RED

QUICK REFERENCE GUIDE

For RED EPIC and SCARLET cameras equipped with the Mysterium X Sensor

Red Epic and Scarlet Quick Reference Guide

introduction:

I have created and compiled many of my notes, data sheets, quick reference cards, and general information regarding shooting with the Red Epic and Red Scarlet cameras. The purpose of this guide is to share among Red owners, shooters, and others to use to help understand how to operate and get the most out of the cameras. Distribute this document freely, but not for commercial resale use. Including this with rental packages is just fine. I will be adding to this as new firmware, information, and sensors become avaialbe and effect the camera's operation.

Phil

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version 1.2 - 12.12.2012

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Red Epic X/M Data Sheet

This data sheet is designed to be a quick reference card for the Epic (both M and X) equipped with the Mysterium X sensor.

RED EPIC X/M DATA SHEET

RECORDING FORMATS AND FRAME SIZE

- 5K Full (5120 x 2700)
- 5K WS (5120x2160)
- 4K Full (4096 x 2160)
- 3K Full (3072 x 1620)
- 2K Full (2048 x 1080)
- 2K WS (2048x854)
- 1K WS (1280x480)
- 1K HD (1280x720)
- 2K HD (1920x1080)
- 3K HD (2880x1620)
- 4K HD (3840x2160)
- 5K HD (4800x2700)

FF35 LENS FOV CROP FACTORS

FF35mm 1x	5K Full 1.30x	4K Full 1.62x	3K Full 2.17x	2K Full 3.25x	1K WS 5.51x
8mm	10mm	13mm	17mm	26mm	44mm
10mm	13mm	16mm	22mm	32mm	55mm
11mm	14mm	18mm	24mm	36mm	61mm
12mm	16mm	19mm	26mm	39mm	66mm
14mm	18mm	23mm	30mm	46mm	77mm
16mm	21mm	26mm	35mm	52mm	88mm
18mm	23mm	29mm	39mm	58mm	99mm
20mm	26mm	32mm	43mm	65mm	110mm
21mm	27mm	34mm	46mm	68mm	116mm
24mm	31mm	39mm	52mm	78mm	132mm
25mm	32mm	40mm	54mm	81mm	138mm
27mm	35mm	44mm	59mm	88mm	149mm
28mm	36mm	45mm	61mm	91mm	154mm
32mm	42mm	52mm	69mm	104mm	176mm
35mm	46mm	57mm	76mm	114mm	193mm
40mm	52mm	65mm	87mm	130mm	220mm
50mm	65mm	81mm	108mm	162mm	276mm
60mm	78mm	97mm	130mm	195mm	331mm
65mm	84mm	105mm	141mm	211mm	358mm
75mm	98mm	122mm	163mm	244mm	413mm
85mm	110mm	138mm	184mm	276mm	468mm
80mm	104mm	130mm	174mm	260mm	441mm
90mm	117mm	146mm	195mm	292mm	496mm
100mm	130mm	162mm	217mm	325mm	551mm
135mm	176mm	219mm	293mm	439mm	744mm
150mm	195mm	243mm	326mm	488mm	826mm
180mm	234mm	292mm	391mm	585mm	992mm
200mm	260mm	324mm	434mm	650mm	1102mm
300mm	390mm	486mm	651mm	975mm	1653mm
400mm	520mm	648mm	868mm	1300mm	2204mm
500mm	650mm	810mm	1085mm	1625mm	2755mm
600mm	780mm	972mm	1302mm	1950mm	3306mm
800mm	1040mm	1296mm	1736mm	2600mm	4408mm

RECORDING TIMES (MIN)

128GB SSD - 24 fps 5K Full	128GB SSD - 24 fps 4K Full
14 @ 3:1	22 @ 3:1
23 @ 5:1	36 @ 5:1
28 @ 6:1	43 @ 6:1
33 @ 7:1	50 @ 7:1
38 @ 8:1	58 @ 8:1
47 @ 10:1	72 @ 10:1
56 @ 12:1	86 @ 12:1

MAX FPS

Format	FPS
5K FF	96
5K WS	121
4K	121
4K HD	121
3K	160
2K WS	303
1K WS	400

Scarlet X Data Sheet

This data sheet is designed to be a quick reference card for the Scarlet X equipped with the Mysterium X sensor.

RED SCARLET X DATA SHEET

RECORDING FORMATS AND FRAME SIZE

- 5K Full (5120 x 2700)
- 5K WS (5120x2160)
- 4K Full (4096 x 2160)
- 3K Full (3072 x 1620)
- 2K Full (2048 x 1080)
- 2K WS (2048x854)
- 1K WS (1280x480)
- 1K HD (1280x720)
- 2K HD (1920x1080)
- 3K HD (2880x1620)
- 4K HD (3840x2160)
- 5K HD (4800x2700)

