MERCURY FOCUS SCALE CREATION

Intro

To create a Mercury focus scale for a lens that isn't in the database, to use for handheld shooting, you need to set up a series of targets at specific distances, focusing on each and marking a piece of tape on the Focus Unit. This tape can then be scanned, and Inkscape (free software)Acle that matches your test strip. Please share your files with us so we can add the lens to the database for other users!

The focus scale creation process is divided into four phases: First you need to do an infinity test and series of measurements for each lens. This will determine how it is mounted to the Mercury. Secondly, Mercury Works will need to fabricate the proper parts (shutter plates, lens barrels, spacers, etc.) to mount your lens with correct infinity spacing. Third, using this kit, you will create a rough focus scale by measuring and marking a series of focus targets. Finally, you will scan this rough scale and use it to create a digital version that can be printed out for actual use (or you can have us create the digital version after sending us your scanned rough scale).

Items You'll Need

- Testing camera (see below)
- Set of Mercury lens mounting components (front spacers, barrels, shutter plates, etc.)
- Callipers (preferably digital, and certainly one that can measure in millimetres).
- Roll of blue painter's tape (preferably without anything printed on its surface)
- Fine-tipped black permanent marker (Sharpie)
- Two other-colored permanent markers
- Glossy magazine or similar surface you can cut up
- X-acto knife
- Metal straight edge

- Recommended: 2” or 3” wide roll of white masking tape or white duct tape
- Recommended: flatbed scanner

Camera Setups

The best setup for lens testing is an official Mercury Testing Body. We have two versions: one accepts Micro 4/3 digital cameras whose grips are small or don't get in the way (recommended: Olympus Pen E-P1 or E-P2, which are very inexpensive on the used market) and the other accepts any Canon EOS-M.

The second best setup is to use a Mercury with a medium format digital back, via that native back adapter (i.e., not on the Graflok 23 adapter). This is faster and easier if you digiback has live view capability, but still works fine taking photos. (Note: Leaf Valeo backs have live view capability, but require a special Live View USB Dongle ot activate it in Leaf Capture software.)

The third option is to use ground glass and a good (high magnification) loupe. This is rather difficult to do accurately with ultra wide lenses.

Where to test lenses

Lenses should be tested in a long enough room or space to set up as many distance targets as possible. The standard target distances are listed below. You'll want to line up as many as you can in a row at camera height. Longer distances than are available within your room can be set up using mirrors or outside, through windows, as described below.

Focus Targets (in feet)

When creating a Mercury focus scale, we ask that you test for both feet and meters. Because many distances are easily convertible between the two, we have found that the best method is to set up most distance targets in FEET, but to add a few in METERS. This will provide you (or us) with all of the necessary information to create both a feet and meters version of the focus scale. We ask that you do this regardless of the units you wish to use personally, as it will benefit the entire Mercury community. Here are the distances you should measure (in feet):

2', 2.5', 3', 1m (3'4”), 3.5', 4', 4.5', 5', 6', 7', 8', 9', 10', 12', 4m (13'1”), 15', 5m (16'5”), 20', 25', 30', 10m (33'), 50', 100', infinity

Lenses 65mm or less: You can optionally add shorter distances, and remove some intermediate distances (when marks are very close together) such as 25, 100, etc. The wider the lens, the closer infinity will be (the fewer long distances you'll need).

Longer than normal lenses will drop close focus distances (will have a longer minimum focus), and at some point, may add a 200' or 250' focus mark before infinity.

Testing Setup

Setup your testing camera on a firm tripod. The tripod must not move at all during the testing process (which may stretch out over multiples days or weeks). Focus targets from 2' to about 8' can be created by folding over pieces of white masking or duct tape and drawing black crosses on them. Longer distances require larger targets: print out a number of copies of the included

target PDF (or choose a focus target to print from the Internet). It is important to label *all* focus targets with their focus distances.
When you have exceeded the length of your testing room, you can use a mirror to extend the distance backwards. To calculate distance, just measure the distance from the camera to the mirror, and then add the distance from the mirror to the target.

