

TN010: Using a Camera Link Trigger & FireBird Timers

Summary

This is a step-by-step guide to trigger area scan GenCP compatible cameras from ActiveCapture using a CC1 Camera Link trigger & FireBird internal timers A1 (period) and M1 (pulse width).

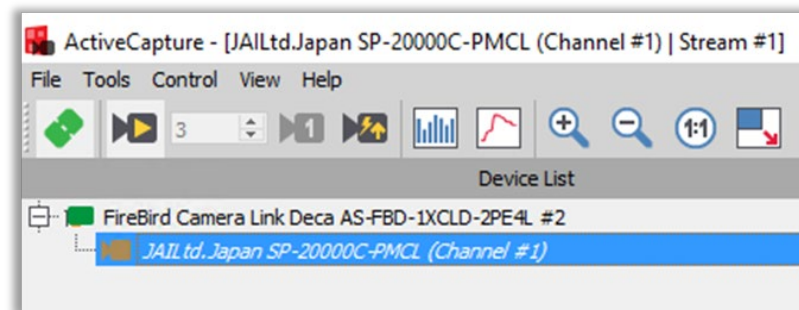
Compatibility: All FireBird Camera Link boards
Software required: ActiveCapture v1.5.7 onwards
Windows installer required: All Camera Link installers from v1.5.0 onwards

Variation for non-GenCP cameras

This example uses a GenCP compatible camera and therefore the camera's name is displayed in the 'Device List', as shown below.

The same procedure applies if a proprietary GenICam Camera Link DLL is installed. This must be supplied by the camera manufacturer and setup via our GenTL setup utility as described in the FireBird QuickStart guide.

If a non-GenICam camera is used instead, the same trigger settings for the Frame Grabber tab can be used. The camera settings, however, will need to be controlled via the manufacturer's own application software, this is shown in Technical Note 013.



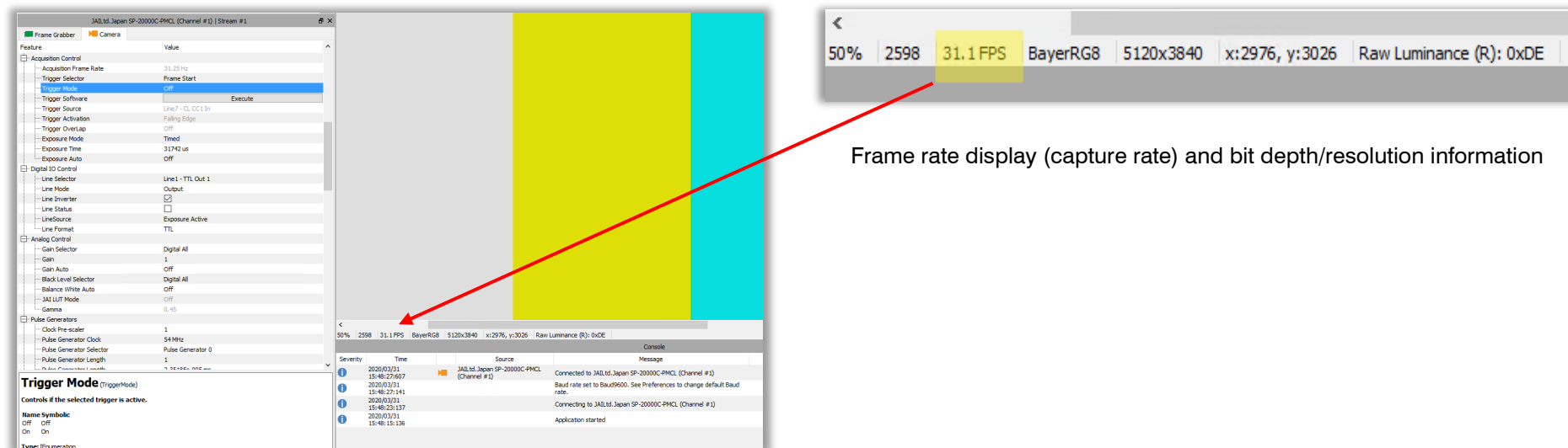
ActiveCapture connected to a GenCP compatible JAI SP-20000C-PMCL camera

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Get a live image

Connect to the camera in ActiveCapture after first setting up the GenTL connection, as described in the FireBird QuickStart guide included with the Windows installer and available on our [website](#). Once connected, live images should be obtained to check that the camera tap mode setting is correct, that the image is undistorted and correctly proportioned.

