HOW TO CONVERT AN OM1/1N to use a Silver Oxide 357 Cell (Germanium Series Diode Method)

File: OM1DiodeVer2.1C © T.Hughes 1999,2000,2001,2002,2003

As an alternative to the no compromise calibration modification given elsewhere, a Germanium diode in series with the battery may be used. This is a little easier to install, as it does not require top plate removal. Accuracy at high EV values will be lower and there will be some small meter non-linearity. (approx 0.4EV, and some small temperature sensitivity) This modification is essentially the same as using a (Criscam) MR9 adapter, but building it into the camera.

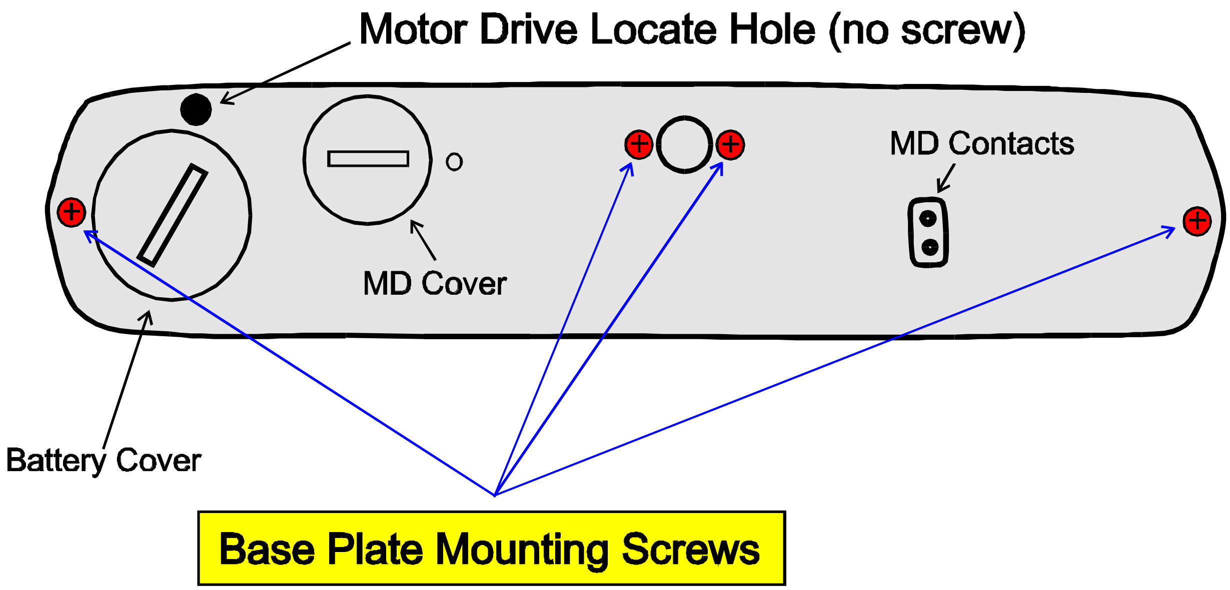
The 1N34A should be a very easy part to get as it is widely used by school kids for making "crystal" radios (see Diodes Sources at end of this document)

