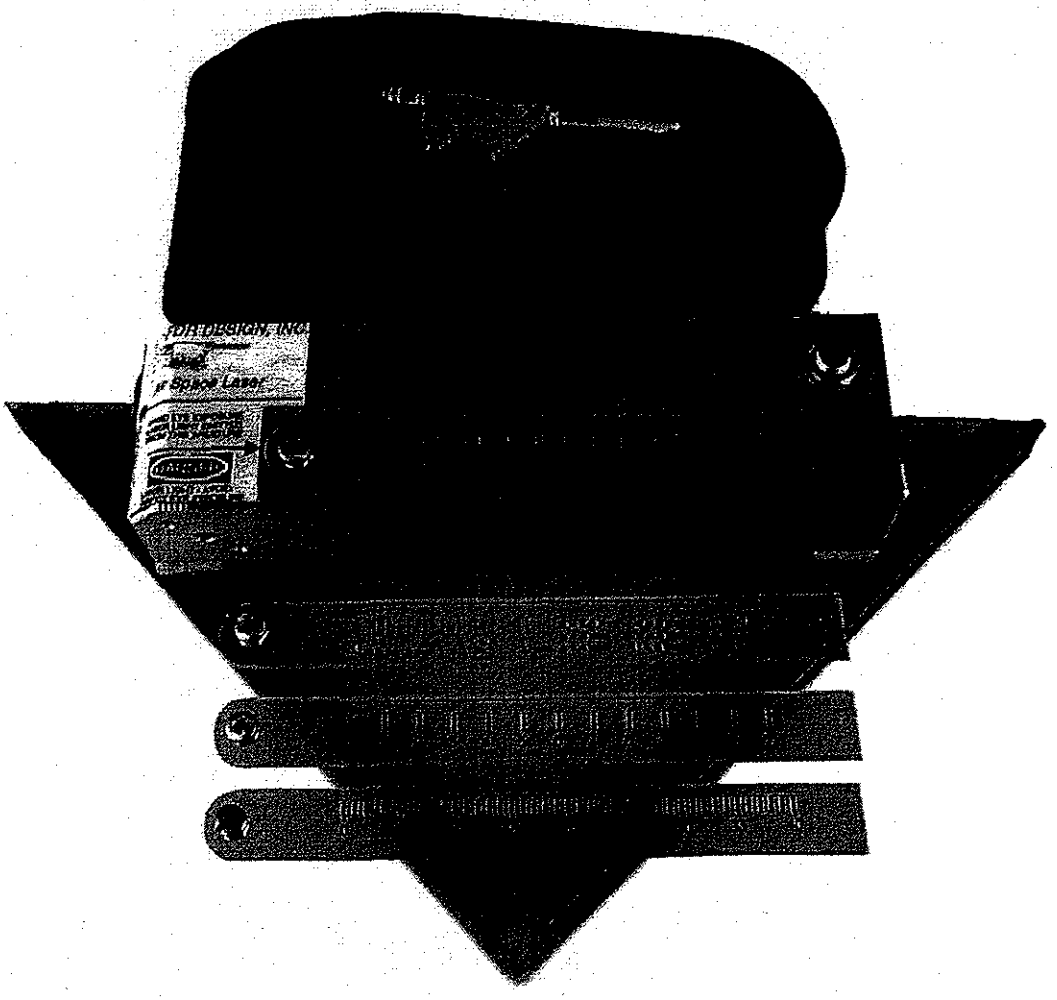


Air Space Laser

- Determines dimension of glass and air space
- Measures glass deflection in sealed glass units
- Quick and accurate measurement taken from one side of the IG unit
- Scales include metric, 1/8", decimal inch, and glass thickness
- Complete with carrying case and belt holder
- Designed & manufactured in North America, serviced worldwide

World Leaders in Gas Filling Technology

FDR Design Inc.

303 12th Avenue South
Buffalo, Minnesota 55313
www.fdrdesign.com
sales@fdrdesign.com
Tel : 763-682-6096
Fax: 763-682-6197

FDR Design Inc.