You will want to position your tripod so that its head can be rotated (not moved!) to point out a window. This direction should include an unobstructed view to an infinity target (100 yard / meters or farther away). It should also include a 100' target, ideally.

If you cannot position your tripod where it can be aimed at both close and faraway targets without moving, you will have to use two (or more) locations, splitting the testing process into different distance ranges, marking each lens' scale two different times.

[photo of closer distances]

Which Focus Unit to use?

Ultra-Wide Helical Lens Board: Use this for very wide lenses, at least up through 75mm. Even though 65mm and 75mm lenses can be used on a medium format configured Mercury with the standard Focus Unit, larger formats require this board, so as a courtesy to others in the Mecury community, please consider testing all 65mm and 75mm lenses on both this board and the standard focus unit. 90mm lenses with very large rear elements may not work witht the standard focus unit and will require this board.

Standard Focus Unit: All lenses from 65mm to 180mm should be tested on this, assuming they physically fit. Larger lenses must be tested on one of the two other units.

XL Focus Unit: Lenses too large for the standard focus unit, 90mm or larger, or lenses longer than 150mm should be tested on this unit. Any lens meant to be used on 5x7 should be tested on this unit.

Which tape to use?

Blue painter's tape leaves the least amount of residue. Tape it down to the cover of a glossy magazine and cut into thin strips for either of the focus units. The Ultra-Wide Angle board utilizes paper cutouts instead of tape.

Phase One: Infinity Test

The purpose of this test is to determine the proper spacing for use on the Mercury. First, choose the proper focus unit (page 1 of this guide). Then, mount the lens to the following:

> If using on an Ultra Wide Board or Standard Focus Unit: 2mm thick M58 shutter plate designed for your lens' shutter (for example, Copal 0).
>
> If using an XL Focus Unit: a 5mm thick XL barrel designed for your particular shutter, or, if your lens doesn't fit or your shutter is too large, directly to an XL Mounting Plate designed for your shutter (for example, Ilex No. 4).

You now need to add front spacing to get your lens in the ballpark of its focal length. You can use this formula:

> Lens focal length
> - 35
> [-30 if using standard focus unit]
> [-4 if using Ultra Wide Board]
> [-50 if using XL focus unit]

This is the approximate amount of front spacing you need for this test. Round down to the nearest 5mm (or 10mm if using the XL Focus Unit).

Mount the lens to the focus unit and the focus unit to the Mercury Front Plate. Add your front spacers between the focus unit and Front Plate when you mount them. Front Spacers are square "rings," each of which is labeled with a number that indicates its height.

Mount this lens stack using M4 bolts of the correct length, each of which should have a Front Washer threaded through it. Use the included allen wrench to tighten these bolts to just slightly beyond finger tight. **Overtightening these bolts can damage your camera!**

If using the XL Focus Unit, you need to use the smaller diameter Front Washers.

If your front spacing number is larger than 55, you will need to use a Front Mounting Spacer in addition to standard Front Spacers. An FMS mounts to your Front Plate as if it were a focus unit (but uses the smaller diameter Front Washers), and provides an additional mounting point for further spacers and your focus unit, as if it were a Front Plate. An FMS *must* include a standard Front Spacer in between it and the camera's Front Plate (except in the relatively rare case of the XL Front Plate). Additionally, the XL Focus Unit, when used with an FMS, must include a standard Front Spacer inserted between the FMS and the XL Focus Unit.

Once your lens stack is bolted to your Front Plate, you can mount your camera on the tripod, aim at an infinity target, and extend the focus unit until your image comes into focus. This is your

infinity point. When you have found it, use callipers to measure the amount of extension of the focus unit. This is how far “out” the helical has extended from the null (zero) position.