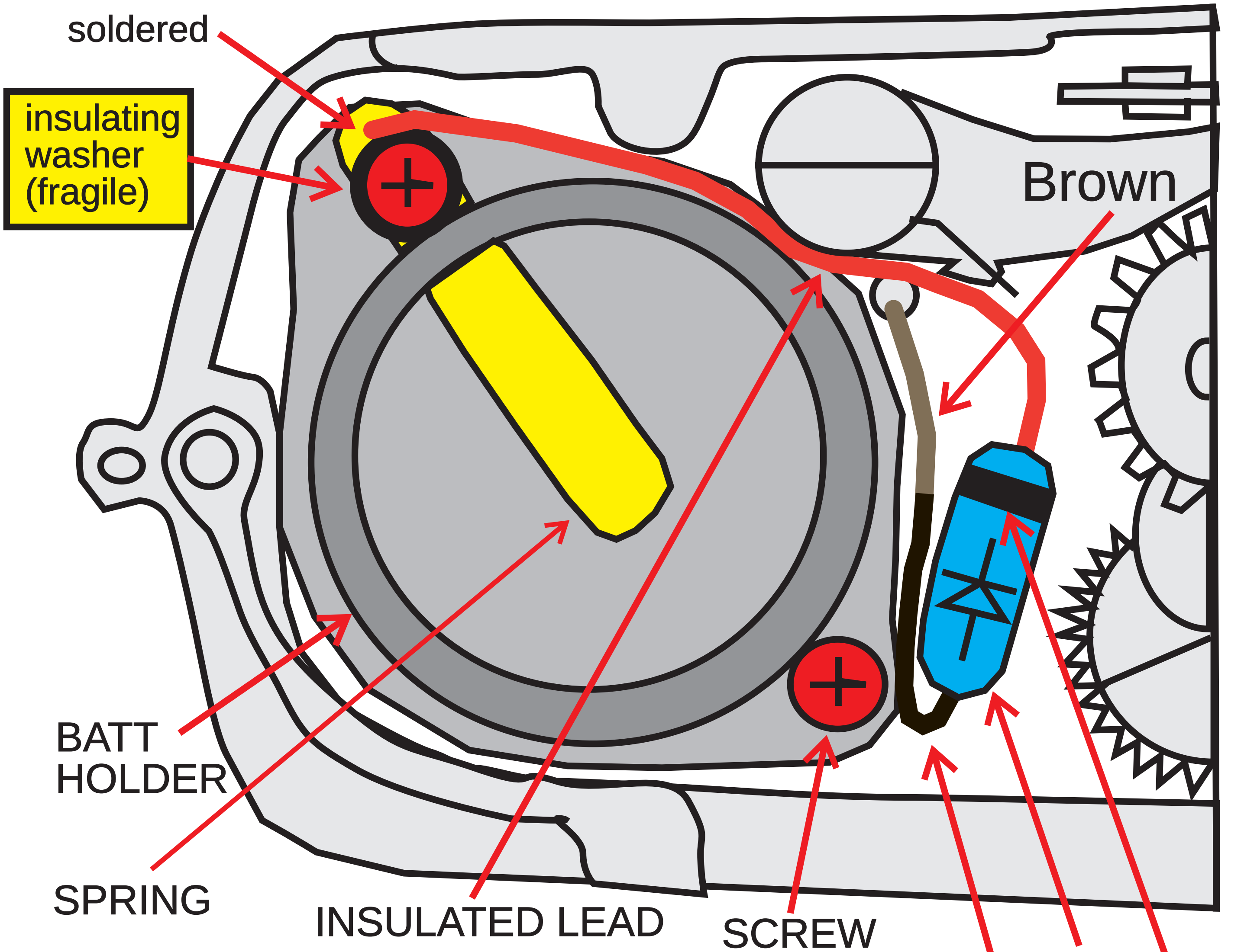
Before using the diode, trim it's leads shorter and apply solder so they are tinned making it easy to solder into the camera. Some of the diodes can be rather large and the leads may need dressing to fit around parts in the camera base. Cover any exposed lead as needed with an insulating sleeve or heatshrink tubing to stop it shorting to adjacent metal.

To make the modification all you need to do is remove the base plate (4 screws, see attached drawing) and find the black plastic part that holds the negative side of the battery (under the battery plate on base plate). This has a wire (brown on newer OM's) on its edge (which actually connects to the metal strip spring on the black plastic) .

Remove the screw that holds the battery spring strip connected to the wire. Carefully remove the spring. Do not lose the insulating washer and screw. Removing the screw and spring prevents damaging (melting) the plastic pieces when soldering wires to the spring strip end. Desolder the brown wire from the spring strip. Tin the spring strip. Solder the diode in series between the wire and the contact where it had been connected. The marker line on the diode should be nearest the spring (this is important, as the meter won't work if you get it wrong, although no harm is done). The metal strip can sometimes be difficult to resolder. If so, use a file or fine sandpaper to remove or roughen the nickel coating. This may help when tinning the strip prior to soldering the diode. If you are unable to tin the strip this way you can try using acid flux for tinning the strip. However you must then wash and brush (old toothbrush) the tinned strip very well or the acid flux will attack the new joint you make causing long term reliability problems. Using acid flux is a last resort as it is very tough to clean properly. Pass the diode lead through and bend back around the spring strip to improve the electromechanical connection when soldered. Solder the diode to the tinned strip with rosin core solder. Insulate the wire with tape or shrink tubing. Reassemble spring strip and insulating washer back into camera. Note: You may find it easier to remove the complete black plastic battery holder when performing this

OM1N Base Plate





MERCURY BATTERY REPLACEMENT FOR OM1/N USING SERIES DIODE

1) REMOVE BASE PLATE
2) REMOVE TWO SCREWS HOLDING BATTERY HOLDER
   (may be sealed tight,insulating washer fragile)
3) REMOVE SPRING FROM BATTERY HOLDER
4) DESOLDER BROWN WIRE FROM SPRING
5) SLIDE INSULATOR OVER DIODE LEAD MARKED WITH LINE
6) SOLDER INSULATED (line) LEAD TO SPRING
7) SCREW BATTERY HOLDER BACK IN PLACE
   be careful not to damage insulating washer on spring screw
8) SOLDER OTHER END OF DIODE TO BROWN WIRE
9) FIX DIODE DOWN WITH HOT GLUE TO STOP MOVEMENT /shorts
10) CHECK FOR SHORTING TO ADJACENT PARTS AND BASE PLATE
    PLACE INSULATING MAGIC TAPE ON BASE PLATE ABOVE DIODE

modification. Always use resin core electrical solder on the wire or diode never use acid core solder or flux.