Also, make a note of the frame rate displayed at the bottom of the image window in frames per second (FPS), which is the acquired frame rate from the camera, whilst free running using the camera's own internal timing. The value shown below is 31.1 FPS for this 20MP camera using its internal trigger. This value will be used later when comparing to the externally triggered frame rate that we can control using the FireBird timers.

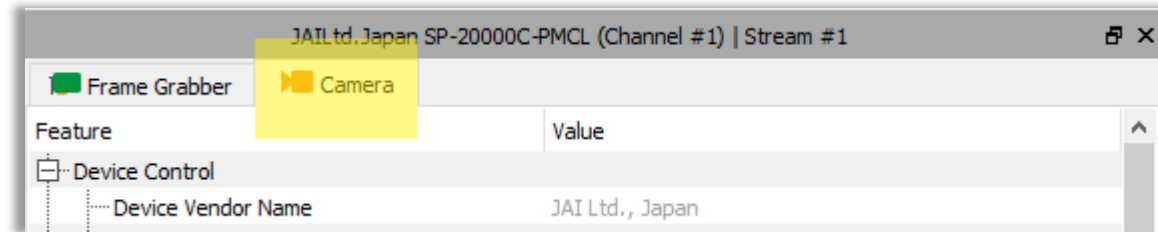


The screenshot shows the ActiveCapture software interface. On the left is a 'Features' panel with various settings like Acquisition Frame Rate, Trigger Selector, and Line Selector. The main window displays a live image of a yellow and blue pattern. At the bottom of the image window, a status bar shows: 50% 2598 31.1 FPS BayerRG8 5120x3840 x:2976, y:3026 Raw Luminance (R): 0xDE. A red arrow points from the '31.1 FPS' value to a callout box on the right.

Frame rate display (capture rate) and bit depth/resolution information

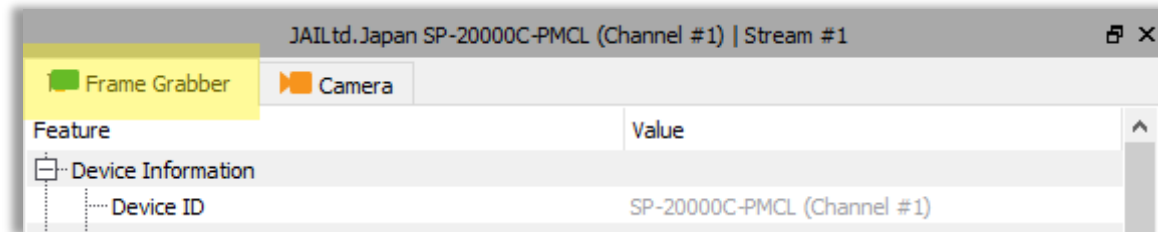
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The configuration of both the FireBird frame grabber and the camera are set up by using drop down menus in the ActiveCapture GUI. The controls for the camera and FireBird board are shown in separate tabs in ActiveCapture, as indicated below.



Feature browser 'Camera Tab' when connected to a JAI SP-20000C-PMCL camera

Note: The 'Camera Tab' feature browser will only appear when a GenCP compatible camera is used or a proprietary Camera Link DLL is installed.