FF35 LENS FOV CROP FACTORS

FF35mm 1x	5K Full 1.30x	4K Full 1.62x	3K Full 2.17x	2K Full 3.25x	1K WS 5.51x
8mm	10mm	13mm	17mm	26mm	44mm
10mm	13mm	16mm	22mm	32mm	55mm
11mm	14mm	18mm	24mm	36mm	61mm
12mm	16mm	19mm	26mm	39mm	66mm
14mm	18mm	23mm	30mm	46mm	77mm
16mm	21mm	26mm	35mm	52mm	88mm
18mm	23mm	29mm	39mm	58mm	99mm
20mm	26mm	32mm	43mm	65mm	110mm
21mm	27mm	34mm	46mm	68mm	116mm
24mm	31mm	39mm	52mm	78mm	132mm
25mm	32mm	40mm	54mm	81mm	138mm
27mm	35mm	44mm	59mm	88mm	149mm
28mm	36mm	45mm	61mm	91mm	154mm
32mm	42mm	52mm	69mm	104mm	176mm
35mm	46mm	57mm	76mm	114mm	193mm
40mm	52mm	65mm	87mm	130mm	220mm
50mm	65mm	81mm	108mm	162mm	276mm
60mm	78mm	97mm	130mm	195mm	331mm
65mm	84mm	105mm	141mm	211mm	358mm
75mm	98mm	122mm	163mm	244mm	413mm
85mm	110mm	138mm	184mm	276mm	468mm
80mm	104mm	130mm	174mm	260mm	441mm
90mm	117mm	146mm	195mm	292mm	496mm
100mm	130mm	162mm	217mm	325mm	551mm
135mm	176mm	219mm	293mm	439mm	744mm
150mm	195mm	243mm	326mm	488mm	826mm
180mm	234mm	292mm	391mm	585mm	992mm
200mm	260mm	324mm	434mm	650mm	1102mm
300mm	390mm	486mm	651mm	975mm	1653mm
400mm	520mm	648mm	868mm	1300mm	2204mm
500mm	650mm	810mm	1085mm	1625mm	2755mm
600mm	780mm	972mm	1302mm	1950mm	3306mm
800mm	1040mm	1296mm	1736mm	2600mm	4408mm

RECORDING TIMES (MIN)

64GB SSD-24 fps 4K Full
- 23 @ 6:1
- 27 @ 7:1
- 31 @ 8:1
- 35 @ 9:1
- 38 @ 10:1
- 42 @ 11:1
- 46 @ 12:1

128GB SSD-24 fps 4K Full
- 46 @ 6:1
- 54 @ 7:1
- 62 @ 8:1
- 70 @ 9:1
- 77 @ 10:1
- 85 @ 11:1
- 93 @ 12:1

MAX FPS

Format	FPS	HDRx
5K	12	6
4K	30	12
4K HD	30	15
3K	48	25
2K	60	30
1K WS	120	60

Red Format Key

This is a key to the different Red capture formats. It contains the format name, max fps, resolution, and aspect ratio. I've included both Epic and Scarlet information on the same key; hopefully useful to those using Epic and Scarlet in A/B cam situations.

RED FORMAT KEY 2012

format	Epic max fps	Scarlet max fps	resolution	aspect ratio
5K	96	12	5120x2700	1.9:1
5K 2:1	101	n/a	5120x2560	2:1
5K HD	96	n/a	4800x2700	1.78:1(16x9)
5K ANA	96	n/a	3296x2700	1.22:1
5K WS	121	n/a	5120x2160	2.40:1
4K	121	30	4096x2160	1.9:1
4K HD	121	30	3840x2160	1.78:1(16x9)
3K	160	48	3072x1620	1.9:1
3K HD	160	48	2880x1620	1.78:1(16x9)
2K	240	60	2048x1080	1.9:1
2K HD	240	60	1920x1080	1.78:1(16x9)
2K WS	303	60	2048x854	2.40:1
1K HD	359	89	1280x720	1.78:1(16x9)
1K WS	400	120	1280x480	2.66:1

* as of beta firmware v3.2.8 released 05/09/2012

** max frame rate for HDRx per format = 50% of max fps above

Red Mysterium X Relative Crop Factors

This graphic sets the "relative crop factor" at 5K or 4K. The purpose is to assist the shooter on choosing their desired focal lengths when changing formats to produce a similar field of view from their main recording format.
An example: You've decided on renting a 32mm prime lens for a shoot, but know you want to shoot some overcranked 2K material to match the approximate field of view. With this chart you can see that you would also want to rent a 16mm lens to produce the similar FOV and feel of 32mm at 4K.

RED MYSTERIUM X RELATIVE CROP FACTORS

5K MAIN CAPTURE FORMAT

5K Full 1x	4K Full 1.25x	3K Full 1.67x	2K Full 2.5x	1K WS 4.24x
8mm	10mm	13mm	20mm	34mm
10mm	12mm	17mm	25mm	42mm
11mm	14mm	18mm	28mm	47mm
12mm	15mm	20mm	30mm	51mm
14mm	18mm	23mm	35mm	59mm
16mm	20mm	27mm	40mm	68mm
18mm	22mm	30mm	45mm	76mm
20mm	25mm	33mm	50mm	85mm
21mm	26mm	35mm	52mm	89mm
24mm	30mm	40mm	60mm	102mm
25mm	31mm	42mm	62mm	106mm
27mm	34mm	45mm	68mm	114mm
28mm	35mm	47mm	70mm	119mm
32mm	40mm	53mm	80mm	136mm
35mm	44mm	58mm	88mm	148mm
40mm	50mm	67mm	100mm	170mm
50mm	62mm	84mm	125mm	212mm
60mm	75mm	100mm	150mm	254mm
65mm	81mm	109mm	162mm	276mm
75mm	94mm	125mm	188mm	318mm
85mm	106mm	142mm	212mm	360mm
80mm	100mm	134mm	200mm	339mm
90mm	112mm	150mm	225mm	382mm
100mm	125mm	167mm	250mm	424mm
135mm	169mm	225mm	338mm	572mm
150mm	188mm	250mm	375mm	636mm
180mm	225mm	301mm	450mm	763mm
200mm	250mm	334mm	500mm	848mm
300mm	375mm	501mm	750mm	1272mm
400mm	500mm	668mm	1000mm	1696mm
500mm	625mm	835mm	1250mm	2120mm
600mm	750mm	1002mm	1500mm	2544mm
800mm	1000mm	1336mm	2000mm	3392mm

