# ARRI

Ramp Tutorial

5/2000d

Summary

This tutorial defines and explains the following terms:

- Ramp
- Internal Ramp
- External Ramp
- Linear Ramp
- Exponential Ramp
- Shoot time
- Screentime
- Reverse Ramp.

It also discusses exposure compensation and the use of ramps with HMI lights.

What is a Ramp?

A ramp is a controlled change of the camera's frame rate (fps) over time, performed while the camera is running.
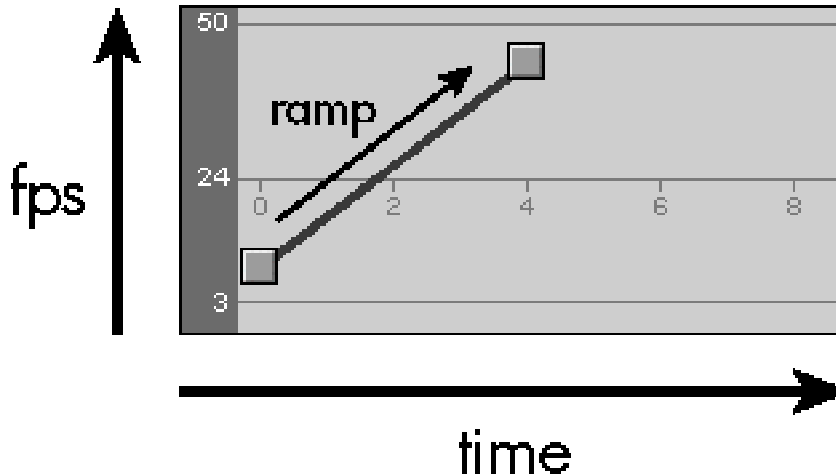

Ramps can be used for a myriad of effects, from the dramatic speeding up or slowing down of the action to the subtle enhancing of a scene's timing. A ramp essentially can compress or stretch time within a scene.

Please note that switching between the NORM and PS/CCU speed setting on the ARRIFLEX 535, 535B, 435, 435ES and 16SR3, or between crystal and variable speeds on a 35-3 are wild speed changes (not controlled), and are not considered ramps.

What is an Internal Ramp?

It is a speed change stored in the camera's internal memory. Internal ramps are possible with the 535, 535B, 435 and 435ES, but not with the 16SR3. An external Controller (Ramp Preview Controller [RPC] Laptop Camera Controller [LCC] or Camera Control Unit [CCU]) is necessary to create and send an internal ramp to the camera. RCU and WRC cannot edit internal ramps.

Once an internal ramp is stored in the camera, it can be activated and executed without an external controllers. Internal ramps are limited to a first and second speed, and to a 100 sec shoot time duration.
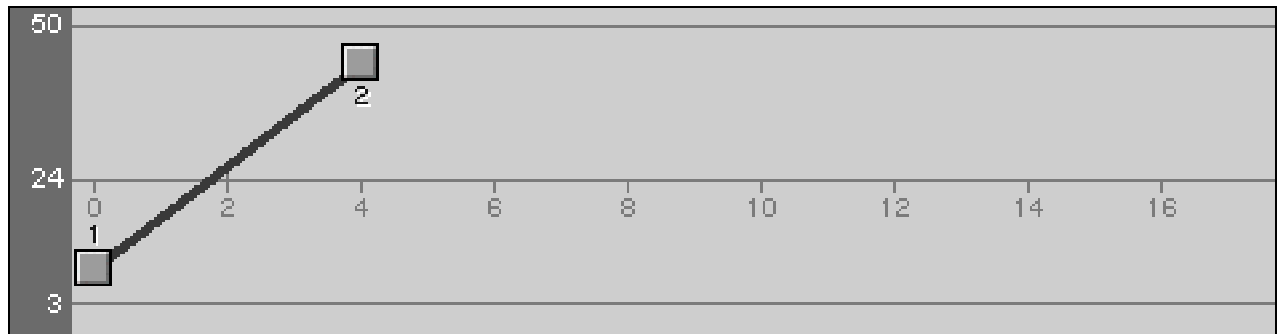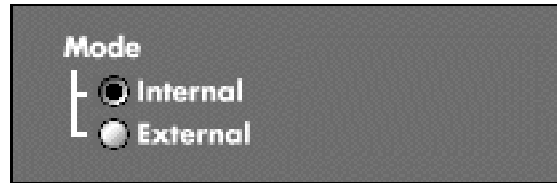
What is an External Ramp?

