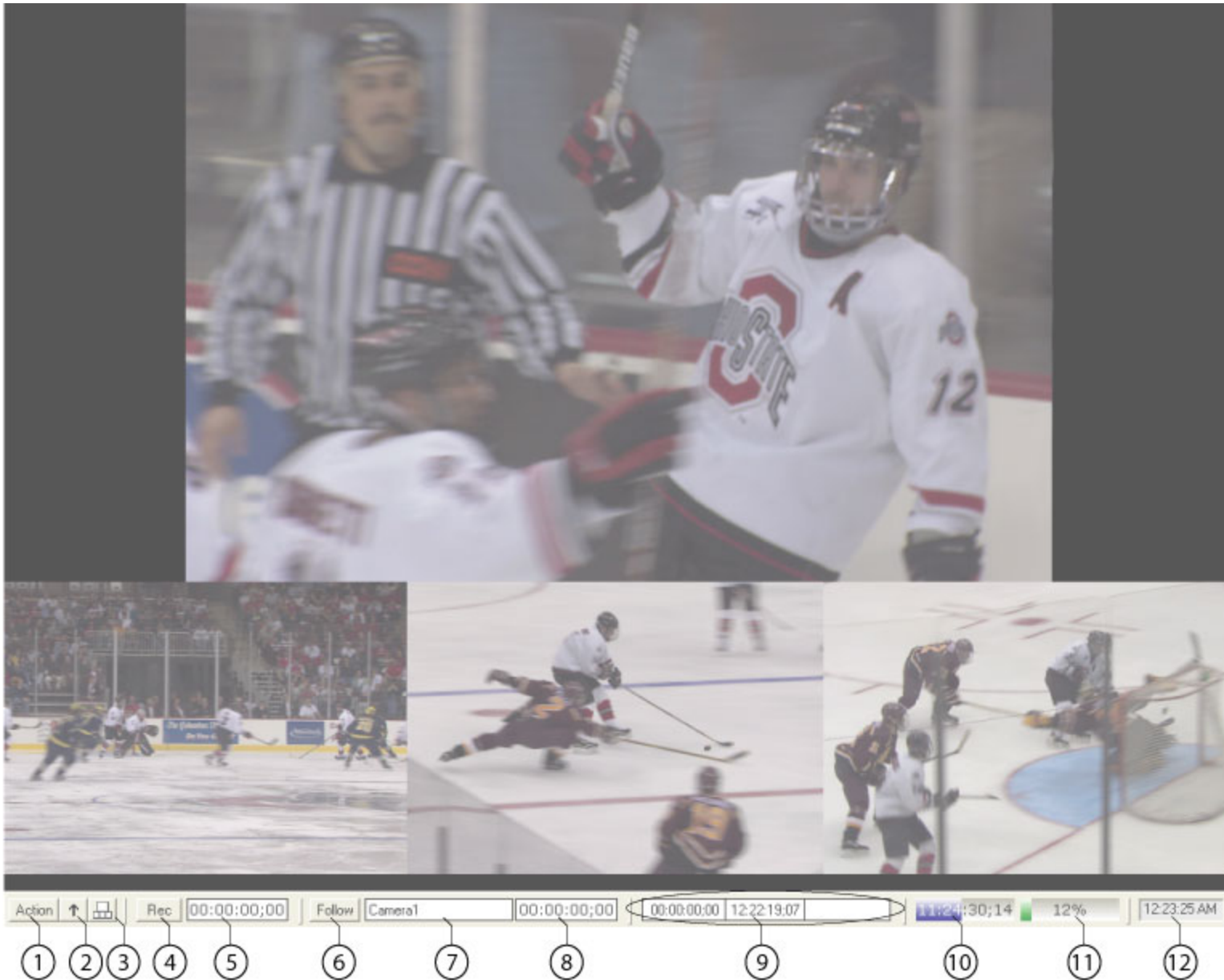
1	Transport State field	Displays the transport state, or whether the unit is in Play, Pause, Stop etc.
2	Time Code Location field	Displays the current time code location.
3	Step forward button	Step forward one frame
4	Video Standard field	Displays the current video standard being used in the system.
5	Time Code Source field	Displays the current time code source (i.e. LTC, CTL, TC etc.)
6	Stop button	Stop playback and display e-e, or pass-through video.
7	Fast reverse button	Play the video in reverse at a high rate of speed.
8	Step Reverse button	Step back one frame.
9	Five Seconds Reverse button	Cue to the frame of video five seconds before the present location.
10	Percentage of Play Speed field	Displays the percentage of play speed, 100% being normal playback speed. Reverse speeds are preceded by a minus sign.
11	Inactive button	The record button is inactive in this version - to start a record, press the Toggle Record button.
12	Fast Forward button	Play the video at a high rate of speed.
13	Inactive button	The eject button is inactive in this version - external VTR control is not a feature of DTReplay .
14	Reverse Play button	Play the video in reverse, at minus 100 per cent of normal play speed.
15	Pause button	Pause at and display the current frame of video.
16	Position Slider section	Offers variable speed playback in forward or reverse, depending on how far the slider is "pushed" using the mouse.
17	Play button	Play the media forward at 100 per cent of normal play speed.
18	Five Seconds Forward button	Cue to the frame of video five seconds ahead of the present location.