4K MAIN CAPTURE FORMAT

5K Full 0.80x	4K Full 1x	3K Full 1.33x	2K Full 2.00x	1K WS 3.39x
6mm	8mm	11mm	16mm	27mm
8mm	10mm	13mm	20mm	34mm
9mm	11mm	15mm	22mm	37mm
10mm	12mm	16mm	24mm	41mm
11mm	14mm	19mm	28mm	47mm
13mm	16mm	21mm	32mm	54mm
14mm	18mm	24mm	36mm	61mm
16mm	20mm	27mm	40mm	68mm
17mm	21mm	28mm	42mm	71mm
19mm	24mm	32mm	48mm	81mm
20mm	25mm	33mm	50mm	85mm
22mm	27mm	36mm	54mm	92mm
22mm	28mm	37mm	56mm	95mm
26mm	32mm	43mm	64mm	108mm
28mm	35mm	47mm	70mm	119mm
32mm	40mm	53mm	80mm	136mm
40mm	50mm	66mm	100mm	170mm
48mm	60mm	80mm	120mm	203mm
52mm	65mm	86mm	130mm	220mm
60mm	75mm	100mm	150mm	254mm
68mm	85mm	113mm	170mm	288mm
64mm	80mm	106mm	160mm	271mm
72mm	90mm	120mm	180mm	305mm
80mm	100mm	133mm	200mm	339mm
108mm	135mm	180mm	270mm	458mm
120mm	150mm	200mm	300mm	508mm
144mm	180mm	239mm	360mm	610mm
160mm	200mm	266mm	400mm	678mm
240mm	300mm	399mm	600mm	1017mm
320mm	400mm	532mm	800mm	1356mm
400mm	500mm	665mm	1000mm	1695mm
480mm	600mm	798mm	1200mm	2034mm
640mm	800mm	1064mm	1600mm	2712mm

REDCODE RAW Primer

This page provides a quick overview of REDCODE RAW, RED's proprietary codec. It covers some of the advantages of REDCODE as well as some general advice on how to produce high quality imagery using this very versatile recording format.

REDCODE RAW PRIMER

Undestanding REDCODE

Red Epic and Scarlet cameras record RAW sensor data using the proprietary wavelet based compression codec called REDCODE RAW.

REDCODE is a powerful, efficient, and flexible recording format. It allows you to control the balance of visual quality versus record time by adjusting your REDCODE compression ratio.

REDCODE RAW records directly on camera to REDMAG 1.8" SSD (solid state drive) media. The metal housed REDMAGs themselves are compact, rugged, and designed to handle rigorous regular use on location. REDMAG SSDs currently come in 48, 64, 128, 256, and 512GB capacities. Estimated record times for each REDMAG size and common compression ratios can be found on the REDMAG Record Time page of this guide.

Currently there are two ways to record REDCODE RAW to REDMAG SSD media. The most common is utilizing the DSMC 1.8" SSD SIDE MODULE which mounts on the left side of the camera. This module also has a large red record button, two user defined customizable keys, and an LCD/EVF port.

For more slender camera setups RED also offers the REAR SSD MODULE. This module mounts to the rear of the camera body via the MODULE ADAPTER. For example, the REAR SSD MODULE is useful for underwater camera housings or compact 3D setups where having access to the REDMAG slot at the rear of the body might be beneficial to not interfere with cabling or the rig itself.

REDCODE ADVANTAGES

Shooting with REDCODE provides several advantages when compared to other lossy codecs. With it's high bit depth and wavelet based compression scheme REDCODE RAW material holds up very well to up-scaling, sharpening, and aggressive color processing without the typical "block" artifacts seen in other lower bit depth codecs. This is useful when mixing and matching REDCODE material captured at different resolutions.

The higher the compression ratio will allow you to record more data onto your REDMAG SSD. However, you may find if you are handling scenes with a lot of high frequency detail or fine shadow detail that you may want to shoot at a lower REDCODE compression ratio to capture those nuances.

GENERAL SHOOTING ADVICE

With 4K or theatrical delivery in mind, it's common for most productions to shoot with a REDCODE compression ratio between 5:1 and 8:1 when shooting at 5K or 4K resolutions. Lower compression ratios like 3:1 work well for scenes with high frequency detail or if your intention is to pull stills from your material.

When shooting at formats below 4K resolution (such at 3K, 2K, or 1K) it's advised to shoot at the highest possible REDCODE compression ratio available for your frame rate and resolution choices to yield the highest quality image for up-scaling purposes.

If your delivery format is 1080p or a lower resolution and you are shooting at 5K or 4K switching to compression ratios such as 10:1 and 12:1 may be desirable. Since you are scaling down your material from a higher captured resolution you can maintain a good balance between visual quality and receiving the added benefits of being able to role longer takes or holding more material on your REDMAG SSD media.

REDMAG Record Time (in minutes)

This graphic displays the recording times of all currently available recording formats and available RedMag capacities. I've listed the common production RedCode compression ratios from 3:1-12:1. Take note that the 48GB RedMag is designed for the current Scarlet X and it's max data rates. Currently we don't know how it performs on Epic.

