

MIRI Detector Readout Fast

JWST's MIRI **FAST** mode detector readout pattern is the default readout mode for [imaging](#), [low-resolution spectroscopy](#), and [coronagraphy](#). For [subarray](#) imaging and target acquisition, **FAST** mode is the only available readout pattern.

Introduction

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FAST¹ mode provides short MULTIACCUM exposures to maximize dynamic range and minimize noise in a background-dominated regime. **FAST** mode is the default readout mode for [imaging](#), [low-resolution spectroscopy](#), and [coronagraphy](#), and is the only mode available for [subarray](#) imaging.

Following [MIRI readout terminology](#), **FAST** mode obtains one sample of a pixel ($N_{\text{sample}} = 1$; $t_1 = 1 \times 2.775 \text{ s} = 2.775 \text{ s}$) and returns it to the ICDH (ISIM Command and Data Handling [ICDH]; ISIM is Integrated Science Instrument Module).

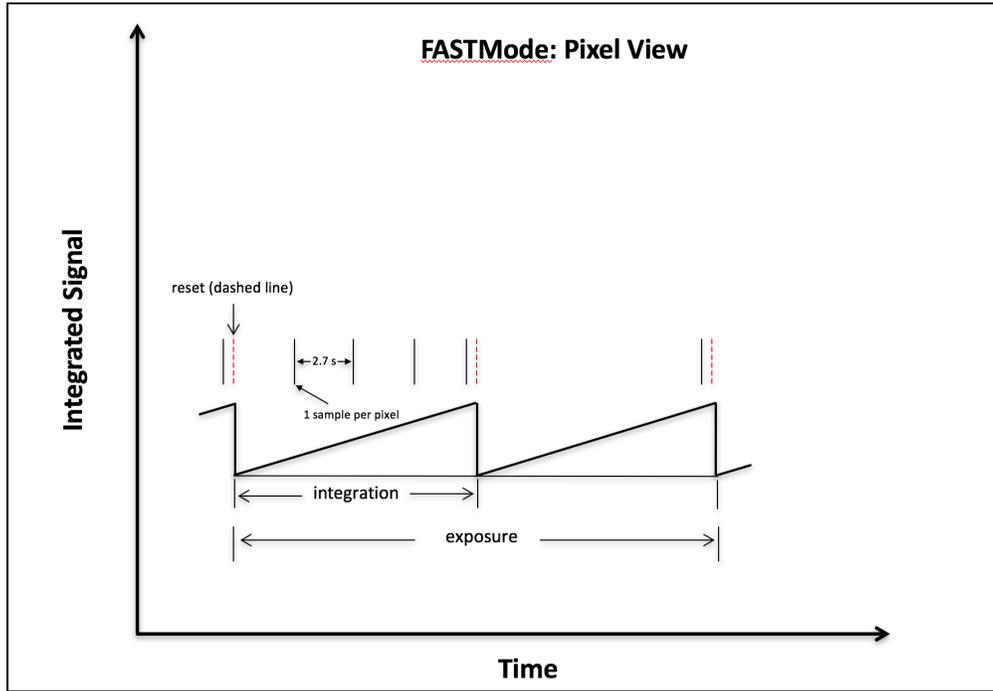
$N_{\text{sample}} = 1$ is a fixed parameter in **FAST** mode and cannot be altered by the observer. **FAST** mode currently requires a minimum of four groups ($N_{\text{groups}} = 4$) per integration to optimize the slope-fitting algorithm. The user can alter the number of groups (N_{groups}) and integrations (N_{int}). All groups will be stored and downloaded.

¹ ***Bold italics*** font style is used to indicate parameters, parameter values, and/or special requirements that are set in the APT GUI.

Pixel perspective

From a pixel's point of view, **FAST** mode patterns will start with a read-reset frame, followed by $N_{\text{groups}} - 1$ non-destructive frames while integrating. The focal plane electronics (FPE) dwells at each pixel for $N_{\text{sample}} = 1$ (10 μs total). The time between sampling the pixel is $t_1 = 2.775 \text{ s}$ because the entire sensor chip assembly (SCA) is read before returning to the pixel. The integration ends with a read-reset after the specified number of N_{groups} and this integration timing pattern may be repeated N_{int} times for an exposure.

Figure 1. Sampling up the ramp FAST mode readout scheme seen from a single pixel's point of view



The sampling up-the-ramp FAST mode readout scheme, as seen from a single pixel's point of view for $N_{\text{sample}} = 1$, $N_{\text{groups}} = 4$, and $N_{\text{int}} = 2$. The x-axis is time and the y-axis is voltage or signal strength. Each black vertical tick mark notes a read of the pixel and each red vertical tick mark notes a reset of the pixel. In this scheme, each reading of a pixel will have only one sample at each pixel. The time to read an entire frame is ~ 3 s and there is only one frame per integration.