Put a piece of foam in the battery holder with a cutout hole to stop the 357 silver oxide battery from rattling around. Sometimes the wire from the battery holder is corroded. If so, clean and "tin" the section with solder, before soldering to the diode. If very badly corroded, strip back and replace a section of wire with new wire

APPENDIX: Comments and detailed tests on using Different Ge diodes:

(Some selected posts I submitted to the Olympus mail List)

(Note errors measured with diode modification could be reduced slightly if the meter fine trim mechanical calibration were performed at ~EV 17, but linearity errors would still remain)

TESTS on an OM1N:

OM1N current consumption is less than 1uA under completely dark and cool conditions. (meter switched on, with eyepiece taped over and lens cap on.)

This implies if the camera is stored in a really dark cupboard it makes almost no difference if the meter is left on or not as the battery should still last more than 2.5 years. This may not be as true at high temperature.

OM1N Current Consumption with a mercury cell (1.35V)

Ambient temperature of test: 18 deg C
Note: meter current consumption is dependent only on light intensity (not on aperture,speed setting or ASA settings).
Current Consumption does depend on lens maximum aperture since metering is at full aperture.

Sealed eyepiece AND lens cap		<1uA
EV2	(F2,1sec,100ASA)	16 uA
EV7	(F2.8,1/15sec,100ASA)	86 uA
EV16	(F16,1/250sec,100ASA)	471 uA

EXPOSURE ERRORS VERSUS BATTERY VOLATGE:

Test settings: ASA 100 (except as noted), OM1N using 50mm,F1.4 lens
Light source incandescent with diffuser
The camera meter was balanced at a battery voltage of 1.35V
The “battery” voltage then varied and the meter rebalanced using speed and/or aperture rings. Approximate errors in stops were then estimated from the balance change with voltage. This calibrates the sensitivity to battery voltage error at a given light level.

Note: Reference Mercury battery voltage : 1.35V

Nominal Silver Oxide Cell voltage : 1.55V (often closer to 1.6V if new)

Voltage match setting		**current**	**error**
1.6V	F2/1sec	15uA	0stop
1.55V	F2/1sec	14.7uA *	0stop
1.4V	F2/1sec	13.1uA	0stop
1.35V	F2/1sec	12.7uA *	REF
1.25V	F2/1sec	11.7uA	0stop

1.6V	F5.6, 0.5sec	71uA	-0.8stop
1.55V	F5.6, 0.5sec	69uA*	-0.8stop
1.45V	F5.6, 0.6sec	64uA	-0.2stop
1.35V	F5.6, 0.8sec	59uA*	REF
1.25V	F5.6, 1.0sec	54.4uA	+0.2stop
1.6V	F5.6, 1/40sec	167uA	-1.2stop
1.55V	F5.6, 1/35sec	162uA*	-1.0stop
1.4V	F5.6, 1/22sec	150uA	-0.6stop
1.35V	F5.6, 1/17sec	140uA*	REF
1.25V	F5.6, 1/12sec	130uA	+0.7stop
1.60V	ASA 50,F18, 1/1000sec	486uA	–3.2stop
1.55V	ASA 50,F14, 1/1000sec	480uA*	–2.8stop
1.45V	F12, 1/1000sec	448uA	–0.6stop
1.35V	F8.6, 1/1000sec	418uA*	REF
1.25V	F5.6, 1/1000sec	387uA	+1.0stop

ERRORS USING VARIOUS ADAPTER DIODES

Adapter using :

4 schottky diodes (1N5711) in parallel to create higher current diode

Input 1.55V silver oxide cell

	current	OutVoltage	error
EV2	12.7uA	1.35V	0 stop
EV6	57uA	1.31V	0 stop
EV7	135uA	1.29V	+0.4stop
EV16	400uA	1.26V	+0.8stop

Using a Germanium Junction Diode (transistor C-E junction)

Estimated Performancefor Ge "Diode" :

EV16	0.42mA	1.35V	+0 stops
EV8	0.15mA	1.38V	-0.5 stops
EV6.5	0.1mA	1.40V	-0.2 stops
EV6	0.05mA	1.42V	-0.2 stops
EV2	0.015mA	1.45V	-0 stops

Estimated performance using series resistor of about 500Ohm
(actual resistor value would be set depending on the particular camera)
Input 1.55V silver oxide cell (Note Error over wide range)