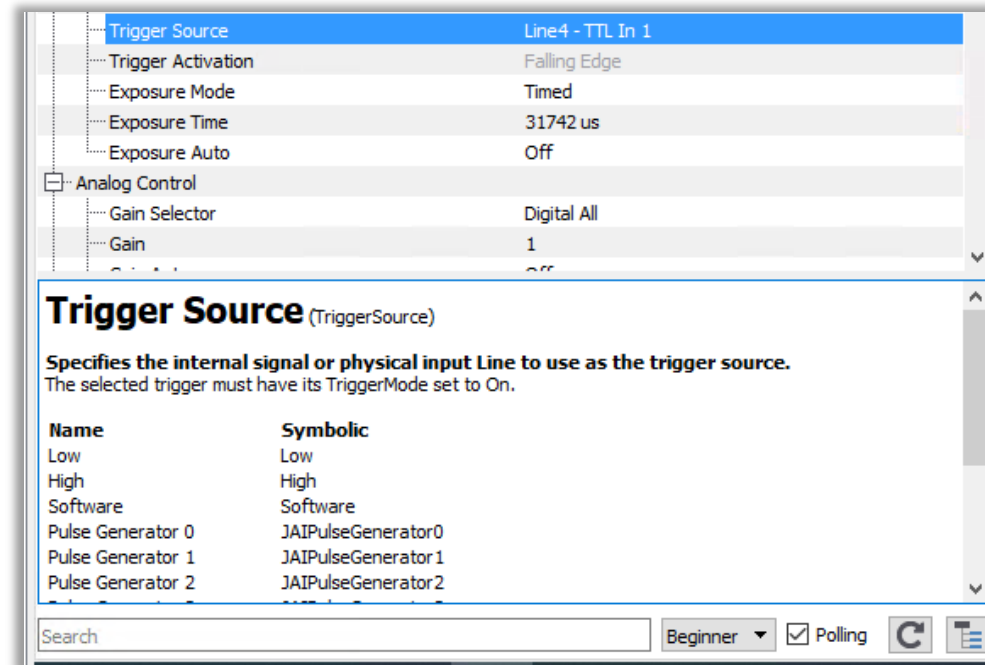


Feature browser 'Frame Grabber Tab' when connected to a FireBird board

Configuring the camera for external trigger input

Referring to the documentation supplied by the manufacturer of your camera, including that listed in the help built into the feature browser (see the screenshot on the next page), find the available options for external trigger input via the Camera Link interface. Typical settings on offer could be configuring the trigger source to be one of the four dedicated Camera Link CCout1-4 trigger lines. Other options could be to trigger on a rising edge signal, falling edge or on both edge types at the same time, i.e. any edge will initiate a trigger event in the camera.

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Feature browser built-in help

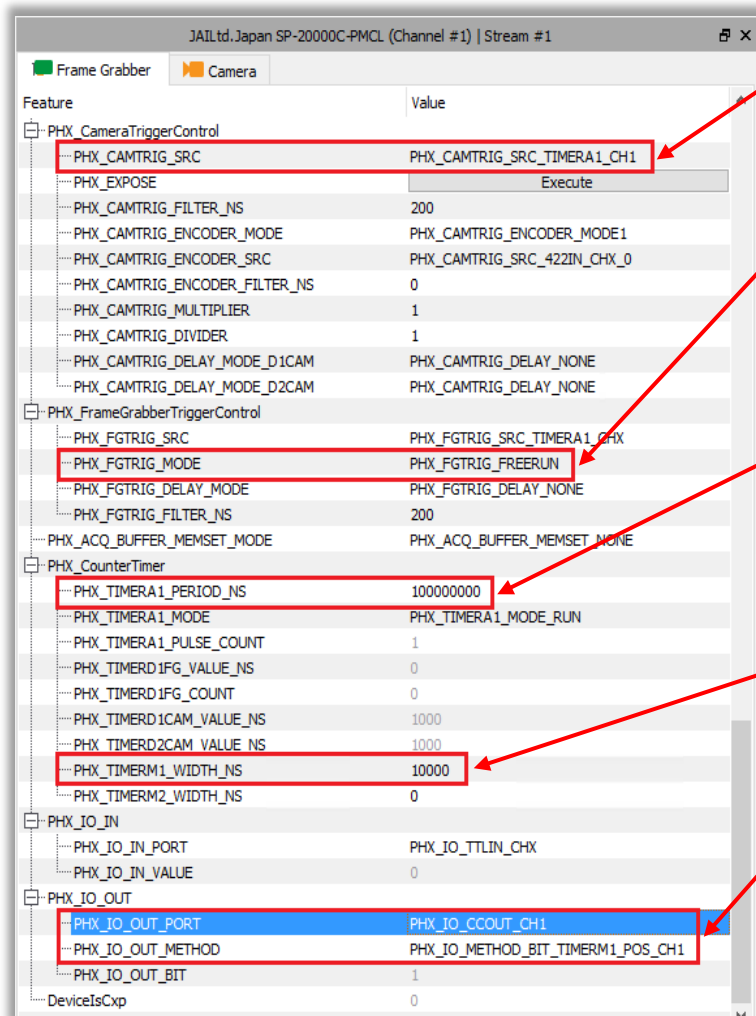
Make a note of these settings, as they will be used next to configure the FireBird board's output to match the camera trigger input and enable triggering via the FireBird board using the Camera Link cable.