REDMAG RECORD TIME (MINUTES)

*all times are approximate for 24fps
**max record time while HDRx is enabled is 50% of any time below

128GB

	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1	12:1
5K Full	14	18	23	28	32	37	41	46	51	55
5K 2:1	15	19	24	29	34	39	44	49	53	58
5K HD	15	20	25	29	34	39	44	49	54	59
5K ANA	21	29	36	43	50	57	64	71	79	86
5K WS	17	23	29	35	40	46	52	58	63	69
4K Full	22	29	36	43	50	58	65	72	79	86
4K HD	23	31	38	46	54	61	69	77	84	92
3K Full	38	51	64	77	89	102	115	128	141	153
3K HD	41	55	68	82	95	109	123	136	150	164
2K Full	86	115	144	173	201	230	259	288	316	345
2K HD	92	123	153	184	215	245	276	307	338	368
2K WS	109	146	182	218	255	291	327	364	400	437
1K HD	207	276	345	414	483	552	621	690	759	829
1K WS	311	414	518	621	725	829	932	1036	1139	1243

48GB

	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1	12:1
5K Full	5	7	9	10	12	14	16	17	19	21
5K 2:1	5	7	9	11	13	15	16	18	20	22
5K HD	6	7	9	11	13	15	17	18	20	22
5K ANA	8	11	13	16	19	21	24	27	29	32
5K WS	6	9	11	13	15	17	19	22	24	26
4K Full	8	11	13	16	19	22	24	27	30	32
4K HD	9	12	14	17	20	23	26	29	32	35
3K Full	14	19	24	29	34	38	43	48	53	58
3K HD	15	20	26	31	36	41	46	51	56	61
2K Full	32	43	54	65	76	86	97	108	119	129
2K HD	35	46	58	69	81	92	104	115	127	138
2K WS	41	55	68	82	95	109	123	136	150	164
1K HD	78	104	129	155	181	207	233	259	285	311
1K WS	117	155	194	233	272	311	350	388	427	466

256GB

	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1	12:1
5K Full	28	37	46	55	64	74	83	92	101	110
5K 2:1	29	39	49	58	68	78	87	97	107	117
5K HD	29	39	49	59	69	79	88	98	108	118
5K ANA	43	57	71	86	100	114	129	143	157	172
5K WS	35	46	58	69	81	92	104	115	127	138
4K Full	43	58	72	86	101	115	129	144	158	173
4K HD	46	61	77	92	107	123	138	153	169	184
3K Full	77	102	128	153	179	205	230	256	281	307
3K HD	82	109	136	164	191	218	245	273	300	327
2K Full	173	230	288	345	403	460	518	575	633	690
2K HD	184	245	307	368	430	491	552	614	675	736
2K WS	218	291	364	437	509	582	655	728	800	873
1K HD	414	552	690	829	967	1105	1243	1381	1519	1657
1K WS	621	829	1036	1243	1450	1657	1864	2072	2279	2486

64GB

	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1	12:1
5K Full	7	9	12	14	16	18	21	23	25	28
5K 2:1	7	10	12	15	17	19	22	24	27	29
5K HD	7	10	12	15	17	20	22	25	27	29
5K ANA	11	14	18	21	25	29	32	36	39	43
5K WS	9	12	14	17	20	23	26	29	32	35
4K Full	11	14	18	22	25	29	32	36	40	43
4K HD	12	15	19	23	27	31	35	38	42	46
3K Full	19	26	32	38	45	51	58	64	70	77
3K HD	20	27	34	41	48	55	61	68	75	82
2K Full	43	58	72	86	101	115	129	144	158	173
2K HD	46	61	77	92	107	123	138	153	169	184
2K WS	55	73	91	109	127	146	164	182	200	218
1K HD	104	138	173	207	242	276	311	345	380	414
1K WS	155	207	259	311	363	414	466	518	570	621

512GB

	3:1	4:1	5:1	6:1	7:1	8:1	9:1	10:1	11:1	12:1
5K Full	55	74	92	110	129	147	166	184	203	221
5K 2:1	58	78	97	117	136	155	175	194	214	233
5K HD	59	79	98	118	137	157	177	196	216	236
5K ANA	86	114	143	172	200	229	257	286	315	343
5K WS	69	92	115	138	161	184	207	230	253	276
4K Full	86	115	144	173	201	230	259	288	316	345
4K HD	92	123	153	184	215	245	276	307	338	368
3K Full	153	205	256	307	358	409	460	511	563	614
3K HD	164	218	273	327	382	436	491	546	600	655
2K Full	345	460	575	690	805	921	1036	1151	1266	1381
2K HD	368	491	614	736	859	982	1105	1227	1350	1473
2K WS	437	582	728	873	1019	1164	1310	1455	1601	1746
1K HD	829	1105	1381	1657	1933	2209	2486	2762	3038	3314
1K WS	1243	1657	2072	2486	2900	3315	3729	4143	4558	4972

Red MX Format Crop Factors

This graphic shows the cropping effect of the different Red recording formats of the Mysterium X sensor.

5K WS (5120 x 2160)

2K WS (2048 x 854)

1K WS (1280 x 480)

1K HD (1280 x 720)

2K HD (1920 x 1080)

3K HD (2880 x 1620)

4K HD (3840 x 2160)

5K HD (4800 x 2700)

2K Full (2048 x 1080)

3K Full (3072 x 1620)

4K Full (4096 x 2160)

5K Full (5120 x 2700)