Mark/Index Display

1	2	3	4
Event Record Time	Time of Day		Mark Type
00:00:00.00	09:01:03.00		
00:00:00.00	09:01:05.20		snap
00:00:00.00	09:01:07.00		run
00:00:00.00	09:01:07.15		throw
00:00:00.00	09:01:07.28		end of play
00:00:00.00	09:01:09.21		
00:00:00.00	09:01:12.15		snap
00:00:00.00	09:01:14.26		run
00:00:00.00	09:01:16.22		throw
00:00:00.00	09:01:19.05		end of play

1	Event Record Time column	Event record time is the time indicated at the record channel when the event was made. It is also its position in the playback channel.
2	Time of Day column	Time of day displays when the mark was made. The computer's clock is used for this time source.
3	Event field	Each event is listed in sequence in this field. The Jog/Shuttle Controller , and the mouse and up and down keys allow the operator to select events for playback. The last mark seek is indicated by the highlight. This is position it will move from when next or previous mark is selected.
4	Mark Type column	Displays the mark type for each marked event - specific mark types are entered during events using the Mark Index Controller . The mark type settings are accessed through the Configure window.

Reduced View



Pressing the **Minimize** button puts the interface into **Reduced View** mode. In **Reduced View**, the controls are reduced to a minimum to allow more space for the video frames.

The following controls are offered in **Reduced View** mode:

1	Action pulldown menu	Pressing the Action button displays the Action pulldown window.
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2	Maximize button	Pressing the Maximize button returns the interface to Main View
3	Toggle View button	Toggles between View 1 and View 2. In View 1, Camera 1 is displayed at full size and Cameras 2 – 4 are displayed at half size. In View 2, all cameras are displayed at half size.
4	Toggle Record/ Stop Record button	When in Stop , this button displays Rec and pressing it starts the recording. When in Record , this button displays Stop and pressing it will stop the recording (the operator will be prompted to confirm that they want to stop recording).
5	Record Status field	Displays the current time code location of the recording taking place if any.
6	Follow button	Pressing the Follow button seeks to a predetermined number of frames prior to the last mark made on the selected channel. This number is set in the Configure dialog box.
7	Selected Channel field	Displays the currently selected channel.
8	Channel Replay Status field	Displays the time code location the selected channel is cued to.
9	Mark/ Index row	Displays the selected row of the Mark/ Index Display .
10	Time Remaining field	Displays the amount of video the operator may expect to be able to record given the amount of drive space available at the current rate of use.
11	CPU Usage field	Displays the percentage of CPU usage based on the available resources of the system.
12	Time of Day field	Displays the current Time of Day , based on the system's internal clock.

Action window

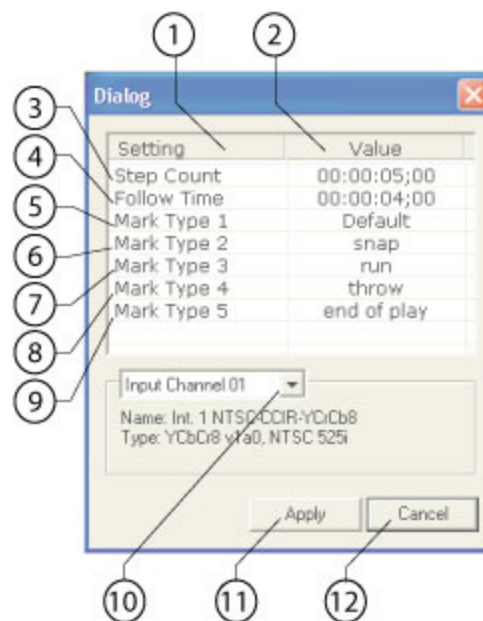
Press the **Action** button in **Reduced View** to display the **Action** pull-up window.



1	Help	Opens the online Help documents, if they have been installed with the system. Otherwise, the About screen will appear.
2	About	Opens the About screen, which offers details regarding the

2	ABOUT	Opens the ABOUT screen, which offers details regarding the installation and version of DTReplay .
3	Configure	Opens the Configure dialog box, which allows the operator to set specific behavior for the system.
4	Close	Close the application. The operator will be prompted to confirm that they really want to close.
5	Auto Hide	This will hide the Reduced View Control Surface and permit the video frames of the input cameras to occupy the largest area possible. Moving the mouse down to this area will restore the Control Surface to view.
6	Return to Full	Select to return the interface to the Main View , with more controls displayed and accessible.
7	Action tab	Pressing this tab displays or hides the Action pulldown menu.

