

Understanding Exposure Times

All JWST detectors integrate using the MULTIACCUM readout, which consists of up-the-ramp sampling that utilizes a combination frames, groups, integrations, and exposures to arrive at a total exposure time.

See also: [MIRI Detectors](#), [NIRCam Detectors](#), [NIRISS Detectors](#), [NIRSpec Detectors](#)

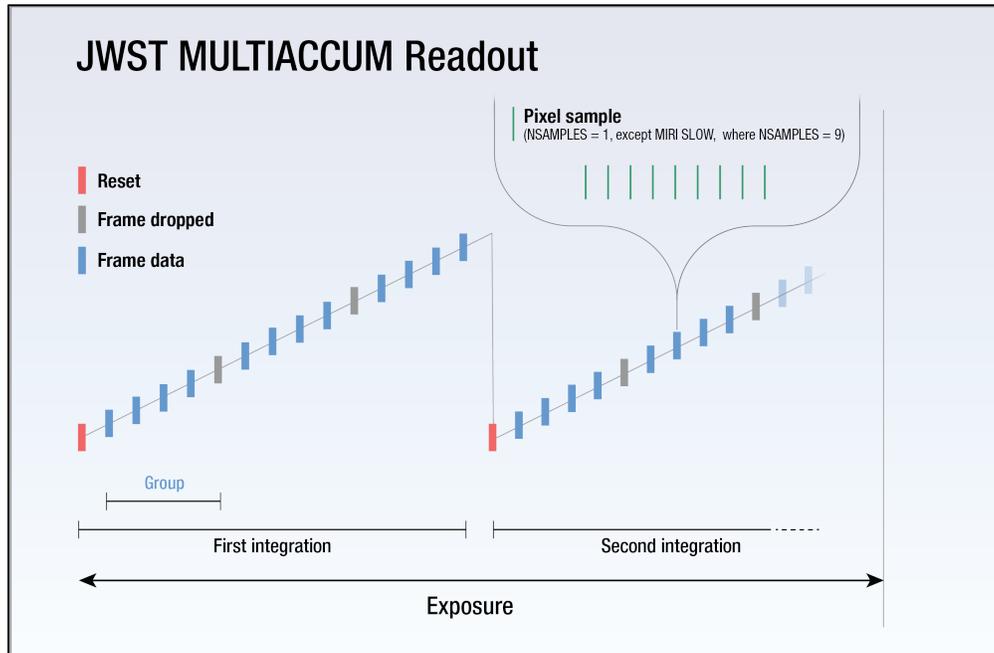
How MULTIACCUM readouts Work

The MULTIACCUM readout is the standardized readout sampling for all JWST detectors. In MULTIACCUM readout, the array is read out non-destructively at intervals defined by the parameters described below during the exposure. Multiple non-destructive "frames" can be averaged by the onboard flight software into a "group" and transferred to the [solid state recorder](#) for downlinking to the ground. The ground-based data processing software can then correct bias drifts using the reference pixels and use "up-the-ramp" [processing algorithms](#) to reject cosmic rays. The MULTIACCUM approach is quite flexible since it allows for a large range of readout patterns, while permitting teams to subselect a relatively small set of optimal patterns for observations in flight. Figure 1 illustrates the components of each MULTIACCUM exposure:

1. NFRAMES is the number of frames per group.
2. NGROUPS is the number of groups per integration.
3. NINT is the number of integrations per exposure.
4. For MIRI only, [NSAMPLE](#) is the number of samples per pixel per frame.

For [MIRI](#), users will have some degree of freedom in choosing these parameters. For [NIRSpec](#), [NIRCam](#), and [NIRISS](#), users will select a patterns from a menu of available exposure options that are optimized for different types of targets.

Figure 1. Generic MULTIACCUM readout scheme for each exposure



A generic illustration of the MULTIACCUM readout scheme used by all JWST detectors. Each exposure consists of some combination of samples, frames, groups, and integrations. The specifics available for each instrument and readout mode, however, can vary. Proposers must refer to specific instrument detector pages for details.

References

[Ressler, M. E. et al. 2015, PASP, 127, 675](#)

The Mid-Infrared Instrument for the James Webb Space Telescope, VIII: The MIRI Focal Plane System