RED MX FORMAT CROP FACTORS
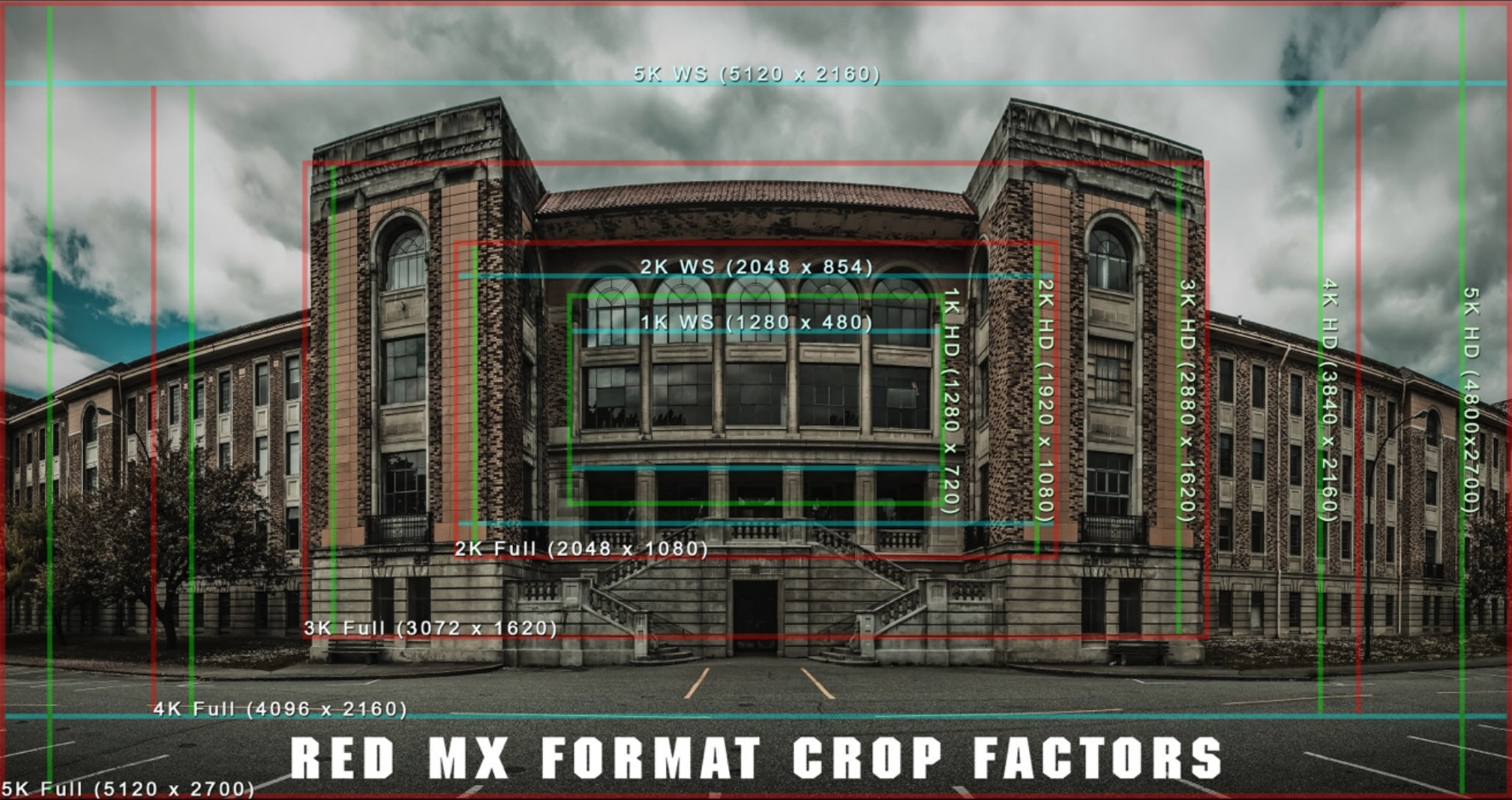
Common Motion Picture Aspect Ratios

This graphic shows common motion picture aspect ratios and how they can be extracted from the full frame of the 1.9:1 aspect ratio of the Mysterium X sensor through vertical and horizontal cropping.

Red formats that end with "HD" are 1.78:1 (16x9)

Formats that end in "WS" are approximately 1.37:1, but it depends on the resolution selected

Formats that end with "ANA" are closer to a 4:3 aspect ratio and intended to be used with anamorphic lenses.

Crop Factors, Dimensions, and Diagonals

This graphic shows the relationship of how the crop factors effect the Field of View between different formats. Additionally you can find the physical dimensions of each format and their diagonal coverage in millimeters.

CROP FACTORS, DIMENSIONS, AND DIAGONALS

FF35 at 1.9:1 (36x18.95mm)
Diagonal Coverage = 40.70mm
Crop Factor = 1.0x
FOV = 44.3°
Actual Capture Lens = 50mm

RED MX 3K (16.62x8.76mm)
Diagonal Coverage = 18.79mm
Crop Factor = 2.17x
FOV = 20.4°
Equivalent Lens FOV = 108mm

RED MX 5K (27.7x14.6mm)
Diagonal Coverage = 31.31mm
Crop Factor = 1.3x
FOV = 34°
Equivalent Lens FOV = 65mm

RED MX 2K (11.08x5.84mm)
Diagonal Coverage = 12.52mm
Crop Factor = 3.25x
FOV = 13.6°
Equivalent Lens FOV = 162mm

RED MX 4K (22.16x11.69mm)
Diagonal Coverage = 25.05mm
Crop Factor = 1.62x
FOV = 27.3°
Equivalent Lens FOV = 81mm

RED MX 1K WS (6.92x2.6mm)
Diagonal Coverage = 7.39mm
Crop Factor = 5.51x
FOV = 8°
Equivalent Lens FOV = 276mm

Infrared Protection

Using deeper neutral density (ND) filtration can introduce a reddish color cast to your image. This is Infrared Contamination. It is hardly noticeable at 0.3 (1 stop) and 0.6 (2 stop), however, around 0.9 (3 stop) it becomes slightly visible and the color cast becomes more apparent as you use deeper (darker) ND filtration. While it is possible to color correct the color cast in post, many prefer to get a more natural and accurate color balance in camera. To counter the effect of the infrared color cast contamination I recommend using either: ND filtration with the addition of a Hot Mirror in the front-most filter tray, an "IRND" filter, or a Hot Mirror/ND filter.

Personally I recommend IR protection when shooting with ND filtration at around 0.9 or 1.2 and anything deeper.