Configuring the FireBird board in the Frame Grabber tab

The next step is to set up the FireBird board to output a trigger signal to the camera via the Camera Link cable. The period of the signal must be defined to control the pulse repetition rate supplied to the camera and in turn to control its frame capture rate.

See the screenshot on the next page.

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This feature sets the camera trigger source to be the FireBird's internal timer A1. It is this timer that will be used to control the camera frame rate via its period setting.

This feature ensures that frame grabber triggers are ignored. By setting this to "Free Run" mode, its settings will have no effect on the acquisition and only the camera trigger is used with the frame grabber slaved to the camera's output timing.

The timer period A1 is set to output a square wave at 10Hz (period 100ms/1E8ns), which is the target frame rate we want to achieve in this example. Note: This can only be obtained however, if the camera is capable of at least this frame rate in the current tap mode and Camera Link clock frequency settings. If the camera is first tested in Free Run mode without any external trigger input using its own internal triggering reference and it runs at a greater frame rate than the trigger rate required from the A1 timer, then this will work. In the example discussed here, the camera in Free Run mode produces live images at ~31Hz and so the 10Hz external trigger is well within that limit.

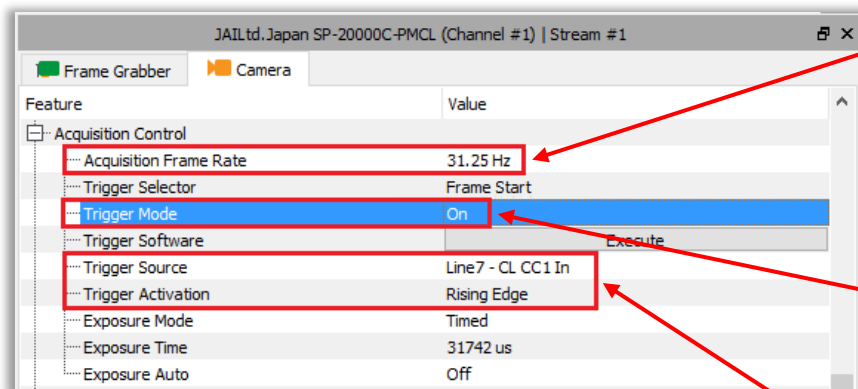
This feature sets the pulse width (in nanoseconds) sent to the camera with a 10Hz pulse repetition frequency. In this case the pulse width is fixed to 10μsec (1E4ns) using the additional timer M1.

Next, the timer output pulses must be routed up the Camera Link (CL) cable and into the camera head, where the camera can use this for its trigger timing. This is achieved by setting one of the four CL trigger lines (CCOUT1-CCOUT4), CCOUT1 in this example, to be the output of our FireBird Timer A1(M1). Most CL cameras will use CCOUT1 as their primary trigger input via the Camera Link interface, but CC2 is also often used for other functionality. In the next line we define the polarity of the pulse and this is set to use a positive edge in this example. A negative edge could be used if required by the camera.

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Camera setup via the Camera tab

The camera must be configured to be externally triggered via the CC1 CL trigger input, which is controlled via the Camera tab of the feature browser, as shown below. The GUI setup will vary slightly between camera models and different manufacturers, but it will follow a similar layout. Refer back to the documentation supplied by the manufacturer of your camera, including that listed in the help built into the feature browser.



This feature shows the camera acquisition frame rate with the camera free running, internally triggered using its own timing. In this case it is also the maximum frame rate possible for this camera in this tap mode and for this Camera Link clock frequency setting. The external trigger rate must not exceed this rate, or triggers will typically be ignored and the target frame rate not achieved.

