

SCANNED
JAN 30 2014

ALAN G. LANCE
Attorney General
State of Idaho

CLIVE J. STRONG
Deputy Attorney General
Chief, Natural Resources Division

BRENT KING
CHARLES L. HONSINGER
Deputy Attorneys General
Department of Water Resources
P.O. Box 83720
Boise, ID 83720-0098
Telephone: (208)327-5458
Fax: (208)327-5400

1996 JUL -1 PM 3:15
DISTRICT COURT-SRBA
TWIN FALLS CO., IDAHO
FILED _____

IN THE DISTRICT COURT OF THE FIFTH JUDICIAL DISTRICT

OF THE STATE OF IDAHO, IN AND FOR THE COUNTY OF TWIN FALLS

In Re SRBA	)	Subcase Nos. 36-00064B, 36-00079
	)	
Case No. 39576	)	AFFIDAVIT OF CARTER FRITSCHLE
	)	REGARDING PLANIMETER
	)	MEASUREMENTS OF CLAIM
	)	NOS. 36-00064B AND 36-00079
_____	)	

STATE OF IDAHO)
) ss.
)

ER FRITSCHLE, being first duly sworn on oath, depose and state as

n a Water Rights Supervisor with the Adjudication Bureau of the Idaho
ater Resources (IDWR).

CARTER FRITSCHLE REGARDING PLANIMETER MEASUREMENTS
36-00064B AND 36-00079 Page 1

PY

2. My work address is Idaho Department of Water Resources (IDWR), 1301 N. Orchard, Boise, ID 83706. I reside in Kuna, Idaho.

3. My educational background includes a bachelor's degree in chemistry that I received from Boise State College in 1973. As part of the curriculum to complete that degree, I completed chemistry, mathematics, physics, and biology courses stressing scientific methods of data collection and interpretation. I have continued my education by periodically completing college level courses in subjects such as hydrogeology, hazardous waste management, hydrology, statistics, and computers. In addition to my education in the sciences, I became certified as a teacher in Idaho in 1986 and have subsequently taught junior high school science and earth science classes.

4. I have completed professional training courses through IDWR in hydraulics, ArcView geographical information systems, and ultrasonic flowmeters.

5. My work experience includes a position with the University of Utah from 1973 to 1974 where I taught chemistry lab and discussion classes. From 1975 to 1985, I owned and operated an irrigated farm. In addition to other positions I have held since 1985, I have continued to own and operate a small irrigated farm. During the summers of 1986 and 1987, I worked for IDWR's Western Regional Office where I conducted beneficial use field examinations on water right permits for licensing purposes. During those summers, I conducted approximately 200 beneficial use exams, of which more than 100 required a

determination of the number of irrigated acres in the place of use. From 1986 to 1987 I worked for the Boise School District as a teacher where I taught science and earth science classes at West Junior High.

6. Since 1987 I have worked in IDWR's Adjudication Bureau as a Senior Water Resource Agent (from 1987 to 1992) and as a Water Rights Supervisor (from 1992 to the present). My duties in these positions have included and include now: assisting claimants in filing Notices of Claim to a Water Right in the SRBA; investigating and recommending water rights claimed in the SRBA; training Water Resource Agents in claims review and investigation techniques; and reviewing claim investigation results for accuracy. With over nine years of experience in water right investigations (my own actual investigations of permits and SRBA claims, and my reviews of claims investigated by others), I have determined or verified irrigated acreage for more than 500 water rights.

7. Through my experience in owning and operating an irrigated farm, and through my work experience at IDWR as both a Senior Water Resource Agent and as a Water Rights Supervisor, I have gained a good working knowledge with the following:

- a. Water flow measurement methods through the use of flow meters, various types of weirs, bucket and stopwatch, and other measurement devices and methods;
- b. The interpretation of aerial photography of various scales;
- c. The calculation of acreage from aerial photographs, orthophoto quads, and other photographs and maps using grids, planimeters and other devices and techniques;
- d. Reading and interpreting legal descriptions in order to locate an area described on maps or aerial photographs;
- e. The public land survey system;
- f. All types of irrigation systems and methods;
- g. Different types of wells and pumps and the calculation of pump outputs;

i. Various farming practices and techniques.

7. As part of my duties as a water rights supervisor, I used a planimeter to ensure the accuracy of irrigated acreage estimates by water agents in their investigations of the following claims:

36-00064B 36-00079

8. A planimeter is an instrument that mechanically measures a bounded area on a map surface and electronically transmits those measurements to a processor. The processor is calibrated to provide results in terms of acreage after adjusting for the scale of the specific map used in the measurement.

9. A planimeter is frequently used by IDWR personnel in water rights investigations as a tool to confirm acreage estimates.

10. IDWR personnel do not generally use planimeter measurements as the sole source for their determination of the size of an irrigated area. Rather, they generally use it as only one of the tools by which a reasonable estimate of a parcel's size is made.

11. While doing my planimeter measurements of the irrigated acreage for each of these claims, I followed the procedures for use of IDWR's planimeter as outlined in the LASICO Planimeters Series 42 and 52 Instruction Manual (copy attached).

12. I first used a planimeter in 1987 at the Ada County Agricultural Stabilization and Conservation Service (ASCS) office to determine irrigated acreage on lands for which the irrigated acreage had not been previously determined as reflected on ASCS aerial photos. I have continued to use a planimeter as an integral part of my investigation of claims in the

I have continued to use a planimeter as an integral part of my investigation of claims in the SRBA. To date, I have used a planimeter over 100 times to measure and thus confirm the size of a specific property.

13. I approach the use of a planimeter in a manner similar to that of a scientist taking a statistical sampling of a population. Thus, when using a planimeter, I will typically make many measurements to ensure that my results are consistent. I then throw out those measurements that are obviously too high or too low. To further ensure consistency, I will typically make planimeter measurements until I have at least two readings that are exactly the same and three readings in which the measurements are no further apart than a few tenths of an acre. I will then use the figure duplicated in at least two measurements (often the figure is duplicated in three measurements) as my final figure for irrigated acreage. I followed this procedure when doing the planimeter measurements to confirm places of use for the claims listed in paragraph 7 above.