NOTES ON INFRARED PROTECTION

ND Optical Densities

0.3	1 stop
0.6	2 stop
0.9	3 stop
1.2	4 stop
1.5	5 stop
1.8	6 stop
2.1	7 stop
2.4	8 stop
2.7	9 stop
3.0	10 stop
3.3	11 stop
3.6	12 stop
3.9	13 stop

White Balance = 5000K   **White Balance = Gray**

Clean Lens
No Filter

ND 1.8 (6 stops)
Without IR Protection

ND 1.8 (6 stops)
With IR Protection

Powering the Epic and Scarlet

Power management and consumption efficiency are constantly changing with each new firmware that Red releases for the Epic and Scarlet cameras. Generally speaking for each watt hour (Wh) you get approximately one minute of running time. For instance, a 60Wh battery can provide power to your camera for approximately 60 minutes or 1 hour. Below are some quick helpers on what the Power Status LED's colors mean, where you can connect external sources, and the types of batteries that can be used through Red and 3rd party accessories.

POWER STATUS LED

Red = Power Present
Yellow = Booting
Green = AC Power
Green Blinking = Battery Power
Yellow Blinking = Battery below 10%
Red Blinking = Battery below 5%

RED BATTERIES

RedVolt
capacity: 30Wh
type: RedVolt
DSMC Travel Charger (1x Redvolt)
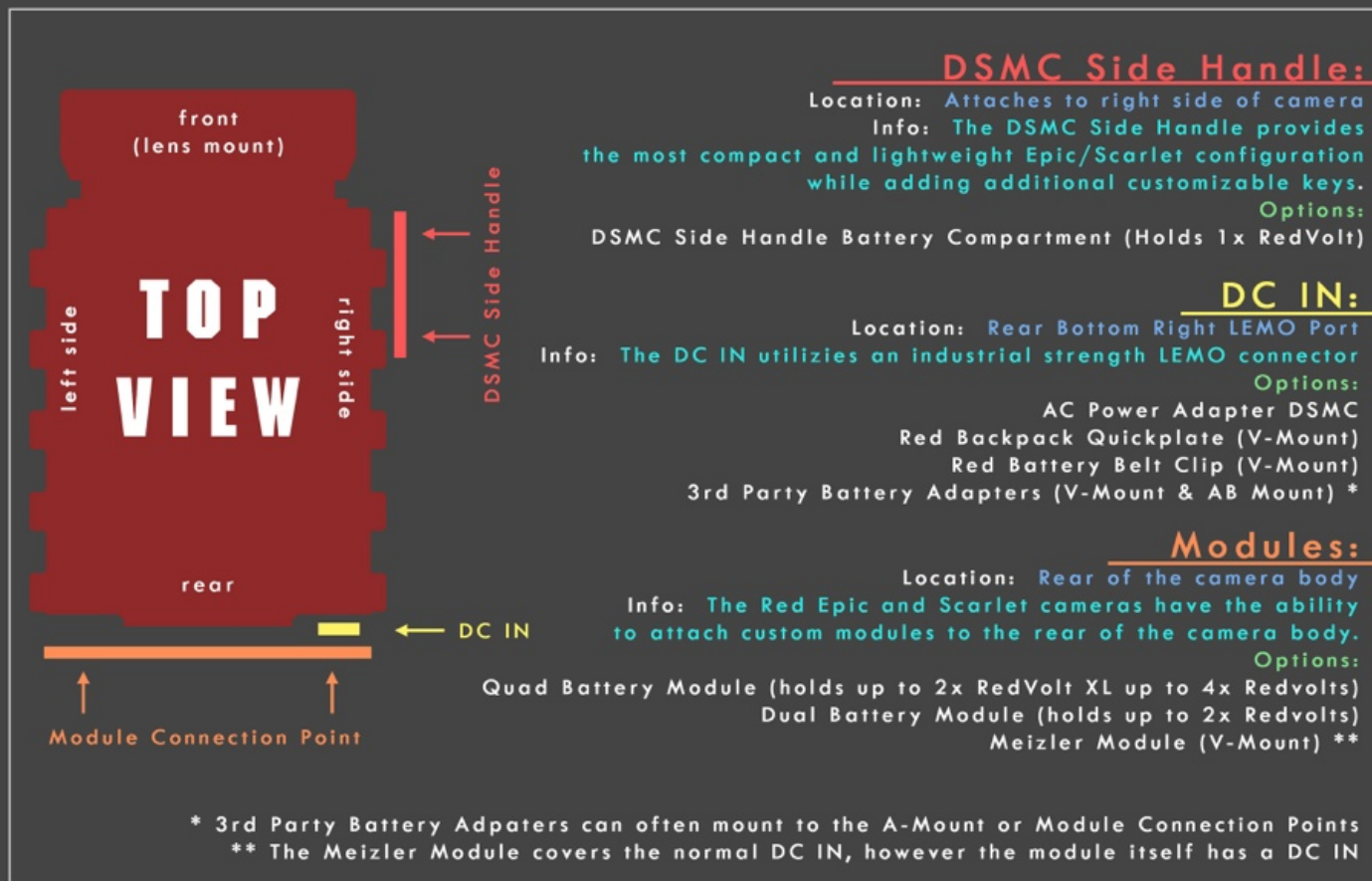RedVolt Quad Charger (4x RedVolts)

RedVolt XL
capacity: 90Wh
type: RedVolt
charging options:
RedVolt Quad Charger (2x RedVolt XLs)

