

HIGH SPEED FLASH

Hi-speed flash units, **1/30,000** of a second plus, are of three types, one is a dedicated ultra high voltage unit, with a special gas mixed flash tube. The unit's expected flashtube life is about 2,000 flashes. The second type is to use a standard flash circuit that the capacitor bank is under voltage and/or capacitor made smaller by capacitor bank switching. The under voltage mode and/or smaller capacitor size can exhibit afterglow. An afterglow is caused by the flash tube, discharging the capacitor to a voltage across the flash tube that will not support the arc. This afterglow can have as much total power as the wanted flash. This afterglow can add a decreasing light after the main flash pulse, to flash tube extinction of arc. The third type uses a second internal gas tube is used to abort the primary flash, by pulsing the primary flash tube's power off. This abruptly removes the available power, voltage and current for the primary flash tube. No power for afterglow. Thus sharper high-speed pictures can be taken, with a conventional flash unit. Also has battery saving circuit, if designed correctly.

The recommended flash for the **1/16,000** to **1/30,000** of the second gas tube type is **Vivitar's 283/285's**, also battery power saving flash unit. Paul of Hue Candela recommends the **Vivitar 285** for best all over camera-mounted flash unit. Price is reasonable, replacement units are easy to find, power control module comes with the **285** flash at no extra charge, full power [M] at $1/1,000 = 60$ W-S, $1/2$ power at $1/2,000 = 30$ W-S, $1/4$ at $1/4,000 = 15$ W-S, $1/16$ at **1/16,000** = 3.75 W-S, an adjustable flash distance head, a wide angle spreading lens for 28mm lens pictures, also slide in area for the lens can be used for color filters with very low light leaks, electronics of good design [around for 6+ years], with battery life foremost requirement, and a two year guarantee comes from Vivitar with each flash unit. The flash unit can operate to **1/30,000** a second by auto mode, with close up reflection in to the thyristor circuitry, or by an added resistor module in place of the power control module. Hue Candela has made an encapsulated small printed circuit board, which replaces the sensor in the **285's** power control module. This module makes the **285** think, it needs, to operate at **1/30,000** a second for correct light to the subject. **Vivitar** also makes **VP-1** Vari-Power

Adapter has dial in values of Full, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$ output power for **283** units, with maximum speed of **1/30,000** of a second. Note the **285** power control module is missing $\frac{1}{8}$, $\frac{1}{32}$, and $\frac{1}{64}$.

A flash of the **283/285** family goes to maximum output power, that is the tube at any instant during flash on time is at, or near maximum power dissipation, which is **60,000 watts** per flash unit. By adjusting the time of the firing of primary flash tube to firing of the gas tube, the total flash power out is set. This means a 1/1,000 flash at **1/16,000** a second has only 1/16 of rated maximum power, available during the flash on time. Or another view is 60 watt-seconds / 16 equals 3.75 watt-seconds of power available for image activation on the film per **283/285** unit. This translates into a decrease 4 f-stops less light. M to $\frac{1}{2}$ = +1 f-stop, M to $\frac{1}{4}$ = +2 f-stops, M to $\frac{1}{8}$ = +3 f-stops, and **M to $\frac{1}{16}$ = +4 f-stops**, and M to $\frac{1}{30}$ = +5 f-stops. One flash unit = reference power, two flash units = -1 f-stop, 4 flash units = -2 f-stops, **8 flash units = -3 f-stops**, and 16 flash units = -4 f-stops. The peak output power for **Lighting Strobe** is **480,000 watts** during the flash duration time for 8 flash units with overlapping light. By using eight flash units at **1/16,000**, **30 watt-seconds** of power an increase of -3 f-stops, net loss over one flash +1 stop for **1/16,000**, +2 f-stops for **1/30,000** a second. For hi-speed close-up work the 2 f-stops can be null out by using ASA 400 film instead of ASA 100 film. At **1/30,000** a second the total image power is about **16 watt-seconds**, which is **480,000 watts** for **1/30,000** a second for one **Lighting Strobe**. Not as much output as a dedicated ultra hi-speed flash, but a reasonable flash source for close-up pictures, 3-10 feet. Two **Lighting Strobe** have **~ 1,000,000 watts** for **1/30,000**. For one 8 flash **Lighting Strobe** five feet flash to subject, f 16 with a low reciprocity film as **Fujicrome Sensia 400 film**. This positive film has low reciprocity law failure at **1/30,000** of a second, and very low color shift for under exposed film. Most film hits reciprocity law failure at 1/3,000 of a second, and large color shift for the under exposed film.