14. The NAPP photographs I used in my investigation of claims in the Hagerman area are identified as follows:

- | | | | |
|----|--------------|-------------|----------|
| a. | IDWR# AA69NE | NAPP#419-61 | 06/25/87 |
| b. | IDWR# AA69NE | NAPP#419-51 | 06/25/87 |
| c. | IDWR# AA70NW | NAPP#439-45 | 08/01/88 |

15. The ASCS maps I used in my investigation of claims in the Hagerman area are identified as follows:

- | | |
|----|--|
| a. | 1977 ASCS map covering Hagerman, Idaho |
| b. | 1987 ASCS map covering Hagerman, Idaho |

16. The orthophoto quads I used in my investigation of claims in the Hagerman area are identified as follows:

- a. IDWR# AA69 1974 Hagerman, Idaho
- b. IDWR# AA70 1974 Tuttle, Idaho

17. As part of my duties as a Water Rights Supervisor, I reviewed the investigating water agent's irrigated acreage estimate pursuant to claim no. 36-00064B. The pertinent details of that review are as follows:

On June 21, 1996, I used a planimeter to measure the irrigated acreage of this property as shown by both the relevant NAPP photograph from and the claim file copy of the relevant ASCS map . The results of my measurements were consistent with the investigating water agent's irrigated acreage estimate.

18. As part of my duties as a Water Rights Supervisor, I reviewed the investigating water agent's irrigated acreage estimate pursuant to claim no. 36-00079. The pertinent details of that review are as follows:

On June 20, 1996, I used a planimeter to measure the irrigated acreage of this property as shown by the relevant NAPP photograph from 1987 and the relevant ortho photo quad from 1974. The results of my measurements were consistent with the water agent's irrigated acreage estimate.

DATED this 1 day of July, 1996.

Carter Fritschle
CARTER FRITSCHLE

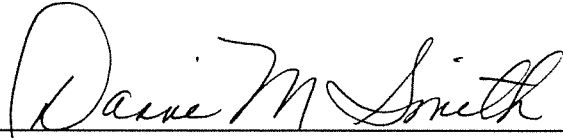
SUBSCRIBED AND SWORN to before me this 1st day of July, 1996.

Danni M Smith
Notary Public for the State of Idaho
Residing at: Boise
My commission expires: 12-5-2000

CERTIFICATE OF MAILING

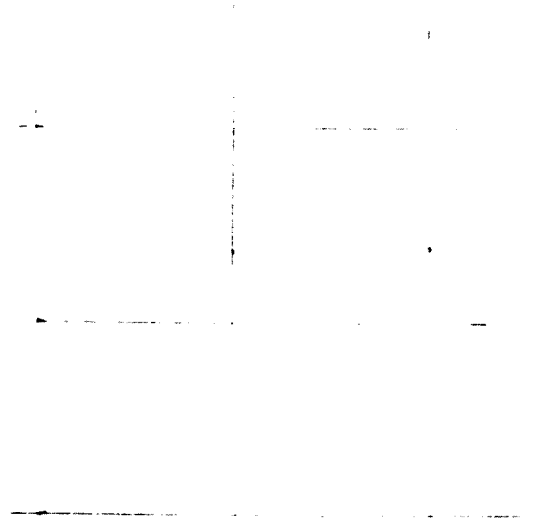
I HEREBY CERTIFY that on the 1st day of July, 1996 I caused to be served a true and correct copy of the foregoing document on the following person(s) listed below by hand delivery:

Patrick D. Brown
P.O. Box 389
Twin Falls, ID 83303-0389



HAND DELIVERED

INSTRUCTION MANUAL



LASICO **PLANIMETERS**

SERIES 42, 52



2451 RIVERSIDE DRIVE, LOS ANGELES, CALIFORNIA 90039, PHONE: (213) 662-2128

INDEX

CHAPTER	PAGE
1. Introduction	1
2. Brief instructions	1
3. The instrument, its components and controls	5
4. Details on components and their use	6
5. Determination of scale constants	8
6. Preparation of model 42 processor	12
7. Instrument set up and operation	12
8. Length measurements	13
9. Accumulative measuring	14
10. Instrument testing and recalibration	15
11. Instrument upgrading	16
12. Tips, hints	16
13. Maintenance	16
14. Trouble shooting tips	16
Warranty	17

PARTS SUPPLIED WITH YOUR INSTRUMENT

MODEL	42P	42PO	42C	42CO	52P
42 Planimeter	x	x	x	x	
52 Planimeter					x
Adjust. Pole Arm	x	x	x	x	x
Pole Weight		x	x	x	x
Carriage			x	x	
SM Processor	x		x		
SMO Processor		x		x	
Linear Handle	x	x	x	x	x
Magnifier	x	x	x	x	x

INSTRUCTIONS

NO. 020187

1. INTRODUCTION

Operation of 42 and 52 series Planimeters is identical. The only difference:
Model series 42 is prepackaged with a SM or SMO Processor while 52 models can be combined with any of LASICO'S standard processors.

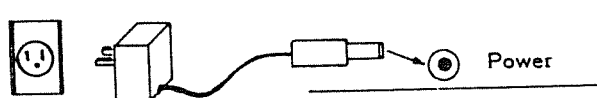
These instructions are executed without details on processor operation. Only the use of 42 processors (SM/SMO) is covered. A detailed Processor Manual is supplied with 52 models.

For the most basic PLANIMETER OPERATION you need to read the **BRIEF INSTRUCTIONS** only.

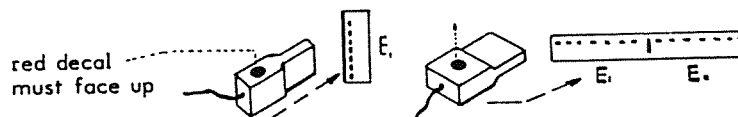
2. BRIEF INSTRUCTIONS

Step 1. PREPARE THE PROCESSOR FOR OPERATION

Plug power supply into the wall outlet and DC plug into the power jack of the processor.

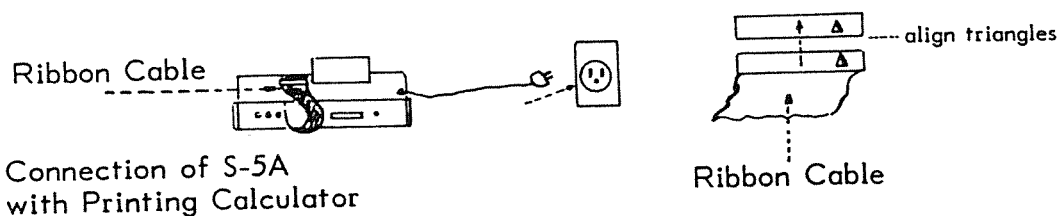


Insert planimeter plug into encoder input jack. If your instrument has two input jacks, select one and set the encoder selector switch to the one used. (if E1 is used, set switch to E1. etc.)



If your instrument is equipped with an attachable calculator or computer, connect it to the processor as outlined in the main section of the respective instructions. Observe correct polarity. **IMPORTANT!** Make sure all components are switched off while you make this connection !