Red Brick
capacity: 140Wh
type: V-Mount
charging options:
Red Charger (2x Red Bricks)

front
(lens mount)

left side

TOP VIEW

right side

DSMC Side Handle

rear

DC IN

Module Connection Point

DSMC Side Handle:
Location: Attaches to right side of camera
Info: The DSMC Side Handle provides the most compact and lightweight Epic/Scarlet configuration while adding additional customizable keys.
Options:
DSMC Side Handle Battery Compartment (Holds 1x RedVolt)

DC IN:
Location: Rear Bottom Right LEMO Port
Info: The DC IN utilizies an industrial strength LEMO connector
Options:
AC Power Adapter DSMC
Red Backpack Quickplate (V-Mount)
Red Battery Belt Clip (V-Mount)
3rd Party Battery Adapters (V-Mount & AB Mount) *

Modules:
Location: Rear of the camera body
Info: The Red Epic and Scarlet cameras have the ability to attach custom modules to the rear of the camera body.
Options:
Quad Battery Module (holds up to 2x RedVolt XL up to 4x Redvolts)
Dual Battery Module (holds up to 2x Redvolts)
Meizler Module (V-Mount) **

* 3rd Party Battery Adpaters can often mount to the A-Mount or Module Connection Points
** The Meizler Module covers the normal DC IN, however the module itself has a DC IN

Black Shading and Operating Temperature

A successful Black Shade Calibration is the key to creating a rich and high quality image from the Mysterium X sensor. Below are a few tips on how to properly perform and check your Black Shade Calibration. Also, I've included some notes on operating the camera in extreme temperatures and what to expect it to do in those situations.

BLACK SHADING AND OPERATING TEMPERATURE

When to Run a Black Shading Calibration:
- after upgrading to new firmware
- big ambient temperature changes
- if shooting at longer exposure times (longer than 1/15th sec)
- at the beginning of a project

* General Note: it is good practice to black shade after switching between long and short exposures

How to Run a Black Shading Calibration:
- securely attach the Red lens mount body cap
- turn the camera on
- wait for it to come to operating temperature
- select the Black Shading from Settings Menu under Calibration
- Black Shading takes approximately 20 minutes

How to Verify a Successful Black Shade
- make sure the body cap or lens cap is on the camera
- change your ISO to 12800
- you will see "noise"
- inspect the image, it should be a flat uniform pattern

* If you see any sort of gradient in the "black" or non-flat pattern you likely had a light leak and should black shade again

LCD High Temperature Indications *
At 72c the temperature display will turn yellow
At 74c it turns orange
At 75c the user speed is overridden and fan goes to max speed
76c the temp display will turn red
At 77c if you are recording, the record will be stopped
At 83c the camera will shutdown

* Once the fan goes to max speed it is unlikely the temperature will go past 76c. In extreme situations, like shooting in broad daylight during a hot day without the camera shaded, it is possible that the camera will overheat and shutdown. To avoid this attempt to shade the camera from direct sunlight when possible.

Monitoring Overview and Lemo Notes

Below is a quick overview on Monitoring options for the Red Epic and Scarlet cameras. Red Displays utilize high quality LEMO connections and can plug into several different modules. Each module listed below has it's own Red Display Port. Certain modules allow the use of two Red Displays simultaneously. You can find which modules support that feature as well as the general position to where the display ports are located, which can assist with rigging out your camera. Also, there are a few some notes on the proper operation of the LEMO Connectors that Red cameras use for their displays and power cords.

MONITORING OVERVIEW AND LEMO NOTES

RED DISPLAYS

RED TOUCH 5.0" LCD
resolution: 800×480
customizable keys: 4X
Information:
Provides a touch interface to operate all camera menus

RED TOUCH 9.0" LCD
resolution: 1280×784
customizable keys: 4X
Information:
Provides a large touch interface to operate all camera menus

BOMB EVF [LCOS]
resolution: 1280×784
customizable keys: 2X
Information:
Contrast Ratio: 1000:1

BOMB EVF [OLED]
resolution: 1280x1024
customizable keys: 2X
Information:
Contrast Ratio: >10000:1

RED PRO LCD 7"
resolution: 1024×600
customizable keys: none
Information:
Lightweight non-touch display

RED DISPLAY CONNECTIONS

Red Side SSD Module
Monitor Port Location: Front of body, upper left
Information:
Provides a single monitor port with 2X customizable keys.

Red Pro I/O Module
Monitor Port Location: Rear, top-middle of module
Information:
Supports operating Dual RED Displays with the Side SSD Module.
Also provides an HD-SDI port (BNC).

Red Meizler Module
Monitor Port Location: Front of body, lower right
Information:
Supports operating Dual RED Displays with the Side SSD Module.
Also provides an HD-SDI port (BNC) and transmits wireless 720p or 1080p uncompressed video at 5Ghz with less than 1ms latency.

Auxiliary Monitor Adapter *
Monitor Port Location: Rear of body, right side
Information:
Supports operating Dual RED Displays with the Side SSD Module.
*Coming Soon

HD-SDI AND HDMI

The Epic and Scarlet "brain" provide HD-SDI (BNC) and HDMI connections which support 720p and 1080p 10 bit 4:2:2 signals.

The Pro I/O Module and Meizler Module each provide an HD-SDI port.

LEMO CONNECTORS

Red Displays and power cables conect via industrial grade LEMO connectors. While these are very strong push/pull connectors, they aren't indestructable and should be operated properly to avoid accidental damage.

Plugging in:
Pinch the knurled collar and line up the red indicator dot with the corresponding mark on the desired port.
It will click in to asure that it is properly seated.
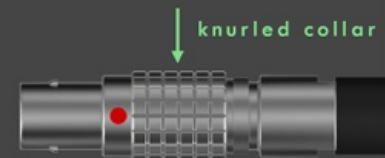
knurled collar

Unplugging:
Pinch the knurled collar and pull.