The nice part is that the camera mounted flash units can do other duties as on camera flash unit, for slave flash, in **Lighting Strobe** as a high power portable flash, and shadow detail flash.

Tables for single and arrayed camera mounted flash used for high-speed pictures

The table below is composed of many separate tables that together give the f stop for 1 and 2- 512 arrayed flash units.

1. The orange field is the manufacture's flash speed and f stop at ASA 100 at maximum output one flash unit.
2. The dark blue fields are the f stop change for the flash to subject distances at fractional output power of one flash unit.
3. The light blue fields are the f stop change for the flash to subject distances at 1/30 output power of one flash unit for ASA 100.
4. The yellow fields are pacific to Vivitar 283/285 camera mounted flash units. That is the f stop change as the flash on time is shortened.
5. The green fields have the f stop values that are corrected for close in flash to subject distance. Note Camera to subject has no effect on f stop.
6. The violet fields display the arrayed flash units correct for total output power at 1/ 30,000 a second for different ASA film speeds for 8 flash units fired.
7. The red field is for highly modified flash unit. Note film reciprocity enters in at 1/10,000 a second for some films, after 1/3,000 most films .

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01 Oct 01

To use table find film ASA in right table. Go down to number of flash units used. Using that row go to the left table and find the distance of the flash to subject. At the cross point of number of flash units and distance is the suggested f stop your picture.

Flash	Vivitar	Output power	f stop for different flash speeds and distances. ASA 100 film						
	283/285		28ft	20ft	14 ft	10ft	7.0ft	5.0ft	3.5ft
Units with pwr setting	unit used FLASH on time								
16 at M		960 WS	16	22	32	45	64	96	128
8 at M		480 WS	11	16	22	32	45	64	96
4 at M		240 WS	8.0	11	16	22	32	45	64
2 at M		120 WS	5.6	8.0	11	16	22	32	45
1 at M	1 / 1,000	60 WS	4.0	5.6	8.0	11	16	22	32
1 at 1/2	1 / 2,000	30 WS	2.8	4.0	5.6	8.0	11	16	22
1 at 1/4	1 / 4,000	15 WS	2.0	2.8	4.0	5.6	8.0	11	16
	1 / 8,000	7.5 WS	1.4	2.0	2.8	4.0	5.6	8.0	11
1 at 1/16	1 / 16,000	3.75 WS	1.0	1.4	2.0	2.8	4.0	5.6	8.0
Auto	1 / 30,000	1.9 WS		1.0	1.4	2.0	2.8	4.0	5.6
	1 / 60,000	0.8 WS			1.0	1.4	2.0	2.8	4.0

Vivitar 283/285 flash units required at 1 / 30,000 second for output to match distance table for ASA 50 - 3200						
50	100	200	400	800	1600	3200
1024	256	256	128	64	32	16
512	128	128	64	32	16	8
256	128	64	32	16	8	4
128	64	32	16	8	4	2
64	32	16	8	4	2	1
32	16	8	4	2	1	
16	8	4	2	1		
8	4	2	1			
4	2	1				
2	1					
1						

Note Vivitar 283 and 285 on auto and maximum feedback have speed of 1/ 30,000 of a second per Vivitar. In Telephoto setting correct total stop value as single stop value. Example if 1/2 stop gain in telephoto mode the total bank gains 1/2 stop of light. If all flash outputs over lap at subject.