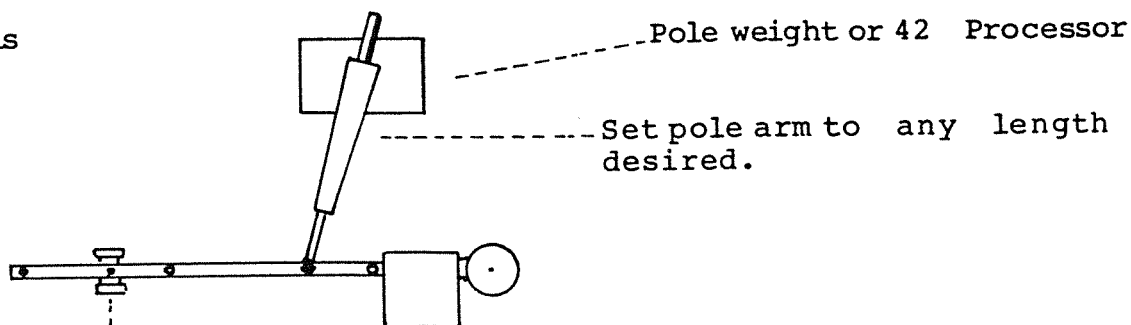
If your calculator/computer is powered independently from the processor and if it is supplied with a power cord, plug it into an outlet.



Step 2. PREPARE YOUR PLANIMETER FOR OPERATION

Assemble your planimeter as shown below

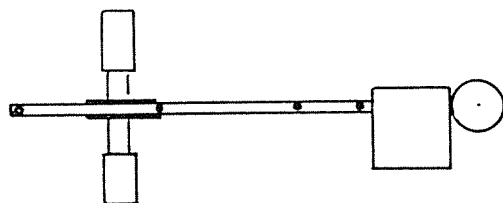
P-Models



Support wheel must always be attached for use with pole arm

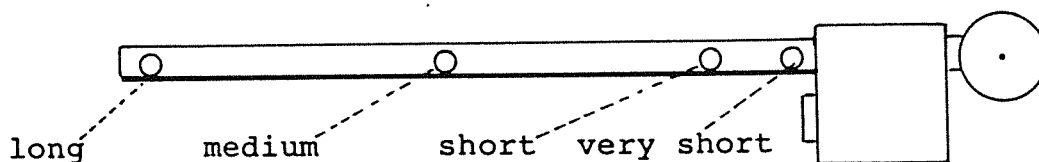
Plug pole arm into one of the four receptacles. Use shorter arm lengths for small areas, longer ones for large areas.

C-Models



Plug carriage into receptacles similar to pole arm (short arms for small areas, long arms for larger ones.) The very short arm should be used with a pole arm only.

Model 42 and 52 are preset (and calibrated) for 4 different tracer arm lengths:



The shortest arm provides the highest resolution and accuracy, the longest one the largest measuring range. Use very short and short arm lengths for very small and small areas, the medium and long arm for medium and large areas.

Step 3. PROGRAMMING OF PROCESSOR

Your instrument is supplied with a CALIBRATION RECORD. It provides the calibration values needed for scale corrected measurements.

Example:

If your scale ratio is 1"=20' and you selected the medium tracer arm length, simply program the value shown in the medium arm length column for 1"=20' into your processor.

AREAS					LENGTHS	
	V. Short Arm	Short Arm	Medium Arm	Long Arm	Length Values	
RT	2072	1256	709	492		
u english	0.006065	0.010005	0.017724	0.025521	RL eng	424
u metric	0.039107	0.064514	0.114288	0.164695	RL met	166.9
CA VALUES (in sq. feet)					CL VALUES (ft.)	
1' = 1'	0.006065	0.010005	0.017724	0.025521	0.0024	
1/32' = 1'	6.210410	10.245200	18.149500	26.133600	0.0755	
3/32' = 1'	0.689959	1.138210	2.016350	2.903370	0.0252	
1/16' = 1'	1.552600	2.561300	4.537360	6.533400	0.0377	
3/16' = 1'	0.172490	0.284553	0.504088	0.725842	0.0126	
1/8' = 1'	0.388150	0.640325	1.134340	1.633350	0.0189	
1/4' = 1'	0.097038	0.160081	0.293585	0.408337	0.0094	
3/8' = 1'	0.043106	0.071112	0.125975	0.181393	0.0063	
1/2' = 1'	0.024259	0.040020	0.070896	0.102084	0.0047	
3/4' = 1'	0.010777	0.017778	0.031494	0.045348	0.0031	
1' = 10'	0.606485	1.000510	1.772410	2.552110	0.0236	
1' = 20'	2.425940	4.002030	7.089630	10.208400	0.0472	
1' = 30'	5.458370	9.004570	15.951700	22.969000	0.0708	
1' = 40'	9.703760	16.008100	28.358500	40.833700	0.0943	

Simply find the CA value for the arm length used and program it into your processor.

Example: CA value for scale 1"=20' and medium arm is 7.0896.

The programming procedure varies depending on processor model used:

42, SM, SMO Processors

Enter 7.089 into scaler switches 7 0 8 9, turn processor off and on again and set correct decimal using "DECI" switch.

M / XM Processors

Enter 7.089 into scaler switches, 7 0 8 9, depress S1 (or S2 or S3, depending on which scaler section is being used). Then use "DEC" switch to install correct decimal point.

S-4A Processors

Enter 7.089 through the calculator keyboard and then activate the following keys: 2nd F STO 1 (or 2 or 3 or 4, depending on which memory is used).

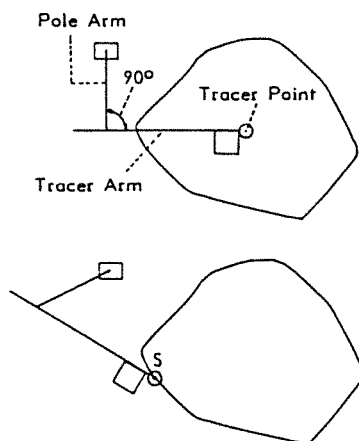
**Model S-5A Processor
(also used with 52P-S-3)**

Set slider switches: Printer to OFF, Decimal to F, 3 or 4. Make sure that memory is cleared. (no 'M' on left side of display)
Then enter 7.089 into calculator through its keyboard and press M±

NOTE : The Calibration Record supplied with your instrument covers the most common scale ratios used in the USA. If your scale ratio is not covered, please check page 9 of the instruction manual.

