SAMUELSON

Mk.II CALCULATOR

Designed by W.B.Pollard in conjunction with D.W.Samuelson F.B.K.S., B.S.C.

INSTRUCTIONS FOR USE

DEPTH OF FIELD

The calculation of Depth of Field is purely arithmetical but the assessment of what is acceptably sharp, and what is not, is a matter of personal judgement which will depend upon the format, the type of presentation, the lighting and not least the degree of sharpness of the most in-focus part of the scene, by comparison with which anything which is less than critically sharp will be judged. For this reason lenses which are particularly sharp, hard and contrasty will appear to have less depth of field than those which are not really sharp anywhere.

The Samcine Mk II Depth of Field Calculator gives three degrees of depth of field based upon circles of confusion of 1/500, 1/700 and 1/1000". (0.05, 0.035 and 0.025mm).

Traditionally 1/500" (0.05mm) has always been used for 35mm film making and 1/1000" (0.025mm) for 16mm work. In recent years, however, the introduction of crisper lenses for 35mm work has made the use of a smaller circle of confusion sometimes necessary while on the other hand some poor quality zoom lenses used for 16mm TV coverage may be used with a circle of confusion larger than heretofore.

Depth of Field must always be calculated from the front nodal point of a lens whereas cameramen always measure distances, for focussing purposes, from the focal plane. Depth of Field calculators should make an allowance for this difference and for this reason the Samcine Mk II Depth of Field Calculator has separate scales for Fixed Focal Length Lenses and Zoom Lenses.

Exceptions to this rule are the Angenieux 10 X 12mm and short range zoom lenses used for 16mm and Super 8 cinematography which, because of their short physical length, are more accurately calculated on the Fixed Focal length scale.

The Samcine Mk II Depth of Field Calculator is suitable for any lens of from 9 to 250mm focal length at f or T1 to 22. Where the depth of field becomes so great or so small that calculation is pointless, the calculator will work to the nearest useful combination.

TO ESTIMATE DEPTH OF FIELD

1. Move the slide up or down until the lens focal length comes next to the f or T stop at which the lens is being used. (See note on f and T stops below).
2. Select the appropriate distance scale marked 'F' (for fixed focus lenses) or 'Z' (for zoom lenses) on the circular disc. Rotate the disc until the distance at which the lens is focussed coincides with the thin straight line between the curves engraved on the slide.
3. The depth of field is read from the distance scale, either side of the focussed distance, against the appropriate circle of confusion curve.

EXAMPLE

For example, when using a 25mm fixed focus lens at f 5.6, focussed at 7 feet — the depth of field on the 'F' scale, for a circle of confusion of 1/700" would be from 4'4" to 20'. Working to a circle of confusion of 1/1000", these figures would be from 5' to 12" and from 3'9" almost to infinity if working to 1/500".

CIRCLE OF CONFUSION

Previously, calculators have been based on circles of confusion of 1/500" (0.05mm) for 35mm work and 1/1000" (0.025mm) for 16mm. It is suggested that, under modern conditions, 1/700" (0.035mm) should be used for 35mm., but that 1/1000" (0.025mm) is still a reliable standard for 16mm. There is no precise rule and cameramen are advised to make their own judgement in this matter.

f & T STOPS

Depth of field is derived from f stops, which should be used when known, for greater accuracy. When T stops are used, note that three lines are engraved on the scale of the calculator for each stop value. The longest indicates 1/6 stop difference between T and f stops, the middle one 1/3 stop, and the shortest 1/2 stop difference. If in doubt use the middle one.