612-682-6096 612-682-6197 (fax)

303 12th Avenue South
Buffalo, MN 55313
July 22, 1994

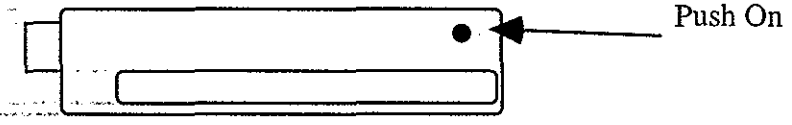
FDR — Air Space Laser

****Do not look into laser beam.****

LASER RADIATION — AVOID DIRECT EYE EXPOSURE

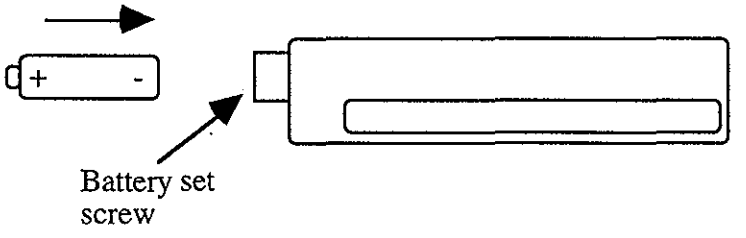
VISIBLE LASER DIODE 5mW MAXIMUM OUTPUT
620 - 680 nm WAVELENGTH CLASS IIIa LASER PRODUCT

1) To turn on — Push the button



2) Battery replacement

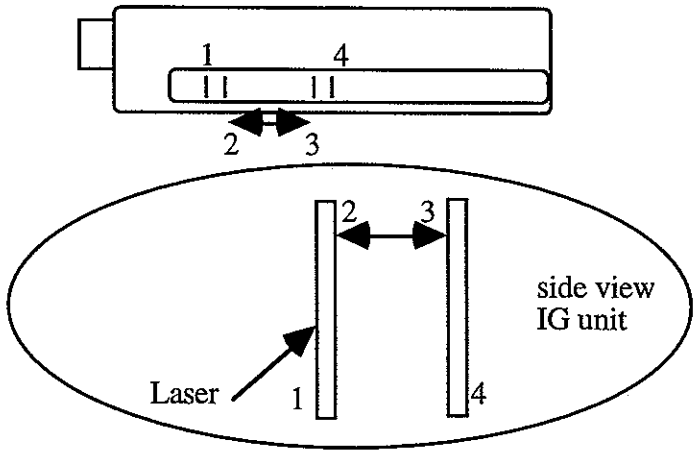
To replace batteries — Screw out battery set screw, hand tight, put batteries in **NEGATIVE** leading, **POSITIVE** at set screw.



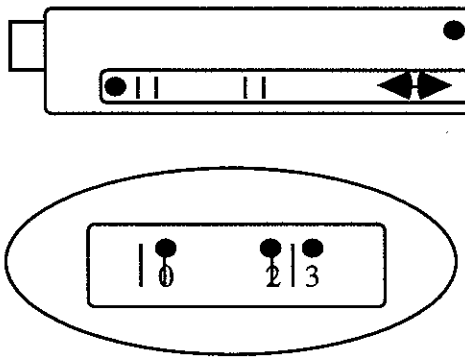
If batteries are installed backwards unit will not function, but no damage is done.

3) To read — If you move your head to the right of the air space laser the lines are brighter. The output power of the laser is 2.5 mW.

****Do not look into laser beam.****



A dual pane will show 4 reflections, the laser is mounted at 45° to the glass surface so the distance between the lines will be 2 times the air space. The scale is actually 2:1 but reads direct. (4 or 1/2" reading on scale is 1 inch of actual distance).



Hold unit with second finger and thumb on both hands and slide scale with left index finger. Push power button with right index finger. Slide scale until laser light line #2 is on the 0 of the scale. Take reading at laser light line #3.

There are 3 scales shipped with the Air Space Laser.
1/8" — mm — 0.025"

On the 1/8' scale the numbers are 8ths's :
2 = 2/8 = 1/4 — 3 = 3/8 and so on.

Due to refraction as the light passes through the glass the two lines representing the glass thickness are not 2:1. We plan on making an optional scale that can be inserted if you want to measure just the glass thickness.

The Laser Diode Module has a 1 year factory warranty, return to FDR for service.

Thanks !! Let us know how it works.

APPLIED LASER SYSTEMS

Visible Laser Module (VLM™)
User Safety Precautions and Instructions

SAFETY PRECAUTIONS:

1. This product is classified as a Class IIIa laser according to CDRH standards.

2. Since a laser beam can be damaging to the eyes, DO NOT look into the laser aperture when the laser is in operation. The emission indicator shows when laser is on.

3. Be aware that laser light can also be dangerous when reflected off a mirror-like surface.

4. For further safety information regarding lasers, refer to ANSI Z136.1 STANDARD) FOR THE SAFE USE OF LASERS, available from the Laser Institute of America, Tel (407)380-1553.