EV	current	OutVoltage	error
EV16	400uA	1.35V	+0 stops
EV8	200uA	1.45V	-0.6 stops
EV7	135uA	1.47V	-0.8 stops
EV6	63uA	1.52V	-0.8 stops
EV2	15uA	1.54V	+0 stops

Estimated performance when using Schottky Power diode (eg 1N5918)

EV16	1.425	0.44mA	-1.2 stops
EV8	1.46V	0.16mA	-0.8 stops
EV6.5	1.47V	0.1mA	-0.6 stops
EV6	1.48V	0.05mA	-0.2 stops
EV2	1.46V	0.015mA	-0 stops

Comments: Because the battery voltage sensitivity error is lower at low Light levels, correcting the error at maximum light levels, tends to reduce errors fairly well over the whole range. This is helpful when using diodes too, as the leakage currents are less significant than at low light levels. At high light levels having too low a simulated battery voltage introduces slightly less error than if the error in voltage were on the high side.This helps reduce the errors from the low power schottky diodes which drop too much voltage at maximum light levels.
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TESTED OM1 ERRORS (1N34A) in stops at approx EV's :

194mV	@0.409mA	EV16	0 stop
165mV	@0.197mA	EV8	-0.5 stop
125mV	@0.100mA	EV6.5	-0.35 stop
100mV	@0.062mA	EV6	-0.2 stop
70mV	@0.023mA	EV2	-0.1stop

(63-90mV for different diodes at low current)

Tests on 9 , 1N34A diodes from Radio Shack (part#276-1123)

Diode voltage @ current

213mV	@ 0.558mA
221mV	"
216mV	"
218mV	"
212mV	"
210mV	"
204mV	"
203mV	"
206mV	"

173 mV	@ 0.27mA
175 mV	“
165 mV	“
168 mV	“
182 mV	“
173 mV	“
185 mV	“
177 mV	“
235mV	@1.100mA

How reproduceable are different types of Diodes?
Ideal Diode for OM1 camera conversion drops about 200mV at 0.5mA

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Tests on 5 Schottky, 1Amp power diodes (1N5818)

At	0.52mA	voltage drop:	0.127-0.132V
At	0.20mA	voltage drop	0.101-0.109V
At	0.05mA	voltage drop	0.065-0.070V

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Test on 4 different Germanium Transistors

Using C-B junction (2N1305) (i.e. used as a diode)

At	0.52mA	voltage drop	0.198-0.205V
At	0.20mA	voltage drop	0.163-0.172V
At	0.15mA		~0.155 estimated
At	0.10mA		0.15V estimated
At	0.05mA	voltage drop	0.127-0.130V

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Test on 3 different 1N5711's low power schottky diodes

At	0.52mA	voltage drop	0.308-0.325V
At	0.20mA	voltage drop	0.295-0.320V
At	0.05mA	voltage drop	0.255-0.270V

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Test on 4 parallel connected 1N5711 schottky diodes

At	0.52mA	voltage drop	0.274V
At	0.20mA	voltage drop	0.261V
At	0.05mA	voltage drop	0.224V

Estimated Errors using a **1.4V Zinc/air** "Wein cell")

EV3	0 stop
EV6	-0.1 stop
EV 7	-0.6 stop
EV 16	-0.6 stop

Unfortunetly cell life is very short once trhe cell has been unsealed.

DIODE SOURCES

Micro-Tools in Vaccaville CA:
http://www.micro-tools.com PH: (707)446-1120 sells 1N34A's

Mouser Electronics
http://www.mouser.com/
Sells CDSH270 and NTE109 GE diodes (see below). (I have not tested these diodes)

Jameco in Redwood City CA
http://www.Jameco.com Sells 1N270's (part # 35941)

One of the few manufacturers of Ge diodes left, is :

American Microsemiconductor, Inc.
133 Kings Road, Madison, NJ 07940 USA
(973) 377-9566 / Fax: (973) 377-3078
info@americanmicrosemi.com

They make 1N270,1N34A,1N60 etc diodes, suitable for camewra use. Unit cost about 18 cents Unfortunately they have a minimum order of $50 so you will need to buy through a distributer. Their 1N34A's have the lowest specified leakage current so are probably the preffered device.

NTE lists their part number NTE109 as similar to the 1N34A but it looks a bit more leaky and a slightly higher current part,so may have lower forward drop.
http://www.nteinc.com/

Many hobbyists sell Ge diodes for crystal set construction:
e.g. Scott sells 1N34A's for hobby use:
http://home.talkcity.com/corporateway/comtrol/In34a.html

Radio Shack used to sell part#276-1123 for $1.20 and included 10 diodes.