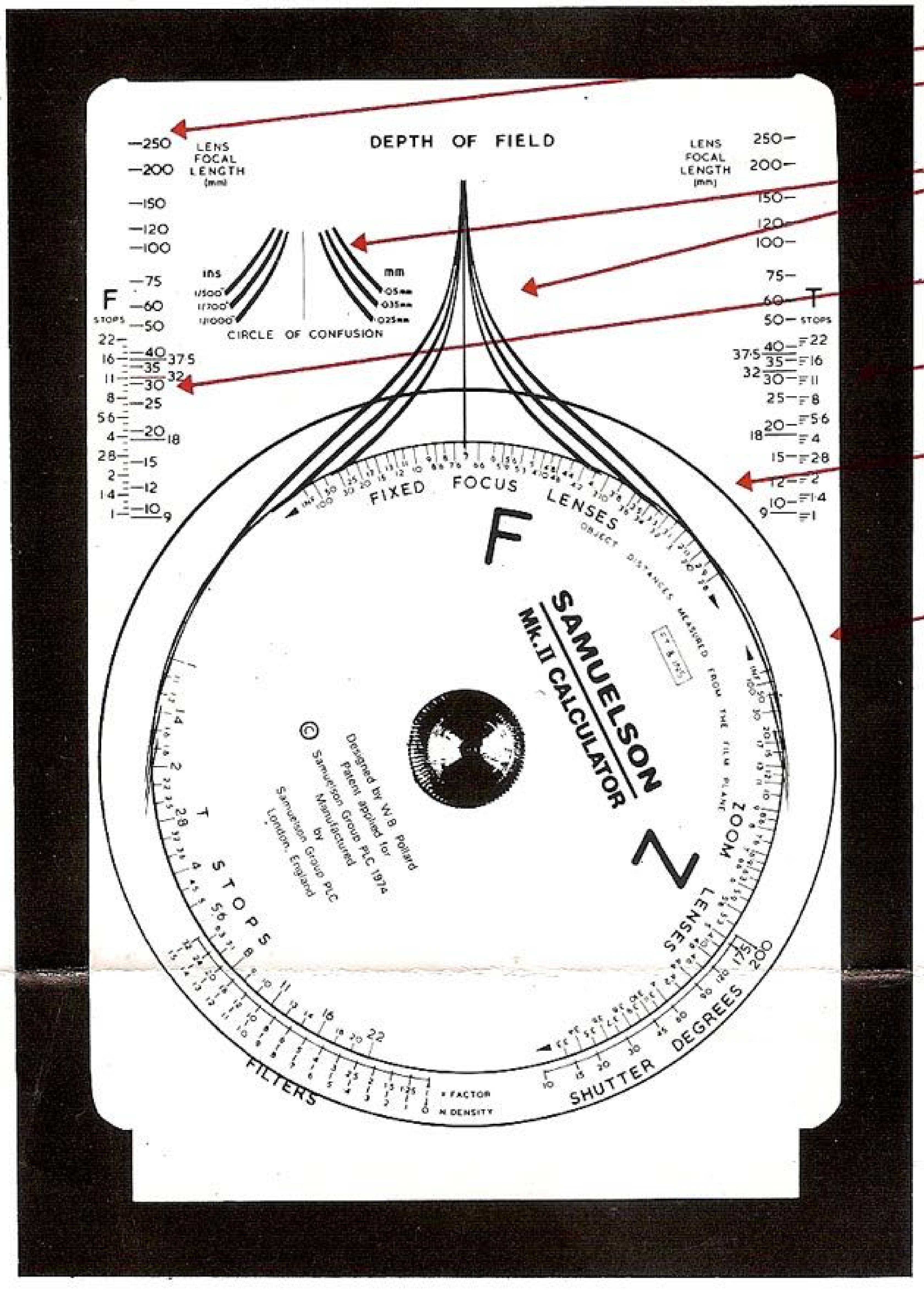
ANAMORPHIC LENSES

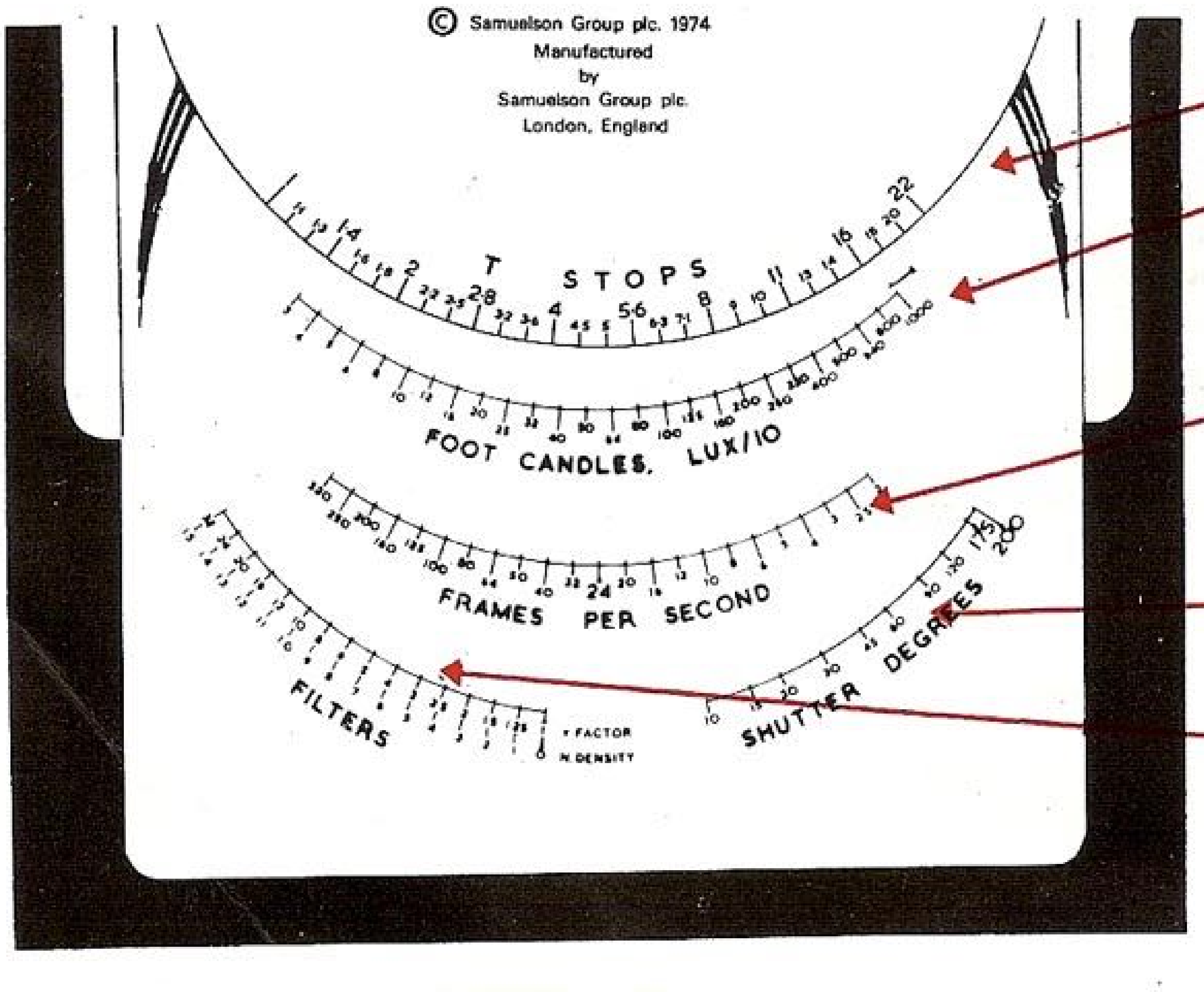
The depth of field is found from the focal length of the basic spherical component of the lens.

EQUIVALENT EXPOSURE CALCULATOR

Pull the centre slide of the Calculator downwards to reveal scales appertaining to Filters (ND & factors), Shutter Opening Degrees, Frames per Second and Foot Candles or Lux/10.

Used in conjunction with the T stop scale engraved on the bottom of the circular disc the variation in exposure caused by any change in the filter, shutter opening, camera speed or lighting intensity may be easily determined and the necessary adjustment calculated.


LENS FOCAL LENGTHS
CHOICE OF CIRCLES OF CONFUSION
F STOPS
T STOPS
FIXED FOCAL LENGTH LENS SCALE
ZOOM LENS FOCAL LENGTH SCALE
DEPTH OF FIELD
LENS FOCAL LENGTH (mm)
CIRCLE OF CONFUSION
FIXED FOCUS LENSES
OBJECT DISTANCES MEASURED FROM THE FILM PLANE
SAMUELSON
MK.II CALCULATOR
Designed by W.B Pollard
Patent applied for
© Samuelson Group PLC 1974
Manufactured by Samuelson Group PLC
London, England
ZOOM LENSES
T STOPS
FILTERS
SHUTTER DEGREES
X FACTOR
N DENSITY


© Samuelson Group plc. 1974
Manufactured
by
Samuelson Group plc.
London, England
T STOPS
LIGHT INTENSITY
CAMERA SPEED
SHUTTER ANGLES
FILTER FACTORS
FOOT CANDLES, LUX/10
FRAMES PER SECOND
FILTERS
SHUTTER DEGREES
X FACTOR
N DENSITY

LENS CALIBRATION AND DISTANCE CONVERSION

When lenses are calibrated in metres and the Focus Assistant thinks in feet or vice versa, the equivalent distance may be read off the 35mm Converter Table by reading off the feet and metres distance for similar camera speeds.

Thus reading off the 35mm 25 f.p.s. scales it can be seen that 10 feet is equivalent to very slightly more than 3 metres.