5. CAUTION - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser light exposure.

USER INSTRUCTIONS

1. Electrical connection to the VLM is made through the red lead or the outside of the module (+) and the black lead or the end of the module (-) for safety reasons DO NOT permanently attach unit using alligator clips. The VLM has reverse polarity protection.

2. A voltage source of 3 to 6VDC must be used.

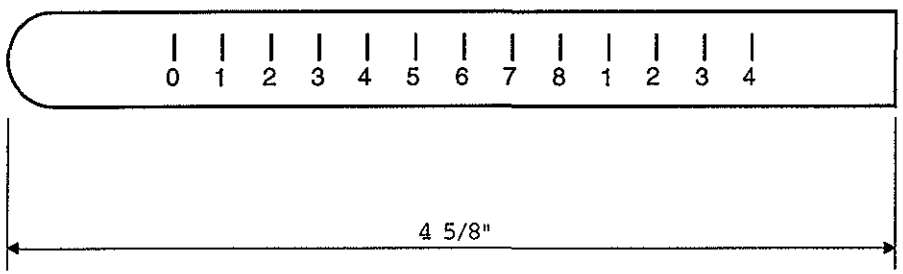
3. Caution: The VLM contains a device sensitive to static and large transient spikes. If these spikes exceed 35V, the VLM may be damaged.

4. DO NOT attempt to solder wire to the body or back of the VLM. This will void the warranty and possibly damage the device.

5. Power Supplies: The VLM may be powered by either battery or line supplies. To avoid warranty questions: if line supply is used, ALS recommends that a pre-regulator, typically a 7805 or equivalent, be connected between the power supply and the VLM to filter out any transients. While recommended operating voltages for the VLM are between 3VDC & 6VDC, the VLM runs cooler and more efficiently at lower voltages.

6. SWITCHES: Any switch used in conjunction with a battery must have a low enough resistance to assure at least 3VDC measured at the VLM.

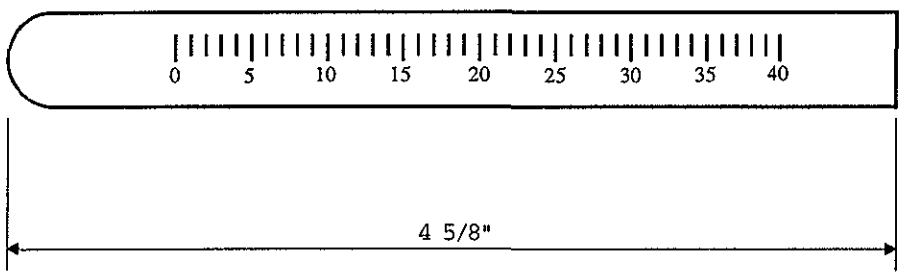
7. Your VLM carries Applied Laser Systems' one-year limited warranty. The VLM contains no external controls, housing access or user serviceable items. If a failure occurs, DO NOT try to open or otherwise enter the VLM, doing so will void the warranty.



FDR DESIGN, INC.
303 12th Avenue South
Buffalo MN 55313
(612) 682-6096 Fax (612) 682-6197

1/8" air space scale
FDR Air Space Laser

Drawn by: KDW	Scale: 1/1	Sheet 1 of 1	
Checked by: RLE	Date: 05/31/94	Drawing Number: 10431-A	



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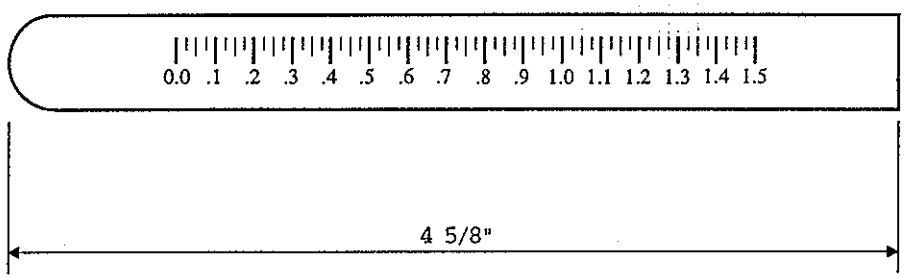
mm air space scale
FDR Air Space Laser

Drawn by:	Scale:	Sheet 1 of 1
KDW	1/1	Drawing Number:
Checked by:	Date:	10432-A
RLE	05/31/94	



FDR DESIGN, INC.
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0.025" air space scale
FDR Air Space Laser

Drawn by:	Scale:	Sheet 1 of 1
KDW	1/1	Drawing Number:
Checked by:	Date:	10434-A
RLE	05/31/64	

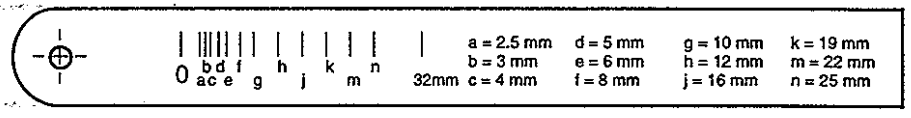
FDR Design Inc.

