In Further Pursuit of Weston Light Meters

By John Bunyan

In my first article on Weston Exposure Meters (PW 160) I concentrated on two of the main families: The early professional meters from America and the ubiquitous 'Master' series that achieved worldwide fame. As I began to develop my collection of these models in the naïve assumption that they represented the total of the company's output of exposure meter range, the truth gradually began to dawn:

Like many of us, I progressed from just picking up models I came across in shops and at fairs, to searching specifically on auction sites. Here I came across strange beasts that didn't look like any Weston meters I was familiar with, but still bore the Weston name. I knew of the Leicameters, though not immediately that four models had been produced, but the others were new territory to me. I think I have them all now and they are the models I cover here:

The **Direct Reading (DR)** family of small compact meters that do not feature the calculator dial, but simplified means of determining exposure.
Leicameters: These are a set of special variants of four of the main designs of professional exposure meters ranging from the pioneering Model 617 through to the early Master series.
Later models not in the 'Master' family:
They include licensed models made in Japan by Sekonic and two models that use Cadmium Sulphide (CdS) cells in place of the Selenium Photronic Photovoltaic cell.

Direct Reading Exposure Meters:

This small series of Westons comprises of four main models with one Cine variant of the earliest model 850. They were produced concurrently with the professional models and, to a major extent, replicate the manufacturing technologies used for the professional series and the styling of the time. It is clear from the advertising how the company itself saw the demographic for these models. They are aimed squarely at the beginner, or the 'Junior'.

An American three-fold dealer's marketing leaflet of 1939 covering the three models of Weston Exposure meter then available: the model 850 Junior, the model 650 Universal and 819 Cine. Yes that is Clark Gable endorsing one of the professional models.

A dealer's three-fold leaflet of 1938 gives a good indication of how the 'Junior' sat in the company's lineup of exposure meters which comprise of the 850 Junior, the 650 Photronic and the 819 Cine. As a volume manufacturer, and keen to capitalize on the advanced technology represented in the Photronic cell, the company were addressing a broader market for the use of exposure meters in photography beyond that of the professional user of the earlier and relatively more expensive models. From Beginner through to Amateur and Professional, everyone can afford and benefit from using a Weston meter.

The 850 featured in the leaflet is now what we would call the 'Entry Level' model. Described as 'for simple operation',

The model 850 Junior and Junior Cine (left to right respectively) at first appear identical. The brightness range mark-up is different and the cine meter uses frames per second in place of shutter speeds.

Though the Model 850 Junior meters sport strong Art Deco styling, the shipping boxes (Junior and Junior Cine left to right respectively) relate more closely to modernist trends in graphic design prevalent in the late 1930's.

it claims to be compact, rapidly operated and ideal for stills, movies, black and white and colour photography. So how does it measure up to these promises?

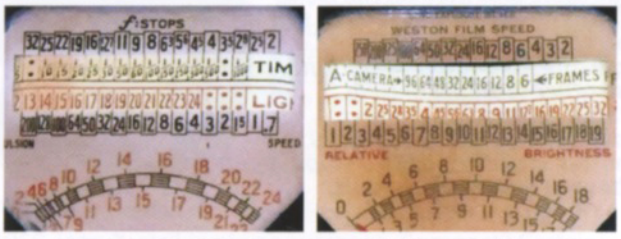
For the collector, models from this series are readily available from on line auction sites, occurring frequently on the U.S. pages and occasionally on the British. The model 850 meter is housed in a durable squared-off Bakelite housing and uses the full-sized circular Photronic cell as in the professional models. It is compact, but only marginally so compared to the 650, being squarer. Immediately noticeable is the same powerful Art Deco fan motive moulded around the meter needle pivot point, as with the models 650 and 819. Even without noticing the name, this iconic motif makes the model 850 identifiably a Weston, important at a time when many other manufacturers were entering this rapidly expanding market.

The 850 Junior is simpler than the professional models in two physical respects: There is no calculator dial on the front face, just the meter panel. Within this, a rolling display is actuated by a small thumbwheel on the top of the meter housing.