An external ramp is a speed change that is stored in the memory of an external controller like the RPC, WRC, LCC or RCU. To activate and execute an external ramp, the controller has to be connected to the camera. Since external controllers can have more memory and processing capacity than the camera has internally, external ramps can be more sophisticated, including special features such as multiple step ramps or exponential ramps.
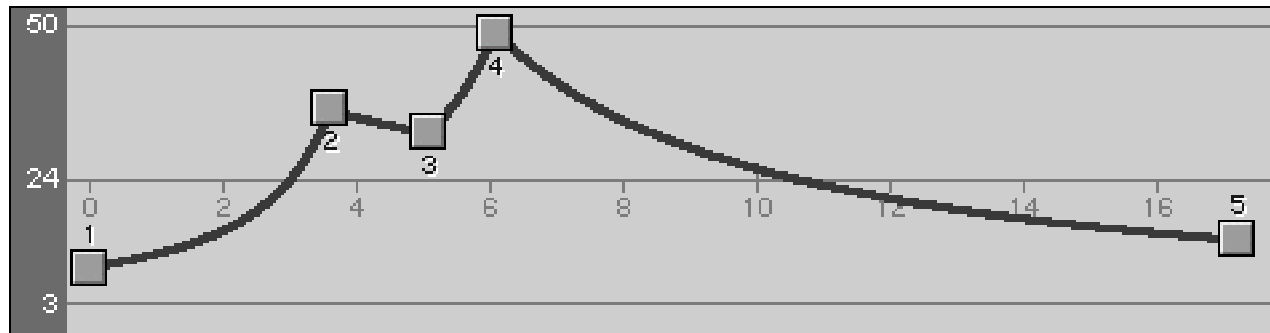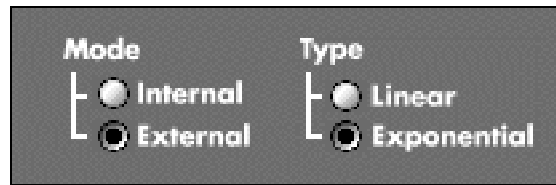
What is a Linear Ramp?

Until the Ramp Preview Controller (RPC), all ramps were linear. A linear ramp has a constant rate of change. On a graph, a linear ramp is represented by a straight line. Linear ramps should be used when the fastest ramp duration is desired.
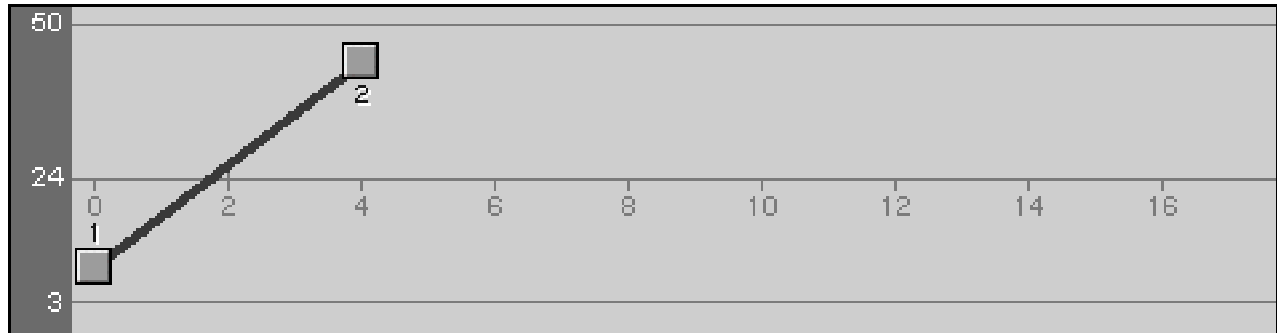
What is an Exponential Ramp?

Even though linear ramps can have the shortest duration, they have one disadvantage. Assuming a ramp going from a slow to a fast speed, the perceived effect (change in the speed of motion) will be very pronounced in the beginning of the ramp, with very little effect visible in the remainder. This is due to the fact that as the shooting fps increases, playback takes exponentially longer. This disadvantage becomes more apparent the longer the ramp duration and the higher the top fps is.

