
WFC3 Detector Timing for Scan Mode Observations

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December 16, 2016

1 BASIC DATA

Key data for calculating the read/resetting rate for WFC3 detector.

Table 1: WFC3 detector read/reset rate

subarray	readout time (theoretical)	readout time (measured)	readout speed per row (s^{-1})
64x64	0.011	0.04	800
128x128	0.045	0.092	696
256x256	0.1825	0.257	498
512x512	0.730	0.832	308

2 DERIVATION

2.1 EXAMPLE: DOWN STREAM SCAN, NO MID LINE PASSING

$$y_{10} = \frac{v_r - v_s}{v_r} y_1 \tag{1}$$

$$y_{20} = \frac{v_r - v_s}{v_r} y_2 \tag{2}$$

$$L_0 = y_{20} - y_{10} \tag{3}$$

Table 2: Parameter definitions

Names	Definition
exptime	exposure time, the time between the start of the reset and the start of the last read
S_0	planned scan length, scan length from the start of the zeroth read and the start of the last read
L	array size
y_{10}	pointing position when the reset starts
y_1	pointing position when the reset past the telescope pointing position, real start of scan
y_{20}	pointing position when last read starts
y_2	read end of the scan
v_s	scan speed (row/s)
v_r	read/reset speed

Therefore

$$S = y_2 - y_1 = \frac{v_r}{v_r - v_s} S_0 \quad (4)$$

3 LIST OF SCAN LENGTH

- Down stream scan, no mid line passing

$$S = \frac{v_r}{v_r - v_s} S_0$$

- Up stream scan, no mid line passing

$$S = \frac{v_r}{v_r + v_s} S_0$$

- Mid Line passing

$$S = \frac{v_r}{v_s + v_r} S_0 + \frac{v_s}{v_s + v_r} L - 2 \frac{v_s}{v_s + v_r} (L - y_1)$$

or

$$S = \frac{v_r}{v_s + v_r} S_0 + \frac{v_s}{v_s + v_r} L - 2 \frac{v_s}{v_s + v_r} y_1$$