This horizontal scrolling display holds the shutter speed and measured light values. The outer static frame of the meter face displays the emulsion speed and aperture values. The measured light reading is located on the scrolling display and set opposite the emulsion speed using the thumbwheel. Combinations of shutter speed and aperture are then read off from the top two levels, one single operation – simple?

It is debatable. The scrolling display has to be adjusted every time a new exposure reading is taken with the same frequency as the calculator dial on the professional meters is rotated. The calculator dial displays all of the exposure options available to the user. The scrolling display of the 850 presents only a small selection in its window. That is the main difference.

The luminance scale on the 850 Junior is a simple numeric one covering twelve exposure stops. There is no other information presented beyond the four parameters of luminance, film speed, aperture and shutter speed needed to set the exposure. No accommodation is made for under and over exposure and brightness range, as is the case with the calculator dial of the Professional meters. The Model 850 Junior's user interface has evidently been simplified, if not actually made any simpler.



Close up of the 850 Junior meter displays, Universal (left) and Cine (right): The cine meter operation differs from the Universal model in that the luminance scale is marked up in units of Relative Brightness. Frames per second replace shutter speeds, which are aligned to the film stock speed. Lens aperture is then read off against measured light value.

With the omission of these additional features, Weston's claim for the model's versatility can be questioned. In terms of provision for cine work however, they did fulfill their promise by producing a variant of the 850 for that purpose. At an immediate glance the meter appears identical to the standard 850 Junior and indeed it can be mis-identified on auction sites. A close study of the meter face however reveals the differences:

The legend 'Cine Exposure Meter' appears at the very top of the meter face, almost hidden under the bakelite lip. The relative brightness scale runs to 19 (about nine stops) which matches the range used on the model 819 professional cine meter. The scrolling centre strip displays framing rates (for type 'A' and type 'B' shutter arcs) and apertures. The framing rate in use on the camera is lined up on the scrolling display with the film stock speed on the top edge of the meter window. The measured light value listed on the lower edge of the window then addresses the required aperture in the scrolling display. This arrangement represents a significant step forward in ease of use since no adjustments have to be made at each light reading. The Film stock speed and framing rate are preset.

The company's advertising stresses the use of a Weston not just for every purpose, but for every purse. The 1938 three-fold leaflet have the prices at $15.50 and $22.50 for the Junior and 650/819 respectively, so the Junior is clearly priced for the entry level market it's aimed at. I find it difficult however to believe that the fiddly and fragile embedded scrolling display mechanism is more cheaply fabricated than the simple stamped metal discs of the exposure calculator dial. But pricing is part of marketing strategy and we can only presume that Weston got their sums right on the Junior.

For the collector though, this scrolling display is problematic. The flexible strip deteriorates with age and is likely to break up. The scrolling barrel mechanism itself is very prone to damage if the meter has been dropped. Examples in this condition cannot be displayed.

The Model 852 Cadet housed in a more rounded and slimmer casing. In operation the meter is identical to the 850 Junior but the white on black value mark-ups give greater legibility than on the 850. This was the first of any model of Weston meter to use A.S.A. speeds in place of Weston.

The presentation box and instruction booklet for the Model 852 Cadet: The Art Deco fan motif on the meter is reprised on the box lid. The striking full-colour artwork on the booklet cover is however unashamedly post-war modernist.

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Weston Light Meters (continued)

The next model of Direct Reading meter, the 852 Cadet, did not appear till 1949 - over ten years on from the introduction of the 850. In America this was introduced contemporaneously with the Weston Master II Universal. The 852 is a much more rounded lozenge shape than the 850 and thinner. It sits easier in the hand than the older model and adopts styling similar to the Master II, its professional brother. But while the Master series of meters dispensed with the Art Deco fan motif, this meter retains a revised version.

The rear of the model 852 cadet: The photovoltaic cell is truncated and a rotating invercone is shown in its parked position below.

The Cadet with the invercone rotated to its active position over the photocell, enabling incident light readings to be taken.