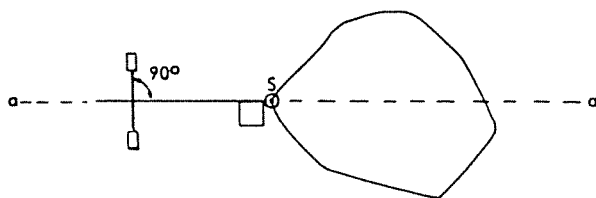
STEP 4 INSTRUMENT SET UP AND OPERATION

SET UP FOR USE WITH POLE ARM



1. Position the instrument tracer point in the approximate center of the area to be measured. Align pole and tracer arms at a 90° angle (approx.)
2. Select a starting point 'S' somewhere on the periphery of the area and position tracer point over it. Clear display using CL switch of processor. (if you have a processor with calculator, do not use CL key of calculator for this purpose!)
3. Move tracer around the area until the starting point is reached again. Find result on display.

SET UP FOR USE WITH CARRIAGE

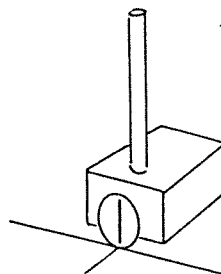
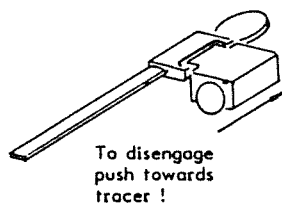


1. Move instrument onto an imaginary line a.....a which goes through the approximate center of the area to be measured.
2. Select a starting point 'S' and move instrument tracer over it. Clear display with 'CL' key of processor. (do not use calculator CL-key if your processor is equipped with a calculator!)
3. Guide instrument tracer around the area until the starting point is reached again and find result on display.

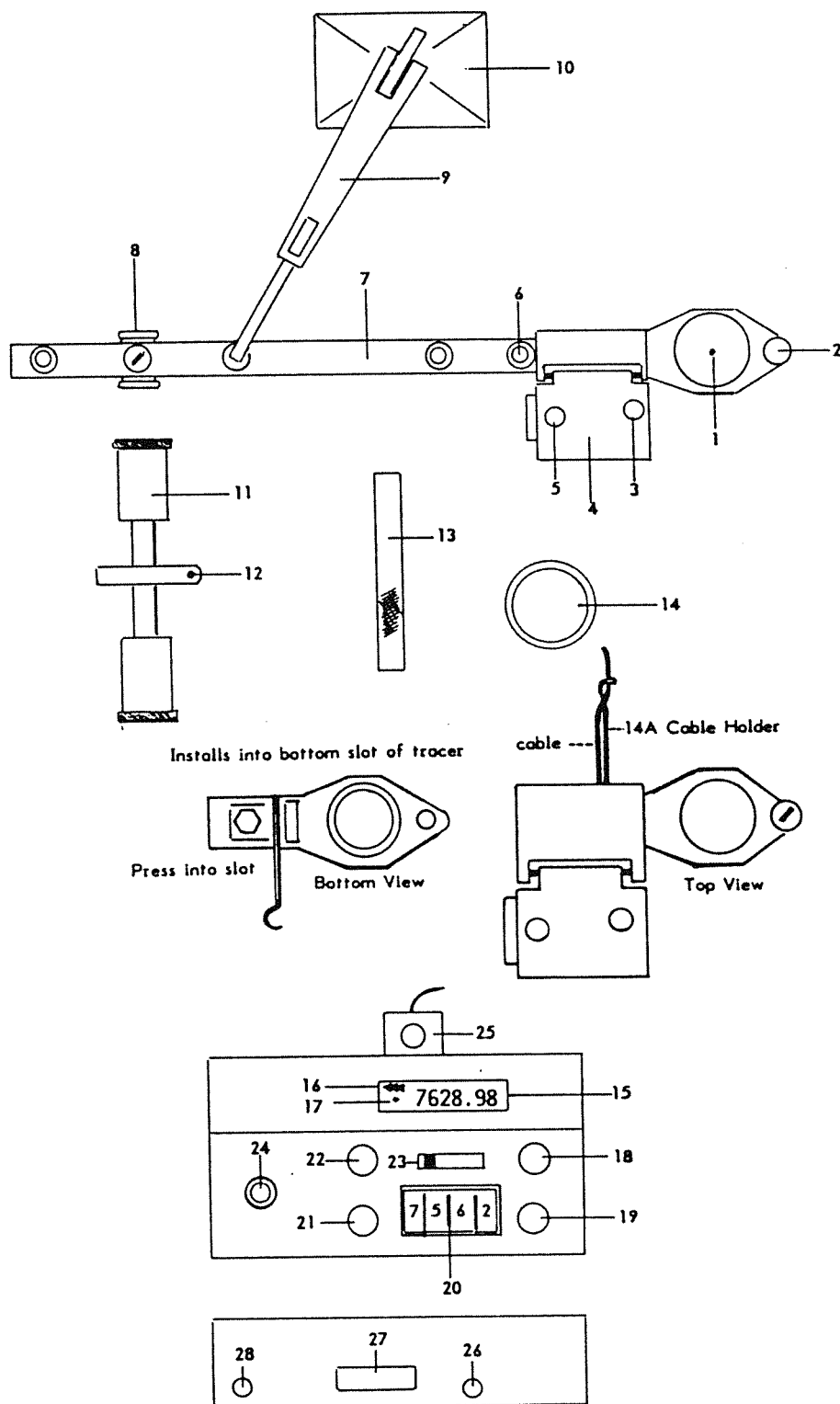
STEP 5 LENGTH MEASUREMENTS

Disengage measuring mechanism from planimeter, attach handle with a slight twist (do not use any force!)
Extract the CL value for the scale ratio in use from the Calibration Record and program it into the processor.

Align measuring guide with starting point, clear display and move the wheel on top of the line until the end point is reached. Find result on display.



3. THE INSTRUMENT, ITS COMPONENTS AND CONTROLS



THE PLANIMETER

1. Tracer point
2. Tracer handle
3. Remote switch *
4. Measuring mechanism
5. Attachment post for linear handle
6. Pole/carriage receptacles (4)
7. Tracer arm
8. Support wheels. Must be positioned as shown.
9. Adjustable pole arm. Can be set to any length desired. May be plugged into pole weight or 42 processor.
10. Pole weight.
11. Carriage. Supplied with 42C/42CO and as accessory for 52P.
12. Carriage pin. Attach carriage to tracer arm in such a manner, that the pin is oriented towards the instrument tracer.
13. Linear handle. Attaches to post on measuring mechanism for linear measurements.**
14. Magnifier for planimeter tracer.
- 14A Cable holder. Supplied with C-models and carriage. It holds the cable off the table surface and prevents entanglement with the carriage wheels.