[photo: measuring focus unit extension]

Record this number (in millimetres). Send us this value, in addition to the following:

Rear element diameter
Rear element length (from the back of the shutter to the end of the element; just an approximate value)
Lens name
Lens Focus Length
Focus Unit used in test

Phase 2: Mercury Lens Mounting Components

When Mercury Works has received the above measurements, we can calculate a “lens formula” for your lens. This will include a shutter plate of a particular thickness, a lens barrel (sometimes), a Front Spacer height, and sometimes custom components. When we calculate a lens formula, we take into consideration elements such as standardization (we try to create formulas that use standard components in similar configurations), ease of converstion between formats (if your lens can cover 4x5, for instance, we try to create a formula that allows for RS-20 mounting with only a simple change, such as the removal of a Front Spacer), the limitations of the lens itself (i.e., what sort of barrels it can and can't fit into), potential vignetting, etc.

If you don't own the particular set of parts necessary to mount your lens according to our formula, we can sell you, inexpensively, whatever you need. Once you have these components, you are ready for the next step...

Phase 3: Focus Calibration

This is the most important test, and the one for which you need your elaborate series of distance targets. To do this calibration, you must have a testing setup as described at the beginning of this document, and the proper Mercury components to match the lens formula that was created in the last phase.

Here's what you need to do:

1. Mount your lens to the testing camera according to the provided lens formula.

2. Place a thin strip of blue painter's tape on a blank Focus Ring on your focus unit (standard or XL). This can be cut form a 1” wide roll of standard blue painter's tape that has been adhered to the cover of a glossy magazine and then cut in 1/3” strips with an X-acto knife and a straight edge. If your lens uses the Ultra Wide Board, do not use painter's tape. Instead, print out a page of UW testing templates and carefully cut one out. Apply it to an Ultra Wide Focus Plate using glue stick. Mount the focus plate to the UW Board, taking care to match the top of the plate to the top of the board (the top right corner of the plate contains a small notch to indicate its position. The board's top is marked on its *back* side with a small notch.

Ultra Wide Board Only: Focus on infinity. When you are at your sharpest point, place a small piece of white tape on the edge of your UW Insert (the part that rotates and extends in and out of the board itself), roughly lined up with the infinity point on the board (top, dead center, pre-marked on the testing templates). Then make a black mark on the tape that perfectly lines up with the infinity mark. This is your indicator mark. For all other focus distances, you will make marks on the paper template that line up with this indicator mark.

[photo: indicator mark on UW board]

Standard and XL Focus Units Only: Retract the focus unit all the way. Then make a mark on your blue tape at the point where it intersects with your focus indicator mark (at the top of your focus unit).

[photo: calibration mark on standard focus unit]

3. Using your digital camera screen, tethered laptop, or ground glass, focus on each distance target (usually starting with infinity and working your way closer). When at your sharpest point, place a mark on the blue tape with your black permanent marker, and label the distance. We highly recommend using a different color (e.g., blue or green) for the meter marks, as they can become confusing later, given how small all of the labels and marks are.

Always do all of this testing with your lens set to its widest f-stop for the narrowest depth of field!

Often you will notice (especially with wider and slower lenses) that a target falls within a range of best focus, and it is difficult to determine the sharpest point. In these situations, you can mark a range on your tape with a pencil. Then place your final mark in the middle of this range.

[photo: tape being marked]

Phase 4: Final Focus Scale Creation

When you are done testing all distance targets for a particular lens, carefully remove the blue tape from the focus ring (for UW boards, use an X-acto to remove the paper template from the focus plate). Then re-apply your test scale to a piece of white paper. It should look something like this:

[photo: focus scale on paper]

[photo: UW board scale on paper]

If you have a flatbed scanner, scan this sheet at 300dpi (exactly: you must use “advanced” settings in your scan software to achieve this; do not use automatic settings). Save it as a jpeg.

METERS: TYPICAL VALUES

0.6 (2')
0.75 (2.5')
1 (marked [3.3'])
1.2 (4')
1.5 (5')
2 (6.56')
2.5 (8.2')
3 (9.85')
4 (marked [13.1'])
5 (marked [16.4'])
6 (20')
7.5 (24.6') (in Blik marked at 8)
10 (marked [33'])
15 (50')
30 (100')