** Never twist the connector or pull directly on the cable.

Audio, Timecode, and Genlock

There are many ways to handle audio, timecode, and genlock with Red cameras either through the camera "brain" or through the use of modules. This page covers what type of audio inputs and outputs and the type of connections they use. It also covers the recommended cables to use when feeding external timecode and when syncing cameras via genlock.

AUDIO, TIMECODE, AND GENLOCK

Red Epic and Scarlet Brain

AUDIO
information:
On their own, the Red Epic and Scarlet cameras are capable of recording up to 2 channels of independently balanced 24-bit 48KHz audio with support for +48V Phantom Power.

audio inputs: 2x 3.5mm Microphone Jacks
location: front of camera, under lens mount
audio output: 1x 3.5mm Stereo Jack

TIMECODE
information:
Timecode can be jammed externally using the 3BNC-TO-00 SYNC CABLE via the YELLOW BNC connector.

GENLOCK
information:
Genlock can be synced using the 3BNC-TO-00 SYNC CABLE via the GREEN BNC connector.

recommended cables : 2x XLR MICROPHONE CABLE
3BNC-TO-00 SYNC CABLE

Pro I/O Module

AUDIO
information:
In conjunction with the additional two inputs on the camera body the Pro I/O Module allows for up to 4 channels of independently balanced audio signals to be recorded in camera.

audio input: 2x Full Size XLR
1x AES Digital Audio Input (LEMO)
location: right side of module
audio output: 1x 5-pin XLR

TIMECODE
information:
Timecode can be jammed externally using the PRO I/O TIME CODE CABLE.

GENLOCK
information:
Genlock sync can be achieved through the BNC port on the Pro I/O Module.

recommended: PRO I/O DIGITAL AUDIO CABLE
PRO I/O TIME CODE CABLE

Meizler Module

AUDIO
information:
The Meizler Module can support up to 2 channels of hard wired audio or up to 4 channels with wireless audio.

audio input: 1x two channel LEMO
or Wireless
location: right side of module
audio output: 1x 3.5mm Stereo Jack

TIMECODE
information:
Timecode can be jammed externally using the BNC port on the Meizler Module or wirelessly using REDsync Master.

GENLOCK
information:
Using an external Timecode source via BNC or REDsync master wirelessly Genlock is produced internally.

recommended: REDsync Master

** The Meizler Module is coming soon and more information will be available when the module is released.

Intermediate F-Stops, ISO & Flicker Free Shutter Speed Reference

Below is a quick reference for intermediete steps in F-Stops and ISO Sensitivities. Also, I've included a quick reference for Flicker Free Shutter Speeds at common operating frame rates for both 60Hz and 50Hz power frequencies. Certain artificial light sources may produce banding or flicker. By shooting at "safe" shutter angles and shutter speeds you can protect yourself from this effect. This is not full proof though. Certain lights may still flicker if they are failing, are not properly seated, or being effected by electronic interference. With artificial lighting setups it's good practice to roll a test clip to make sure your shot looks as intended.

INTERMEDIATE F-STOPS (1/4 stop increments)

| 1 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.8 | 2 | 2.1 | 2.3 | 2.5 | 2.8 | 3 | 3.2 | 3.6 | 4 | 4.2 | 4.5 | 5 | 5.6 | 6 | 6.3 | 7.2 | 8 | 8.5 | 9 | 10 | 11 | 12 | 12.7 | 14 | 16 | 17 | 18 | 20 | 22 |

INTERMEDIATE F-STOPS (1/3 stop increments)

| 1 | 1.1 | 1.3 | 1.4 | 1.6 | 1.8 | 2 | 2.2 | 2.5 | 2.8 | 3.2 | 3.5 | 4 | 4.5 | 5 | 5.6 | 6.3 | 7 | 8 | 9 | 10 | 11 | 12.7 | 14 | 16 | 18 | 20 | 22 |

INTERMEDIATE ISO SENSITIVITIES (1/3 stop increments)

50	64	80	100	125	160	200	250	320	400	500	640	800	1000	1250	1600	2000
2500	3200	4000	5000	6400	8000	10000	12800	16000	20000	25600	32000	40000	51200	64000	80000	102400

FLICKER FREE SHUTTER SPEEDS (60Hz)

FPS	Shutter Angle	Shutter Speed
23.98	138, 207, 276°	1/60, 1/40, 1/30 sec
24	any	any
25	75, 150, 225°	1/120, 1/60, 1/40 sec
29.97	87, 174, 261°	1/120, 1/60, 1/40 sec
47.95	141, 282°	1/120, 1/60 sec
48	144, 288°	1/120, 1/60 sec
50	150, 300°	1/120, 1/60 sec
59.94	177, 354°	1/120, 1/60 sec
60	any	any
72	216°	1/120 sec
95.9	285°	1/120 sec
96	288°	1/120 sec
100	300°	1/120 sec
119.88	357°	1/120 sec
120	any	any

FLICKER FREE SHUTTER SPEEDS (50Hz)

FPS	Shutter Angle	Shutter Speed
23.98	82.8, 165.6, 248.4°	1/100, 1/50, 1/33.3 sec
24	86.4, 172.8, 259.2°	1/100, 1/50, 1/33.3 sec
25	any	any
29.97	104.4, 208.8, 313.2°	1/100, 1/50, 1/33.3 sec
47.95	169.2, 338.4°	1/100, 1/50 sec
48	172.8, 345.6°	1/100, 1/50 sec
50	any	any
59.94	212.4°	1/100 sec
60	216°	1/100 sec
72	259.2°	1/100 sec
95.9	342°	1/100 sec
96	345.6°	1/100 sec
100	any	any
119.88	none	none
120	none	none

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