THE PROCESSOR (MOD. 42P/PO/C/CO)

15. Display panel
16. Symbol indicates that "ACCU" function is engaged.
17. +/- sign. Can be ignored for planimeter work.
18. Shift key. Must be activated if result is larger than 8 digits. Reveals 4 more digits for a total of 12
19. Accu key. If depressed, the "ACCU" function will be engaged. Used to hold (freeze) results.
20. Scale input switches.
21. Display clear switch
22. Decimal set switch
23. Multifunction switch:
Center: Power off
Left: Power on/planimeter remote switch assigned to clear function
Right: Power on/planimeter remote switch assigned to ACCU function.
24. Pole arm receptacle.
25. Transducer plug. Insert into receptacle (27) with red dot pointing up
26. Jack for optional remote switches
27. Receptacle for plug of measuring mechanism.
28. Power supply input jack

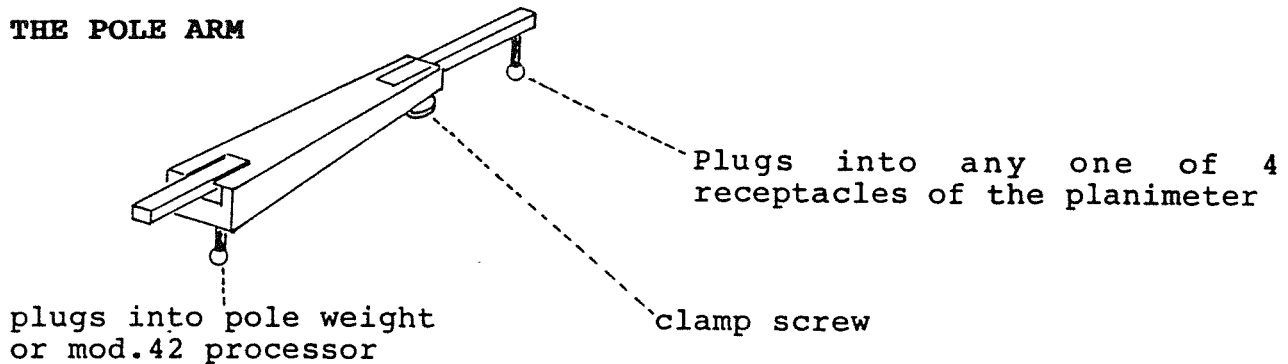
IMPORTANT:

When carrying the planimeter, make sure that the measuring mechanism does not accidentally disconnect!

- *) Remote switch must be pushed very gently and slowly released!
- **) Attach linear handle to post (5) with a slight twisting motion and without excessive force!

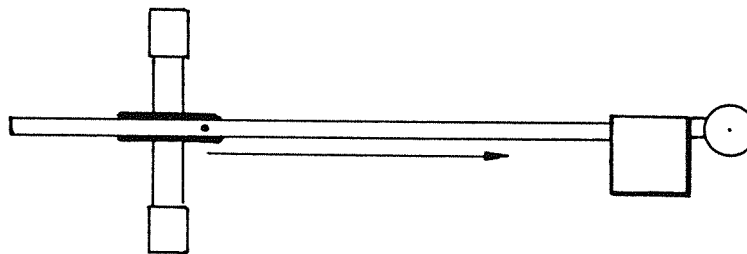
4. DETAILS ON COMPONENTS AND THEIR USE

THE POLE ARM



The pole arm may be set to any length desired without the need to change calibration constants. A longer pole arm provides a larger measuring range. Please make sure that the clamp screw on the lower part of the pole arm is always securely locked.

THE CARRIAGE



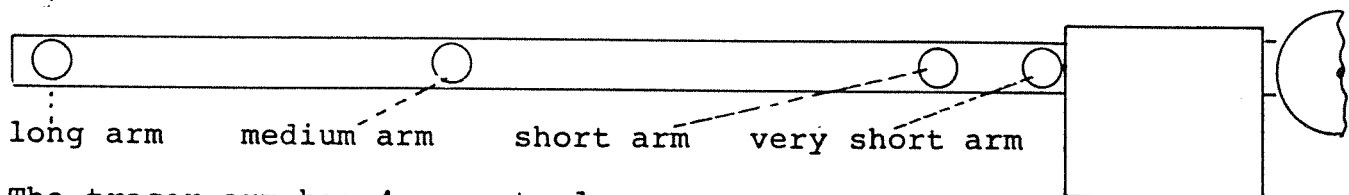
can be used instead of the pole arm.(except for the very short tracer arm length). It provides a large measuring range (in length) and extra smoothness of operation.

The carriage should not be used for the "very short arm extension". Therefore C-models are supplied with a pole arm.

The carriage pin should be located in front towards the instrument tracer. The support wheel supplied for use with the pole arm is not needed for "carriage use". It can be removed or left in place as desired.

THE TRACER ARM

Receptacles for pole-arm and carriage



The tracer arm has 4 receptacles.

WHY ?

A shorter arm provides a higher measuring resolution and accuracy, a longer one a larger measuring range.

The user has a choice of 4 different arm lengths which allow him to optimize his instrument for the job on hand.

If possible, the measuring resolution should always be at its maximum whenever very small areas are to be evaluated. However this

is not very critical for measurements of large areas which should be measured in one continuous operation without the need of subdivision.

THE BASIC RULE: Use the "very short arm" for areas of 1sq.in/6.5sq.cm or smaller or whenever maximum accuracy is required, measure all areas within the range of the very short arm with the very short arm.

USE	The "short arm" for small and medium size areas
	The "medium arm" for medium and large areas
	The "long arm" for very large areas

We recommend to experiment with various arm lengths to find the optimal length for your type of work.

THE PLANIMETER REMOTE SWITCH

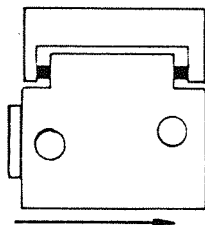
The remote switch built into the measuring mechanism may be assigned to the "CLEAR, ACCU OR PRINT/PROCESS" function of your processor, depending on processor model used. Since the measuring mechanism is hinged, it is necessary to operate the remote switch with caution. It should be depressed and released as gently as possible.

THE FIBER GUIDE

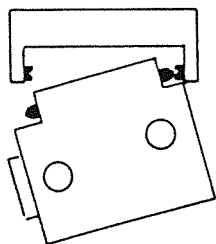
near the measuring wheel is used to align the wheel with the beginning and end of the measuring line when making length measurements. The fiber should not touch the wheel. If it does, simply bend it away from it.