The general layout and operation of the front of the meter is virtually identical to the Model 850 but with two differences: A more legible white on black and black on white mark up of the face replaces the buff facing used on the 850 and the light scale running across twelve stops (as does the 850) is broken into thirds instead of halves. But the principal advance on this meter is in evidence on its reverse. Although the full circular photocell appears to be mounted inside, it is bisected and only half of it is presented to the light.
An invercone is mounted below it and can be rotated into place as needed to make incident light readings.

The instruction manual for the 852 makes it clear that, with the inclusion of the invercone, versatility is very much a design priority: The use of the meter in a wide variety of outdoor, indoor and studio environments is illustrated with drawings and sample photographs. Cine and Polaroid use is there as well.

Three U.S. patents are listed on the back of the 852 meter. The most relevant of these to this specific model is 2,463,770 which can be found at:
https://bit.ly/33czTf4

This covers the arrangement of the bearing mechanism within the meter pivot assembly with the primary objective of reducing instrument thickness. It is this that gives the cadet its slimmed profile.
An American magazine advertisement of the time emphasizes its compactness, being a 'space saver, fitting pocket or purse'. Sure, it's for 'Snapshots' but it is accurate, convenient, quick and simple to use, although at $21.50, I would dispute whether it was at a 'budget price'. The advertisement clearly uses a woman's hand holding the meter, an indicator that Weston were addressing the gender divide in broadening their potential market for exposure meters.

The Model 853 Direct Reading exposure meter of 1954. This is the first model that does not need mechanical readjustment on its front face after each light reading. The meter needle points directly to the aperture required.

Things changed significantly with the introduction of the model 853 in 1954. With a large number of this model still in existence, it must have been popular during its three years of production until being replaced by the last model in 1956. As with the model 852 Cadet, it is compact and sits well in the hand being rounded at its base though squared off at the top. It was produced alongside the Master Universal model's II and III.

What is most striking about this model is that, from the front, there are no adjustable controls. There is no dial and no scrolling display. The meter needle points directly to the aperture to be set on the camera.

Nothing could be simpler, more convenient or more rapid in operation. That is unarguable. At last it looks like Weston had made a meter that truly lived up to the advertiser's claims for their entry-level series. But what did they sacrifice to achieve this aim, and how did they do it?

SEC.	STOPS								
1/10	4.5	6.3	9	12.7	18	25	36		
1/25	2.8	4	5.6	8	11	16	22	32	45
1/50	2	2.8	4	5.6	8	11	16	22	32
1/100	1.4	2	2.8	4	5.6	8	11	16	22
1/200	1	1.4	2	2.8	4	5.6	8	11	16

This table mounted on the front face of the Model 853 is used to correct the indicated lens aperture for shutter speeds in use other than the default 1/50th second. The correct aperture is read vertically for shutter speeds up to two stops above or below the default.

The back of the Model 853 showing the rotating blind: This is set to the film speed and blocks off part of the photocell, pegging the meter to a comfortable working range for the user.

The first clue to this is the small metal plate reference table mounted in a recess below the meter face: The Art Deco fan motif has now been abandoned to make room for it. The crucial assumption that the designers made, was that a beginner or a snapshooter (the target demographic for these models), was unlikely to use the full range of exposure settings on a camera to deal with an unusual and extreme range of lighting levels, specifically the lowest.

For, to make longer exposures beyond, say 1/25th of a second, a tripod and cable release would be needed. Would the user bother with these items, out and about, on holiday, snapshooting? Weston thought not.

So the needle points straight to the aperture on a range limited now to the nine stops that would span the f stop range of a typical high-end snap camera of the time, ranging to f32. The silver strip in the centre of the table refers to these settings for the expected shutter speed of 1/50th second. If a higher or lower speed is being used, all the operator has to do is refer upwards or downwards on this scale to find the correct aperture, but only to a limit of two shutter speeds either way.

That leaves only one variable to be set on the meter: the film speed. Turning the meter over, we find the same truncated segment of photocell as in the previous model. But the invercone had now been dispensed with and replaced with a rotating blind that partially covers the cell. Reference marks on the casing show where to line up the film rating in use. A and B settings are available for cine camera shutters, the meter's one concession to the movie maker.