CONVERSION TABLE FOR 35–16MM/24–25 F.P.S./FEET–METRES/SECONDS

The equivalent running time or measurement of any length of film, may be calculated by using the conversion tables. When converting to and from 35 to 16mm it is necessary to place a card or a straight edge across the calculator to read off the answer.

For example: 90 feet of 35mm film shot at 24 f.p.s., would run for 60 seconds but if reduced to 16mm for showing on European TV at 25 f.p.s., would measure just under 11 metres in length and run for just under 58 seconds.

LENS ANGLES

Some Directors, particularly those trained and used to TV terminology can visualise the width of a picture according to the angle of the lens rather than by its focal length.

From the Calculator it is possible to read off the lens angle for any focal length of lens used for 35mm Anamorphic, 35mm Academy, 16mm, Super 16 or Super 8 formats, to ascertain the lens required to give such an angle and the equivalent coverage given by any focal length of lens with any of these formats.

For example: For a 25° angle of coverage a lens of 50mm focal length would be required if shooting 35mm Academy or wide screen, just over 100mm if shooting 35mm Anamorphic, about 22mm if shooting normal 16, just over 25mm if shooting Super 16 and just over 12mm if shooting Super 8.

FIELD OF VIEW NOMOGRAM OR PICTURE WIDTH

The approximate relationship between the subject distance, the lens focal length and the width of the scene photographed, for any format, may be ascertained by placing a straight edge across the nomagram co-incident with the engraved markings for any two of the three variables.

For example: If it is known that shooting with a normal 16mm format a 50mm lens is to be used to photograph a subject 30′ (9m) away the width of the picture may be calculated by laying the edge of a card across the nomogram at that distance and that lens and format. In this instance, 5′6″ (1.70m).

PICTURE AREA

If the width of a picture and the aspect ratio are known it is possible to calculate the height of the picture by measuring along the picture width line by a pre-determined distance, as engraved for 1.33:1 (16mm Standard and 35mm Academy 1.66 and 1.85:1 (Wide Screen) and 2.35:1 (Anamorphic).

To do this it is necessary to mark the edge of a small piece of card with the distance and transfer the card to the Picture Width line, with one mark against theknown picture width. The other mark (in the decreasing dimension direction) will indicate the picture height.

For example: When shooting 2.35:1 Anamorphic it may be calculated that if the width of a scene is 30′ (9m) the height will be 13′ (4m).