THE MEASURING MECHANISM

can be quickly detached from the planimeter assembly for length measurements.



Simply push the mechanism towards the tracer lens and its spring loaded hinge will be released.



To reassemble the planimeter and measuring mechanism, insert the right springloaded pin into the right hand bearing and guide the left pin into the left bearing.

ABOUT THE MEASURING SURFACE

Like all planimeters whose wheels run on the measuring surface, Mod.42/52 series planimeters should be operated on a flat table and on a good paper surface. If the paper surface is mutilated or too glossy, cover it with a sheet of transparent tracing paper and operate the planimeter on top of it. Always position the planimeter in such a manner, that the measuring wheel does not run over the paper edge.

5. DETERMINATION OF SCALE CONSTANTS

Before the actual measuring operation can be started, it is necessary to either find (on the calibration record) or to determine the Planimeter Calibration Constant CA.

If your scale ratio is either 1:1 or one of the common English scale ratios shown on your calibration record, simply find the correct CA value for the tracer arm length of your choice and program it into your processor.

This procedure is outlined on page 3 of the Brief Instructions.

If your scale is not included or if it is metric, CA needs to be determined.

First you have to find the "u-value" for the tracer arm extension you want to use. The "u-values" (both English and Metric) are shown on your calibration records.

LASICO CALIBRATION RECORDS

MODEL NUMBER: 425

SERIAL NUMBER: 83650

AREAS					LENGTHS
	V.Short Arm	Short Arm	Medium Arm	Long Arm	Length Values
FT	2072	1256	709	492	
u english	0.006065	0.010005	0.017724	0.025521	RL eng: 424
u metric	0.037107	0.064514	0.114288	0.164695	RL met: 166.9

factory calibration
value, of no interest
to you.

English and Metric "u-values"

The "u-value" represents the resolution of the instrument with a specific tracer arm length, i.e. it is the smallest increment which can be recorded. (= value of one planimeter unit)

Determination of C_A for 1:1 Measurements

The area constant for 1:1 measurements

$$C_A = u ;$$

i.e. if an area has to be measured in either in^2 or cm^2 simply program 'u' into your processor for direct readout of results.

Note: For 1:1 work we recommend to limit the constant to max 5 decimal places.

EXAMPLE (based on calibration example)

Measurements have to be made with results to be in in^2 . The short arm is to be used.

Find $u = 0.00955$ on your calibration record sheet.
Program 0.00955 into your processor and all subsequent measuring results will be expressed in in^2 .

Determination of C_A for Scale Compensated Measurements

The formula used is

$$C_A = S_c^2 \times u ;$$

S_c = Scale ratio (must be expressed in number of map units per inch or cm !)

Note: For scale compensated measurements we recommend to limit the constant C_A to 2-3 decimal places.

EXAMPLE (based on example calibration values)

Measurement to be made with results to be expressed in ft^2 !
Short arm is used. ($u = 0.0095$) S_c : 1" = 40 ';

$$\text{Therefore } C_A = 40^2 \times 0.0095 = 1600 \times 0.0095 = \underline{15.2 (\text{ft}^2)}$$

Now program $C_A = 15.2$ into your processor and the instrument is ready for results in square feet.

EXAMPLE (Metric) based on example calibration records.

Results to be in m^2 ! Short arm is used. ($u = 0.0616$); S_c : 1:5500 ;

Since 1:5500 means 1 cm = 5500 cm, it is necessary to convert this proportion for m^2 measurements.

$$\text{Therefore } S_c: 1 \text{ cm} = 5500 \text{ cm} = 55\text{m}; \quad C_A = 55^2 \times 0.0616 = \underline{186.34 (\text{m}^2)} ;$$

If 186.34 (or 186.3 for M-type processor) is programmed into the processor, all subsequent measurements will be expressed in square meters.

IMPORTANT

If scale ratios are expressed in ARCHITECTURAL RATIOS it is necessary to convert them first.

1/32" = 1'	converts to 1"=32'	3/8" = 1'	converts to 1"=2.666'
1/16" = 1'	converts to 1"=16'	1/2" = 1'	converts to 1"=2'
1/8" = 1'	converts to 1"=8'	3/4" = 1'	converts to 1"=1.333'
1/4" = 1'	converts to 1"=4'		etc.

If a proportional scale ratio is given, it too must be converted into a proportion expressing the measuring unit value which is wanted for the final result per inch or per cm !

EXAMPLE:

1:2400 means that 1"= 2400". However if results are wanted in ft² , the 2400" must be converted into feet (=200') and the Sc value becomes 200 (1:2400 = 1"=200')

Special Scale Ratios

Frequently it is required that results are to be shown in value units like 'acres' , 'ha' etc.

Special formulas must be devised to compute the C_A values:

The 'ACRE' Formula :
$$C_A = \frac{Sc^2 \times u}{43560} ;$$

EXAMPLE:

Medium arm is used (u=0.0207) Sc: 1"=1000';

Results must be in 'Acres' .

Therefore:
$$C_A = \frac{1000^2 \times 0.0207}{43560} = \underline{\underline{0.4752}} ;$$

If 0.475 is programmed into your processor, all results will be shown directly in acres !

In some instances (**when measuring cross sections**) it may be possible that two different scale ratios are used on a blueprint. They are normally designated as '**horizontal**' and '**vertical**' scale.

Our formula needs a slight change :

$$C_A = (h \times v) \times u ;$$

h = horizontal scale
v = vertical scale

SPECIAL MULTIPLIERS

The user may develop special measuring constants (multipliers) for various applications.

These constants (C) are derived by simply multiplying the CA value by special parameters.

EXAMPLES:

Creation of a special constant to compensate for slope when measuring areas on slopes.

Frequently used slope factors :

1:1.....	1.414
1/2:1.....	2.236
1 1/2:1.....	1.201
2:1.....	1.118
3:1.....	1.054

Simply multiply your CA value by the slope correction factor and program this value into your processor for slope corrected results.

For simple volume measurements you may multiply your CA value by the depth (of an excavation, etc). If this value is programmed into the processor, the measuring results are expressed in volumetric measuring units like cubic feet, etc.

Please contact LASICO for **APPLICATION NOTES** on SLOPE MEASUREMENTS, VOLUME MEASUREMENTS, etc.

6. PREPARATION OF MODEL 42 PROCESSOR (for Mod:52P check processor instructions supplied with your instrument)

Insert DC plug of your power supply into input jack (28). Plug planimeter connector into receptacle (27) with red dot pointing up.