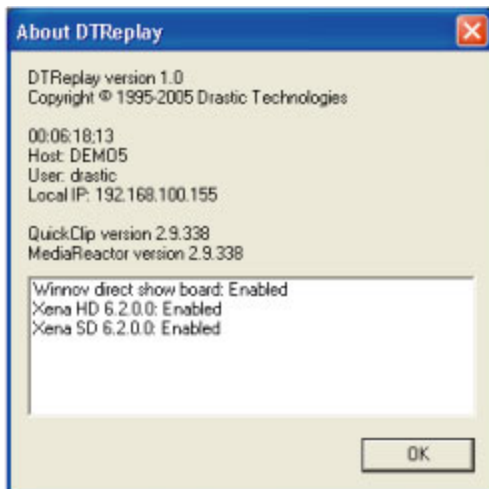
Configure Dialog Box



1	Setting column	The setting to which any changes made by the operator will apply
2	Value column	The value entered by the operator (or the given/ existing value)
3	Step Count row	Defines the number of frames before or after the current location the system will seek to given a Step Forward # or Step Back # command from the Jog/Shuttle Controller .
4	Follow Time row	Defines the amount of frames prior to a marked event the

		channel will seek to when a operator selects an event to replay. This gives the operator 4 seconds to react to an event start.
5	Mark Type 1 row	Mark Type 1 is set by default and cannot be changed. Pressing Mark 1 places a mark with a blank Mark Type field in the Mark Index Display section.
6	Mark Type 2 row	Select the field to the right of Mark Type 2 and type in the second type of mark used. This mark will appear in the Mark Index Display when the operator presses Mark 2 on the Index Marker Controller .
7	Mark Type 3 row	Select the field to the right of Mark Type 3 and type in the second type of mark used. This mark will appear in the Mark Index Display when the operator presses Mark 3 on the Index Marker Controller .
8	Mark Type 4 row	Select the field to the right of Mark Type 4 and type in the second type of mark used. This mark will appear in the Mark Index Display when the operator presses Mark 4 on the Index Marker Controller .
9	Mark Type 5 row	Select the field to the right of Mark Type 5 and type in the second type of mark used. This mark will appear in the Mark Index Display when the operator presses Mark 5 on the Index Marker Controller .
10	Channel pulldown menu	Select between available channels using this pulldown menu
11	Apply button	Apply any changes made and close this window.
12	Cancel button	Cancel any changes made and close this window.

About Screen



The **About** screen offers details regarding the version of **DTReplay**, settings relating to the system itself and hardware installed in the system.

Keyboard Commands

Normally the playback channel is controlled by the Jog/Shuttle controller. If one is not available, it can also be controlled via the PC keyboard.

<F1>	Help
<Q>	Record (crash record)
<8>, <w>, Num<8>	Preview from in to out
<v>, <k>, Num<.>	Pause
</>, <V>, <+>	Stop (pass through, e to e)
<c>, <l>	Play (forward at normal speed 100%)
Shift<C>	Play double speed (200%)
, <j>	Play reverse (-100%)
<z>	Fast rewind
<x>	Fast forward
<}>, Num<2>, Arrow<Up>, Shift<L>	Step forward 1 frame
Ctrl <L>	Step forward 1 field
<{>, Num<8>, Arrow<Down>, Shift<J>	Step backward 1 frame
Ctrl <J>	Step backwards 1 field
<[>, Shift<X>	Step forward # (def 5) seconds
<]>, Shift<Z>	Step backward # (def 5) seconds

<h>, Num<3>, Arrow<Right>	Shuttle forward faster
<g>, Num<1>, Arrow<Left>	Shuttle backward faster
Shift<H>, ShiftArrow<Right>	Fine shuttle up
Shift<G>, ShiftArrow<Left>	Fine shuttle down
<'>, Shift	Return to 0 or start
<\>. Shift<T>	Loop
<m>, Num<4>	Mark in point at current location
<<>, Shift<M>, Num<6>	Mark out point at current location
<n>, <Home>, Num<5>	Go to in point
Shift<N>, <End>, ShiftNum<5>	Go to out point
<y>	Toggle video edit on/off
<u>	Toggle audio 1 edit on/off
<i>	Toggle audio 2 edit on/off
<o>	Toggle audio 3 edit on/off
<p>	Toggle audio 4 edit on/off
Ctrl<O>	Eject
Ctrl<Q>	Quit
Ctrl Alt <F1>	Select Camera 1
Ctrl Alt <F2>	Select Camera 2
Ctrl Alt <F3>	Select Camera 3
Ctrl Alt <F4>	Select Camera 4
Ctrl Alt <E>	Jump # (def 4) seconds back from current record point
<m>	Make a new mark at the current record point
<n>	Go to the previous mark point
<N>	Go to the next mark point