The slower the film in use, the more of the photocell is blanked off when set. This effectively reduces the meter's sensitivity. Rather than allow the meter to be operable under reduced light levels, this model is designed instead to restrict itself to the environments that the snapshooter would feel comfortable in. In doing this however, there is a massive gain in convenience for the user.

The Model 854 of 1956 is the last of the Direct Reading family. The look-up table of the previous model 853 has been replaced by a simple rotating barrel, set to the shutter speed in use. The aperture required is read off directly without further recourse to correction.

The last model in the Direct Reading series; the 854 of 1956, is truly striking in appearance. Compact? Certainly but not rounded at the corners. This angular T shaped meter is housed in rugged green and black plastic with a meter face across the top restricted to a narrow window displaying an array of f numbers and the red meter needle.

The aperture scale is one of five, set around a simple rotating barrel with a thumbwheel at either end. The aperture scales correspond to shutter speeds of 1/50th, 1/100th, 1/200th and 1/500th second and an EV (Exposure Value) scale of 8 – 16. The 1/100th second scale is also that recommended for movie work and labeled additionally as 1/50M. Support for the recently introduced EV scale at this time is significant: Many higher value range / viewfinder cameras such as the Voigtlander Vito family, featured EV linkages on their shutter and aperture settings.

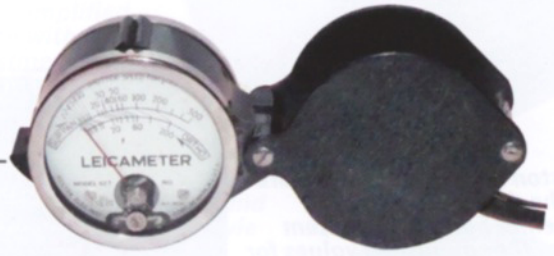
The reverse face of this meter is arranged in a manner identical to the model 853 with its half-moon photocell window and an adjustable blind set to the film speed. On the front face there is a small lozenge sporting the monogram: DR, for Direct Reading. The user does not need the reference table now. They just set the shutter speed on the rotating barrel; simplicity and convenience indeed.

Leicameters:

The landmark introduction in the early 1930's of the Leica 35mm focal plane shuttered eye-level camera, corresponded broadly with the introduction by Weston Electrical Instrument Corp. of their first Photronic Exposure meters. The first professional grade camera to make use of 35mm sprocketed cine film, the Leica was an immediate and massive worldwide success.

Weston decided to make a special version of their meter to support this popular camera. The early screw thread Leicas had a focal plane shutter calibration that deviated at several points from the smooth geometric progression of shutter settings then in use on the traditional Compur leaf shutter.

Four models of meter were produced which were physically identical to their professional parent models, from the loupe model 627 of 1933 to a variant of the Master Universal model 715 of 1939. Apart from the loupe model, they share an inverted mark up of the meter scale and calculator dial, broadly following the general concepts behind the Cine meters.



This reinterpretation of the model 627 cine meter indicates shutter speeds for the Leica for a preset aperture of f6.3 and a film speed of 23 degrees Scheiner. A plate round the meter's side suggests correction factors for other settings.

The first model to come out in 1933 was based on the 627 Cine Loupe meter of the previous year. Unlike the 617 twin celled meter with its calculator dial, the 627 was a pared down design consisting of little more than the Photronic Cell and a circular meter face with a metal cover, the arrangement resembling a magnifying loupe.

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Weston Light Meters (continued)

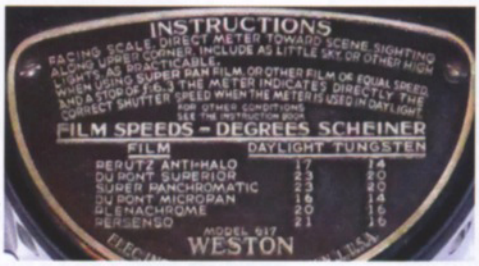
Instead of the meter needle pointing to a luminance scale, it points directly to shutter speeds.