Enter the 3 or 4 most significant numbers of your CA value into the scale input switches. Example: If CA = 2.42567, program 2425 into the processor

2	4	2	5
---	---	---	---

, turn processor on by moving the power switch (23) to the left (assigns remote switch to the clear function) or to the right (assigns the remote switch to the accu function.) and the display will show

2	4	2	5
---	---	---	---

.

Now use the decimal selector switch (22) to set the correct decimal point and the display will show

2.4	2	5
-----	---	---

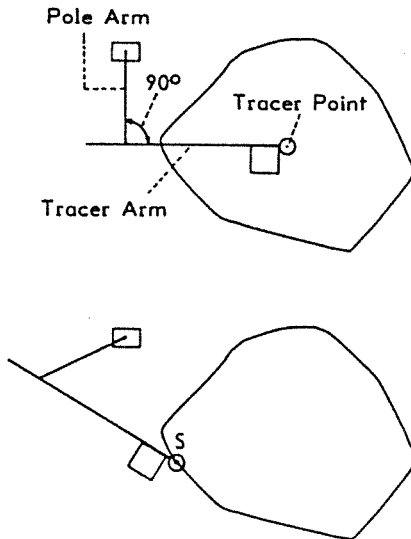
.

IMPORTANT If you enter a new constant into the scaler switches, it is necessary to reset the computer. This is accomplished by switching the processor off and then on again.

If the processor, was turned off when the new constant was entered, it is automatically installed when the power is turned on.

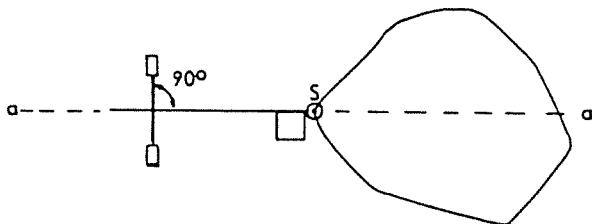
7. INSTRUMENT SET UP AND OPERATION

After selecting the most suitable tracer arm length for the job and after programming the measuring constant into the processor we are ready for the actual measuring operation:



For Planimeters with Pole Arm

1. Position the instrument tracer point in the approximate center of the area to be measured. Align pole and tracer arms at a 90° angle (approx.)
2. Select a starting point 'S' somewhere on the periphery of the area and position tracer point over it. Clear display using CL switch of processor. (If you have a processor with calculator, do not use CL key of calculator for this purpose!)
3. Move tracer around the area until the starting point is reached again. Find result on display.



For Planimeters with Carriage

1. Move instrument onto an imaginary line a.....a which goes through the approximate center of the area to be measured.
2. Select a starting point 'S' and move instrument tracer over it. Clear display with 'CL' key of processor. (do not use calculator CL-key if your processor is equipped with a calculator!)
3. Guide instrument tracer around the area until the starting point is reached again and find result on display.

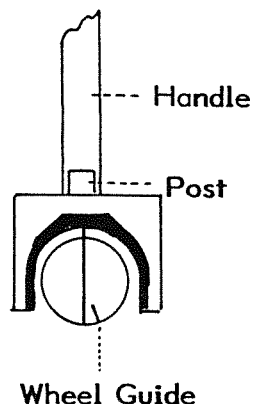
FOR MODEL 42 PROCESSOR:

If all 8 digits of the display show numbers, (this is possible after accumulating many areas) press the shift key (18) to check if the result might possibly be larger than shown on the display. If you see a number(s) on the secondary (shifted) display, it would be the most significant one(s). In order to switch back to the primary display simply activate the shift key (18) once more. Example: If primary display shows 0123.4567 and pressing the shift key reveals a 1 on display, the result is 10123.4567.

Depending on the measuring direction you will get either a positive or negative result. + or - signs can simply be ignored for area measurements, i.e. it makes no difference if the result shows a negative or positive value.

8. LENGTH MEASUREMENTS

Length measurements can be performed by separating the measuring mechanism from the planimeter section. This is accomplished by pushing the mechanism towards the front end (tracer) of the planimeter.



The linear handle (13) should be pushed onto the post (5) with a gentle and twisting motion.

Thus it is possible to guide the mechanism conveniently along the line to be measured.

Since all LASICO PROCESSORS incorporate an up/down counter, it is possible to back up the instrument to correct for mistakes or for subtracting lines.

The instrument resolution for length measurements is generally around 420-425 counts per inch / 165 - 168 counts per cm.

The exact R_L value of your instrument is shown on your calibration record sheet.

The length constant C_L can be computed using the formula:

$$C_L = \frac{S_c}{R_L} ;$$

C_L = Length Constant

S_c = Scale Ratio

R_L = Instrument Resolution (counts/in or cm)

EXAMPLE:

S_c : 1"=40'; R_L = 424; Results to be in feet !

$$C_L = \frac{40}{424} = \underline{0.0943 \text{ (ft.)}}; \text{ Program into processor for results in feet.}$$

EXAMPLE:

S_c : 1:1; R_L = 424; results to be in inches !

$$C_L = \frac{1}{40} = \underline{0.00235}; \text{ Program into processor for readout in inches.}$$

EXAMPLE: S_c : 1:25000; R_L = 167; Results to be in meters !

Since 1 cm = 25000 cm = 250 m; we enter 250 into formula

$$C_L = \frac{250}{167} = \underline{1.497}; \text{ Program into processor for results in meters !}$$

NOTE: Do not follow the line to be measured with the wheel guide. The wheel should be running on the line. The guide is used to align the instrument with the beginning and end of the measuring line.

Use the 'ACCU' function to momentarily interrupt the measuring process. (example: if you have to go around a sharp bend, etc.)

9. THE ACCUMULATIVE MEASURING FEATURE

This feature permits addition or subtraction of consecutive areas or lengths to or from each other.

The additive procedure

A number of areas have to be added up (they could be located on different sections of a map, on different maps or they could be part of a very large area, which must be subdivided for measurement, because the planimeter does not have sufficient measuring range to cover it in one operation).

EXAMPLE:

A large area, subdivided into several (4) sections must be evaluated.

Measure A1 and engage 'ACCU'. This will hold (freeze) the result of area A1.

Move instrument to A2, disengage 'ACCU' and measure A2. A2 has now been added to A1.