To counter this effect, the ramp itself needs to be exponential. By their very nature, exponential ramps take longer than linear ramps. During playback, though, an exponential ramp will show the effect of changing the speed of motion smoothly over the whole duration of the ramp.
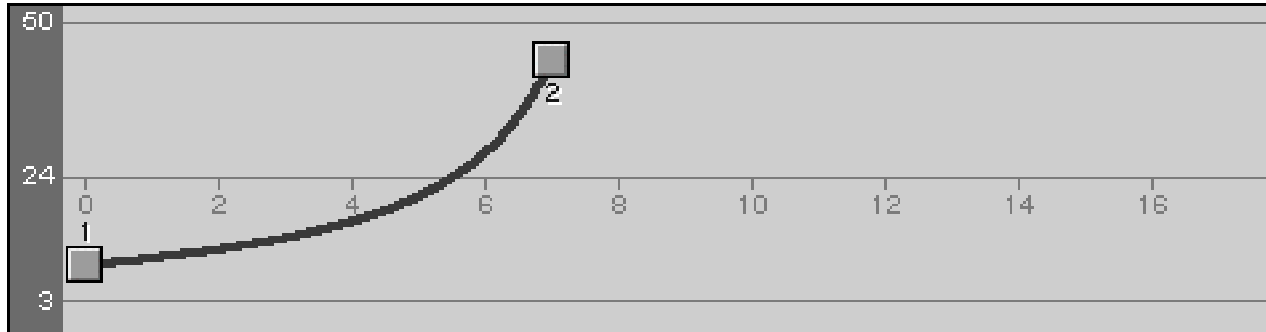
What is Shoot Time?

Shoot time is the amount of time it takes to shoot an event. If, for instance, a car drives in 4 seconds from point A to point B, shooting this event will also take 4 seconds, no matter what fps rate the camera is running at.
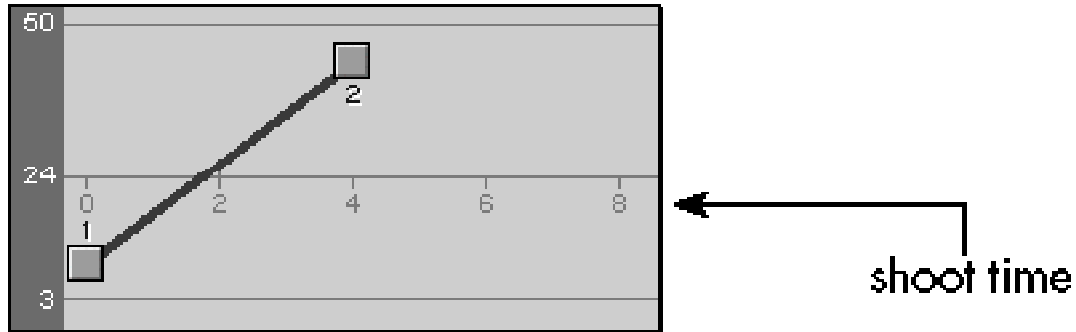
What is Screentime?

Screentime is the time it takes to playback a length of film. It is the time the event filmed will be visible on screen. Screentime is determined by shoot time, shooting fps, and playback fps.

If our car driving for 4 seconds was shot at 24 fps and played back at 24 fps, screentime would also be 4 seconds. If, on the other hand, the car was shot at 48 fps, we would have generated twice as much film in those 4 seconds of shoot time. Playback at 24 fps, then, would result in 8 seconds of screentime.

The ramp in the figure below will take 4 seconds to shoot, but when played back at 24 fps will take 4.4 seconds.
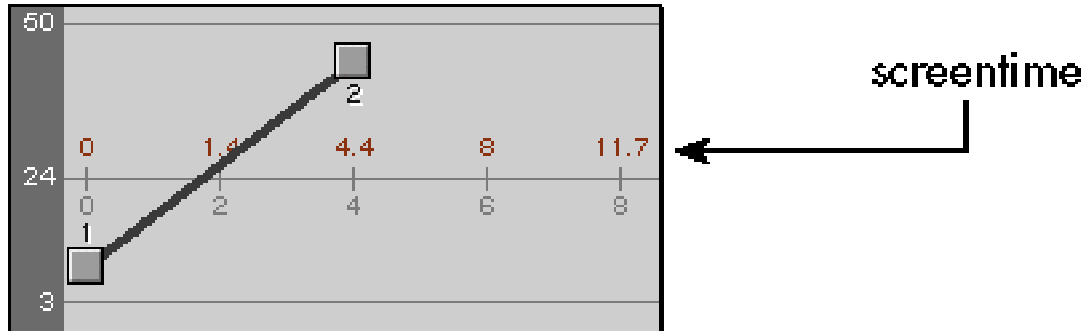
What is a Reverse Ramp?