In the meter's mark up, it is presumed that the operator will be using a panchromatic film rated at 23 degrees Scheiner and an aperture of f6.3. An additional scale on the meter supports a lower speed Orthochromatic film. So, provided you are using these particular settings, the use of this meter to calculate your shutter speed is supremely convenient. If not, then things get a bit more complicated:

The metal plate round the side of the 627 Leicameter shows two tables. The top table indicates exposure weightings for films of different speeds other than 23 degrees Sch. The lower table gives shutter speed corrections for apertures other than f6.3.

A metal reference table riveted to the meter's side helps: The upper section indicates the exposure weighting that needs to be applied for different film speeds, and the lower table indicates the exposure weighting for apertures other than f6.3. Neither table appear intuitive to the modern eye and we can only speculate how easy or difficult this meter was to use in practice. The 627 Leicameter seldom appears on auction sites and examples are usually expensive.

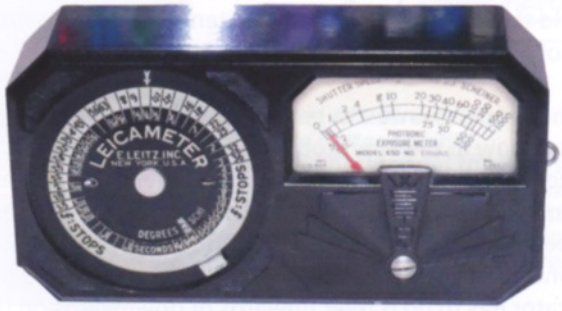
The model 617 Leicameter indicates shutter speeds directly for the default settings. For other settings the inner outward facing pointer is set to the required film speed and the outer inward facing pointer to the indicated shutter speed. Combinations of shutter and aperture values are then read off.



Weston may have been aware of the declining use of the Scheiner film rating system since they published values for proprietary films on the back of this Leicameter. Different values for Daylight and Tungsten lighting reflect the uneven chromatic response of the Photronic cell.

Even rarer than the 627, the next model of Leicameter based on the second single-celled model of the original 617 photronic of 1934, does not appear on Lester Pfeffer's 1983 Chronology of Weston Meters available at http://www.westonmeter.org.uk/Chronology.html

As with the 627 model, the meter needle on the 617 Leicameter points directly to shutter speed for a film speed reference of 23 degrees Scheiner and f6.3. The mark up of the three disc calculator dial is completely different from the 617 Photronic, and facilitates the calculation of exposure for settings other than the default film speed and aperture mentioned. Two pointers on the dial are adjusted: One for the film speed in use and another to which the shutter speed indicated on the meter is aligned. The shutter speed dial is now aligned with the aperture ring and any desired combination of these settings can be selected.



The Leicameter Model 650 is physically the same as its Photronic Universal parent, but the meter scale and calculator dial follow the same principles as the 617 Leicameter.

Not surprisingly, the next model of Leicameter is based on the 650 Photronic Universal. This 1938 issue by Weston must represent the high point of Leicameter popularity because this model appears on auction sites more frequently than the others. Even so, a good example will cost between six and twelve or so times what an equivalent Universal or 819 Cine will fetch.

Though identical physically to the 650 Universal, the 650 Leicameter meter face and calculator dial operate in a manner identical to the 617. Instead of the film speeds being arranged on the outer ring of the calculator dial however, they are set in a small window on the inside dial. Weston retained the Scheiner film speed rating system on this model despite it declining in general use by this time. Reputedly they did produce a variant of the 650 Leicameter that used A.S.A ratings, but I have never seen one.

The Model 715 was the last Leicameter made. It now has two pointers for the high and low light level ranges and the Scheiner film speed system has been replaced at last by Weston's own film speeds.