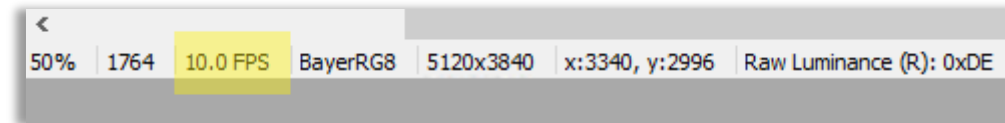
This feature sets the camera's external trigger and is set to ON. It should be noted that if no valid external trigger signal is received, either via the Camera Link cable or directly into the camera head (for some models that support this), the camera will not output any video and no live image can be obtained.

With a valid trigger input applied, a 'live video' can only be obtained when the trigger signal is present. In this line, we define the source of the external trigger input to the camera to be 'CC1 In', i.e. one of the dedicated Camera Link lines from the frame grabber to the camera via the Camera Link cable. The trigger can occur on either a rising or falling edge on CC1 and here it is set to use a rising edge.

The camera will now trigger from the CC1 trigger input using the FireBird's internal timer A1 (signal period) and using M1 for its pulse width.

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Selecting 'Live Acquisition' from ActiveCapture's ribbon will show the camera operating at 10Hz, as shown below.

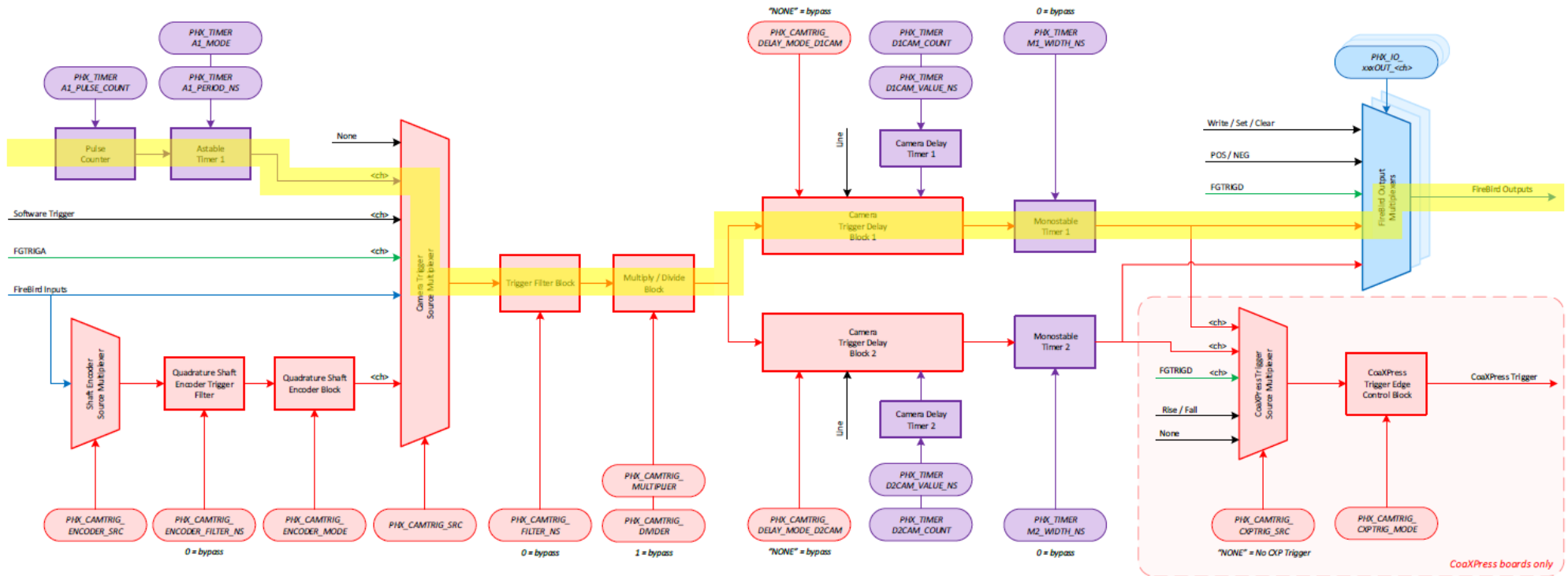


ActiveCapture running with the camera acquiring images at 10Hz (10 FPS) triggered via FireBird's internal timer

For more information on trigger scenarios, please refer to the 'FireBird System Manual' included in the installed documentation.

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Trigger configuration path indicated in yellow:



Camera Trigger Block Diagram per Channel

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