A "Reverse Ramp" is a ramp during which the camera runs at reverse speeds. Currently only internal ramps can be run in reverse.

To use Reverse Ramps:

535B, 435 & 435ES

1. Create an internal ramp with the RPC, LCC or CCU.
2. Send it to the camera.
3. Set the camera to a reverse speed.
4. Push the PROG button on the camera to activate the ramp.
5. Run the camera, and push the PROG button again when you want to start the ramp.

16SR 3, 16SR 3 HS

No reverse ramps are possible, since the 16SR 3 does not run in reverse.

535

Reverse ramps are not possible since the 535 does not allow a speed change while running in reverse.

What is Exposure Compensation?

As the camera's frame rate changes during a ramp, so does the exposure for each frame. To keep the exposure constant, some form of exposure compensation has to occur.

The 535 and 435ES can compensate by varying the open angle of their electronic mirror shutter while the camera is running. This is called a speed/shutter ramp. Below is a graphic of an electronic shutter set to an open angle of 90°.

On the 535, 535B, 435, 435ES and 16SR 3, as well as on the 16SR 1 & 2 and 35-3 type cameras, the Iris Control Unit (ICU) can be used to compensate for the exposure change. The ICU will slave to the speed of the camera and vary the lens iris opening accordingly. This is called a speed/iris ramp.

CAMERA

ICU tells lens motor to change iris ring

Camera changes fps

ICU
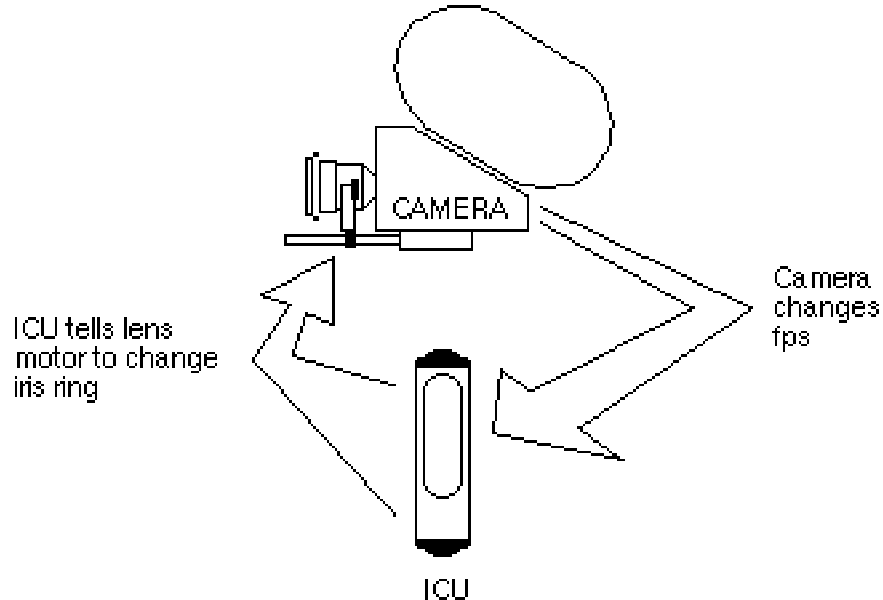
Please note that compensating for the exposure change with either method has certain advantages and disadvantages:

1. When compensating with the electronic mirror shutter, there could be a strobing effect during a fast pan while the mirror shutter is set to a small angle. The image will also be very sharp (little motion blur) at small shutter angles.

2. When compensating by changing the lens iris with the ICU, the depth of field will change. The depth of field will not change when compensating with the electronic mirror shutter.

It is of course also possible to run a ramp without any exposure compensation. In that case the image will get brighter as the camera's fps decreases, or darker as the camera's fps increases.

Can I use HMIs During Ramps?

Disclaimer: ALWAYS shoot a test to verify that everything is OK.

That said, it is OK to shoot ramps when using HMI lights with an electronic ballast set to flicker free mode. Using HMIs with a magnetic ballast is not recommended, because flicker will be visible on film.

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