The final model in the series is based on the legendary Weston Master Universal 715. It follows the same layout of meter face and dial as established in the 650 Leicameter but, by its introduction in America in 1941, Weston decided to abandon support for Scheiner film speed ratings

in favour of their own, by now well established, Weston Speeds. Two reference pointers exist on the outer dial to support the baffle-actuated dual range innovation of this model: The sensitive 'A' range with the baffle down and the 'B' range, baffle up, for higher brightness levels.
The model 715 Leicameter appears to be as rare as its Universal Master counterpart is numerous. The advantage of having a meter dedicated specifically to the Leica was, by now, beginning to diminish. The Second World War notwithstanding, later models of screw mount Leicas and the bayonet mount 'M' series soon to appear, all used a more conventional shutter speed progression, and so were accommodated by the now ubiquitous series of Weston Masters in large scale production in both America and Britain, and in use worldwide.

Later Models:

Weston Electrical Instrument Corp. in New Jersey, America ceased manufacture of the Master series of exposure meters in the late 1950's. They continued to be made in the Sangamo factory in Britain with updated models until closure in 1980, the Euro Master being the model in production up till then. Models from the U.K. were exported back to the U.S.A. and other locations worldwide.

But two more models of exposure meter were made Stateside by Weston: The Cadmium Sulphide Ranger 9 and the Pixie. Additionally two budget priced meters were made in Japan for Weston under license: The Selenium celled XM1 and the CdS XM2.

The Cadmium Sulphide based model 348 Ranger 9 sported a larger calculator dial and a spread of 21 luminance capture levels down to 0.002 candles / square foot.
A sighting finder is visible at the top.
The rear face shows the cell and finder apertures and the battery compartment cover.

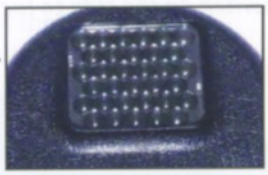
The Model 348 Ranger 9 was manufactured from 1966 and, judging by the frequency it crops up on American auction sites, was popular. The Newark factory's only excursion into CdS exposure metering, it is a tour de force in design and quality manufacturing. The largest of the hand-held meters, it has an Aluminium top casing and black solid plastic body. An over-sized calculator dial works in the same basic way as with the other models and full support for the Exposure Value (EV) system is provided. The reason for the large dial is apparent since a range of 21 stops in candles per square foot and Exposure Values is printed on the inner dial, which goes down to an astonishing 0.002 Cdls/Sq.Ft. It is just speculation on my part but that may just be the reason this meter was called the Ranger 9: Because, unlike the Selenium meters, this one 'ranges' 'nine' stops lower.

Such is the advantage of the CdS cell. But being Photo Resistive, the meter needs a power source and this is where issues arise concerning using this model today: It uses a, now obsolete, Mercury cell. Equivalents can be used but the voltage will be slightly different and the readings correspondingly skewed. But, yes, they can still be used and more of these meters appear to be in fully working order than the photovoltaic models. And they are accurate.

The Ranger 9 has dual range operation and a viewfinder to aid in accuracy when taking spot readings. A single push button activates the power and locks the reading on release. Strangely however there is no provision for an invercone and incident light readings. A special variant was produced with Ansel Adams' zone system dial mark up. The world renowned photographer was evidently a committed disciple of the model.

The Ansel Adams variant of the Ranger 9 replaces the E.V. scale on the standard model with a tonal range supporting his Zone System.

The Model 548 Pixie was a simplified design with no adjustment features beyond the selection of one of four Kodak films by rotating the outer toothed rim.
Though not commercially successful, this model found favour with amateur movie makers.



The hooded cell aperture of the model 548 Pixie

The 1968 Model 548 Pixie could not be more different: Of relatively cheap fabrication, this three inch diameter disc could not be simpler in operation. In many respects it returns to the marketing philosophy underpinning the earlier Direct Reading family of meters in that it is aimed at the Snapper – the leisure photographer rather than the dedicated amateur or professional.