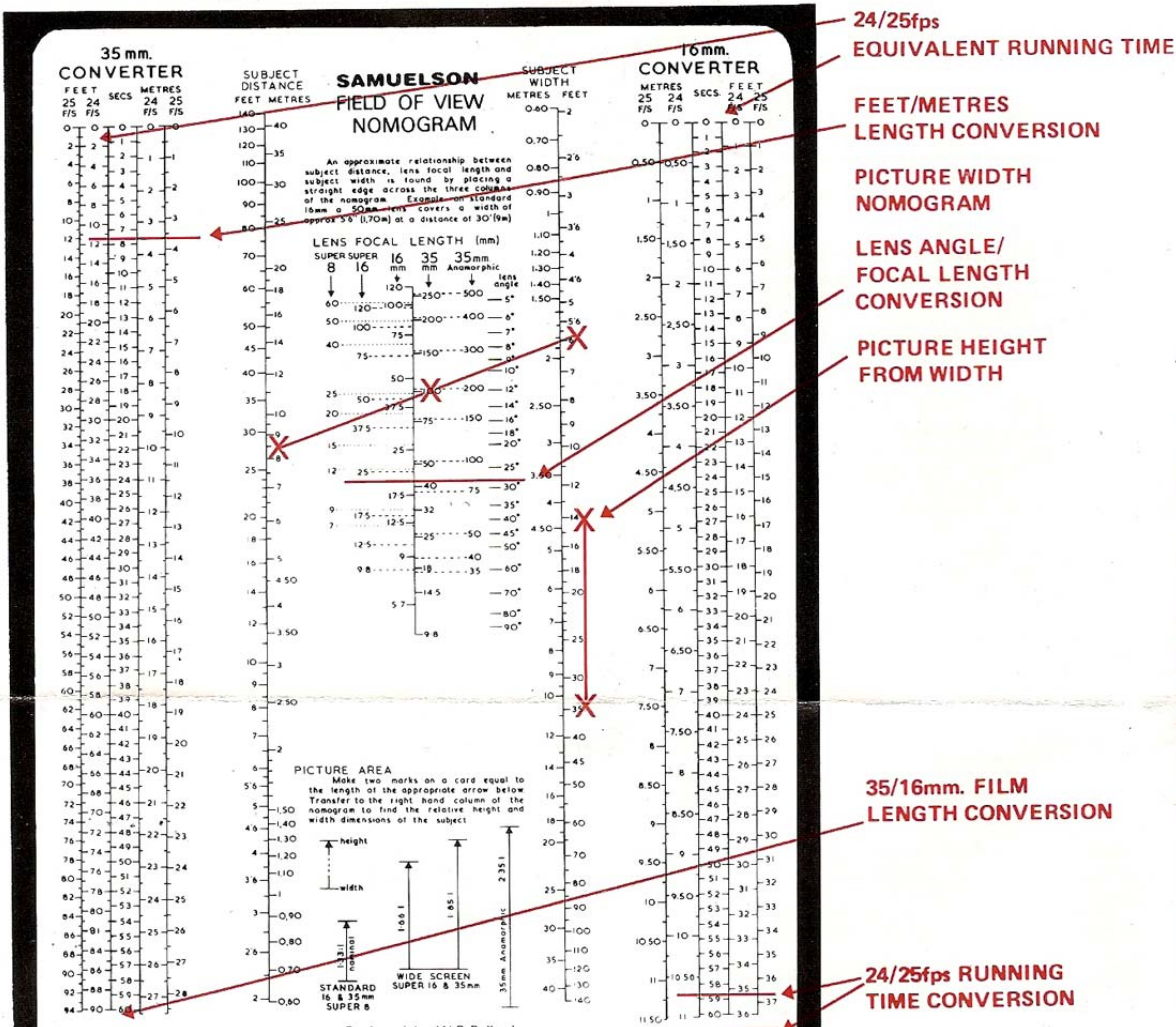
MIRED VALUES AND COLOUR TEMPERATURE

The effect of any Colour Correction Filter on Colour Temperature may be calculated by converting the Colour Temperature in °Kelvin to Mireds, applying the + or – Mired factor for the appropriate filter and, if so desired, converting back to °K.

For example: to take the simplest case; filmstock balanced for 3200°K (313 Mireds) is to be used with 5500°K (182 Mireds) daylight. The difference between the two colour temperatures is thus 131 Mireds and to compensate a + 131 Mired (Wratten 85B filter must be used.

The Mired equivalents of °K between 2350 and 8000 are given, as are the Mired factors for all the amber coloured + conversion filters from the 85 B down to the 81, all the – (bluish) filters from 80A to 82 and all the blue and orange light conversion filters.

Using Mireds it is also possible to calculate that if, say, an 85B filter was necessary when a sequence was commenced in the morning and the light was good but by late afternoon the light had deteriorated to about 4000°K, to match the earlier material an 81EF filter should be used on the camera and ½ blues on the lighting.



Designed by W.B.Pollard

100 ft = 30.5m

303 - 315 Cricklewood Broadway, London, NW2 6PQ. England

E 2 8 7 5

30m = 98ft 5ins

FILTER MIRED VALUES

°K/MIRED VALUES CONVERSION

MIRED VALUES

If A = the mired value of the existing colour temperature
B = the mired shift value of a filter
C = the mired value of the effective colour temperature produced by the addition of the filter,
then A+B = C

Kelvin	mired	Kelvin	mired	Kelvin	mired	Kelvin	mired
2350	426	2900	345	3900	256	5800	172
2400	417	2950	339	4000	250	6000	167
2450	408	3000	333	4200	238	6200	161
2500	400	3100	323	4400	227	6400	156
2550	392	3200	313	4600	217	6600	152
2600	385	3300	303	4800	208	6800	147
2650	377	3400	294	5000	200	7000	143
2700	370	3500	286	5200	192	7250	138
2750	364	3600	278	5400	185	7500	133
2800	357	3700	270	5500	182	7750	129
2850	351	3800	263	5600	179	8000	125

CAMERA FILTER

filter	mired	filter	mired
85B	+131	82	−10
85	+112	82A	−18
85C	+81	82B	−32
81EF	+53	82C	−45
81D	+42	80D	−56
81C	+35	80C	−81
81B	+27	80B	−112
81A	+18	80A	−131
81	+10		

LAMP FILTER

filter	mired
full orange	+13[illegible]
1/2 orange	+66
1/4 orange	+33
1/4 blue	−33
1/2 blue	−66
full blue	−132

Registered Design No. 67104
British Patent Application No. 29496
U.S. Patent Application No. 348051
Patents also applied for in France, Germany, Italy, Japan, U.S.S.R. and other countries.