612-682-6096 612-682-6197 (fax) 303 12th Avenue South
Buffalo, MN 55313

Optional Glass Thickness Scale for Air-Space Laser

Measuring the glass thickness is perhaps not an accurate description as what we really are doing is identifying a glass size. You can not for example measure the glass and conclude it is x.xx mm thick. You can however determine what standard glass size it is closest to.

There is such a wide range in the glass thickness specification that it is very difficult to tell some of them apart. The specification almost overlaps in the case of the thinner glass. (attached chart)



As you can see the lines are very close together on the thinner sizes. The scale works the same as the standard scale in that you "zero" the scale on the first laser line and then read the thickness at the second laser line. You will find the laser line is about 3 times as thick as the scale line but it is fairly simple to center the scale on the laser line.

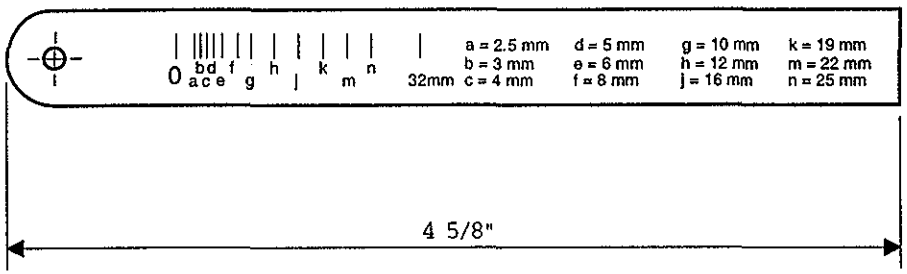
We are investigating other lasers to see if one which would allow greater resolution is available but to be honest the demand for measurement of glass thickness is at present small and the higher price of a new laser would be prohibitive. In most cases just simple glass thickness identification is needed not actual measurement and then this scale works fine.

The Laser will not work with textured glass and some darker tints can be so opaque as to make the laser difficult to read.

The scale is available at no charge for present laser owners and will be included as a standard scale on all new lasers.

Randi L. Ernst

MM	Traditional	Min Inch	Max Inch	average		Min mm	Max mm	average
1	micro-slide	0.031	0.049	0.040		0.79	1.24	1.015
1.5	photo	0.050	0.070	0.060		1.27	1.78	1.525
2	picture	0.071	0.084	0.078		1.80	2.13	1.965
2.5	single	0.085	0.101	0.093	a	2.16	2.57	2.365
2.7	lami	0.102	0.114	0.108		2.59	2.90	2.745
3	double-1/8"	0.115	0.134	0.125	b	2.92	3.40	3.160
4	5/32"	0.149	0.165	0.157	c	3.78	4.19	3.985
5	3/16"	0.180	0.199	0.190	d	4.57	5.05	4.810
5.5	7/32"	0.200	0.218	0.209		5.08	5.54	5.310
6	1/4"	0.219	0.244	0.232	e	5.56	6.20	5.880
8	5/16"	0.292	0.332	0.312	f	7.42	8.43	7.925
10	3/8"	0.355	0.406	0.381	g	9.02	10.31	9.665
12	1/2"	0.469	0.531	0.500	h	11.91	13.49	12.700
16	5/8"	0.595	0.656	0.626	j	15.09	16.66	15.875
19	3/4"	0.719	0.781	0.750	k	18.26	19.84	19.050
22	7/8"	0.844	0.906	0.875	m	21.44	23.01	22.225
25	1"	0.969	1.031	1.000	n	24.61	26.19	25.400
32	1-1/4"	1.125	1.375	1.250		28.58	34.93	31.755



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Glass Thickness Scale
FDR Air Space Laser

Drawn by: rle	Scale: 1/1	Sheet 1 of 1	
Checked by: RLE	Date: 05/2/95	Drawing Number: 10435-A	