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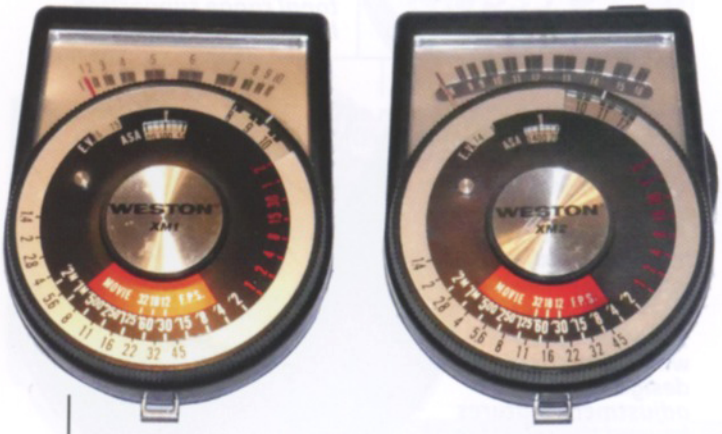
Weston Light Meters (continued)

But there are no adjustments here for different film or shutter speeds: Just a single outer wheel which sets the meter to one of four proprietary Kodak films: They are Plus X pan, Kodacolor X, Kodachrome II and Kodachrome II movie. They refer only to a default shutter speed of 1/125th second or, for the movie film, 16 to 18 frames per second. The needle then points to the f number needed. The user working with something else is therefor on their own, or in need of the instruction manual at any rate.

The Pixie is very rare and was probably not a big seller for Weston in 1968. By then the very popular Kodak Cartridge loading 126 Instamatic had become established. The user of this remarkable camera was not faced with an array of shutter speed, aperture and focus controls to be set, but typically just a couple of weather symbols. Good pictures could be taken without recourse to a separate exposure meter. There is some anecdotal evidence however that the Pixie was popular with movie - makers; understandable given that it did not need any adjustments. For the same reason it found its own place in underwater photography; a third-party underwater housing was created especially for it.

The models 540 XM1 and 550 XM2, were made concurrently by Sekonic in Japan from 1972. Of cheap plastic-cased fabrication they, are evidently aimed at the budget sector, probably in response to the emergence of meters such as the Russian Leningrad on the world market. As with the Japanese Master VI, they are often disparaged by collectors because of their build quality.



The Model 540 XM1 (Selenium cell, left) and 550 XM2 (CdS cell, right) made by Sekonic in Japan. Though appearing at first glance identical, the XM2 differs in having a dual range luminance scale and a switch on the side to facilitate this.

At first glance the two meters appear identical but significant differences are evident between the Selenium XM1 and the CdS XM2: The XM1 has a single ten point luminance range and an easy to operate calculator dial which, though it appears simple, still has all of the shutter and aperture settings that a photographer would need. With its support for the EV system, it is surprisingly well designed.

The XM2 has an apparently identical dial, but there is a 4-way rocker switch on the side of the body which switches between high and low light level ranges, battery test and meter turned off. Instead of an exposed Selenium cell on the top edge, there is a small lens for the CdS cell and a sliding invercone for incident light measurement. The XM2 has a range of sixteen luminance levels between the two ranges as opposed to the XM1's ten.

I have not covered every single model of exposure meter made that bears the Weston name. The New Jersey factory were responsible for several other models or variants that were produced either in extremely small quantities or were special models, variants of the standard meters. These include special cine meters for the Filmo and Bolex 16mm cine cameras and one or two designed for high-speed cine work with the Fastax camera. Some general-purpose multi range luminance meters were also modified for photographic studio applications. These various models represent the holy grail of exposure meter collecting, so if you are interested in finding them, good luck. They are very very rare.

John's Weston Meter site is at:
https://www.westonmeters.info

Websites relevant to this article:

Model 852 Cadet Patent:
https://patentimages.storage.googleapis.com/d7/d6/9f/180b0a8f0cdaa1/US2463770.pdf

Lester Pfeffer's *Chronology of Weston Meters*:
http://www.westonmeter.org.uk/Chronology.html

Simon A Spaans' *Illustrated History from 1931 – 1970 of the Photoelectric Light Meter in Photography (2014)*:
https://docs.wixstatic.com/ugd/3fcc93_3297ab790cf440abaf3d309b06dea29c.pdf
available via my site:

https://www.westonmeters.info/publications

The difference between the XM1 (left) and the XM2 (right) become more apparent when looking at the cells. The XM2 has a small aperture for its CdS cell and a sliding invercone for incident light readings.