Use the same procedure to add A3 and A4 until summation of all areas is displayed. (fig.1)

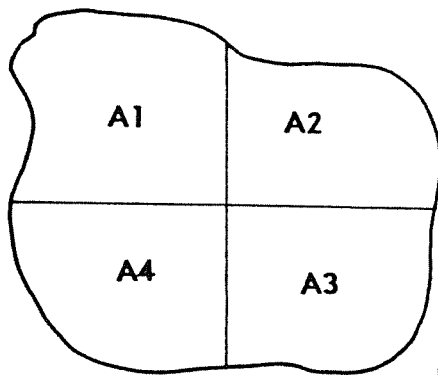


Fig. 1

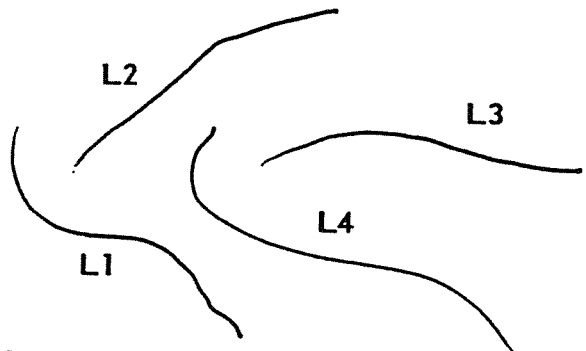


Fig.2

To accumulate length sections proceed in a similar manner by activating 'ACCU' between the individual measurements.

EXAMPLE:

Irrigation lines of a certain size or capacity must be added up.

Measure line L1, engage 'ACCU'.

Move instrument to L2, disengage 'ACCU' and measure L2. On display find $L1+L2$. Proceed in a similar manner to add additional lines to L1 and L2 until the summation of all lines is displayed. (Fig.2)

The subtractive procedure

To subtract the small area As from the larger area A1, measure large area A1 first and engage the accu function.

Subsequently move the instrument tracer to the small area As, disengage the accu function and measure As in the opposite direction. (If A1 was measured in clockwise direction, measure As in counter clockwise direction).

Result on display : $A1 - As$. (Fig.3)

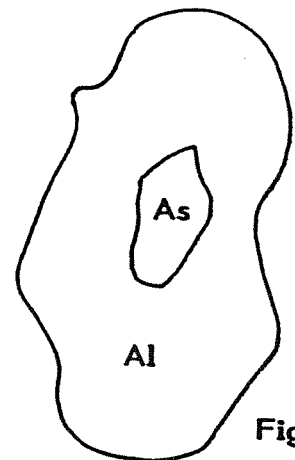


Fig.3

Application: Measurement of water body of lake minus island, etc.

10. INSTRUMENT TESTING AND RECALIBRATION

Any area of known size may be used for testing and recalibration.

EXAMPLE: Draw a 4x4 sq.in figure on a piece of paper. Use the short arm extension and program the u-value for this arm into your processor. Measure the figure and you should read 16 sq.in. $\pm 0.2\%$. Since tracing errors are inevitable, measure the area a number of times and average the result.
(For metric work, simply use a figure of known size in metric, and program the metric u-value into the processor.)

If the test results are off but consistent, or if you have lost your calibration records, you may have to recalibrate your instrument.

Program 1 into your processor (Mod.42: 0001) for unscaled measurements of the test area. Measure the figure (of known size) with every arm length (very short, short, medium, long) Repeat each measurement at least 10 times and take the average of these results. These unscaled measuring results of the test figure are designated RT.

The known area (in our example $AT=16\text{sq.in}$) is designated AT (Test Area)

Now we use the formula $u = \frac{AT}{RT}$; and determine the u-value for each tracer arm length.

Example: We assume that we have obtained a RT of 1652 (using the short arm length) by measuring the test area of 16 sq.in.

Using our formula $u = AT/RT = 16/1652 = 0.00968$;

Use the same procedure to determine the u-values for the other arm extensions.

The u-value is subsequently used to compute the scale constants CA as outlined on page 9 .

CHECK YOUR INSTRUMENT FREQUENTLY TO AVOID COSTLY MISTAKES

FOR A QUICK CHECK:

draw an area of known size on a piece of paper and place it permanently somewhere on your work table. A quick check in the morning takes only seconds and will show if everything is OK !

11. INSTRUMENT UPGRADING

is possible in a number of ways.

You can improve on the measuring range of your 42P/PO or 52P by adding the Carriage (Mod.C-1)

Your instrument can be converted into a ROLLING DISK PLANIMETER by adding a Mod. L or N 1260 C-2 Carriage. The advantages: Independence from measuring surface conditions, an increase in measuring range to 45"/114 cm in width by unlimited in length, an improvement in measuring resolution to 0.0017 sq.in/0.01 sq.cm.

The Processor of models 42P and 42C can be upgraded with a serial output for computer interfacing (contact LASICO)

12. TIPS AND HINTS

It is perfectly normal for the measuring wheel (and the display) to move forward and backward during area measurements.

If an accidental tracing error was made, it can be minimized by purposely making the same error in the opposite direction.



If the instrument was stored at low temperatures, move the instrument around to loosen up the measuring wheel. Avoid exposure to direct sunlight and to excessive temperatures.

If you routinely measure everything twice to minimize tracing errors, you could program CA/2 into the processor. Measure area twice without clearing the display between measurements.

13. MAINTENANCE

The Instrument is practically maintenance free. However it should be protected from dust, excessive humidity, etc. Never touch the rim of the measuring wheel or loosen any of the screws.

14. TROUBLE SHOOTING TIPS

If an instrument is malfunctioning, check the following:

Is the measuring wheel in good contact with the paper ?

Is a bend in the paper or table surface causing a wheel lift off?

Is the measuring surface too glossy ?

Check if the pins of the pole balls or the carriage are loose ?

Check the transducer: Program 1 into the processor; make a mark on the measuring wheel and align it with the linear tracing guide (red fiber)

Clear the display and rotate wheel around once. Then align fiber and mark again. Display must show 1000. Repeat this procedure in the opposite direction. Display must show 1000 again. If OK, clear display again after fiber and mark are aligned and rotate wheel quickly back and forth. Align mark and fiber again and result must show an even thousand number like 3000, 15000, etc.



Tracing Guide Index Mark

Now program 5 into the processor and repeat above steps. You must read 5000 for each wheel revolution.

If this test is negative, either your measuring encoder or the counter electronics is defective.

Ship defective instruments to LASICO, Att: Service Dept.

Record C_A Values not included in your Calibration Records for future reference.

Scale Ratio Sc	Results to be in:	AREAS				LENGTHS
		C_A V.Short Arm	C_A Short Arm	C_A Medium Arm	C_A Long Arm	C_L

We recommend to record important instrument data below. This could be of value in case you ever lose your calibration records.

Instrument Model No. _____ Serial Number _____ Date _____

Area u-Values Very short Arm : English _____ Metric _____
 Short Arm: English _____ Metric _____
 Medium Arm : English _____ Metric _____
 Long Arm: English _____ Metric _____

 Length C_L - Value English _____ Metric _____

INSTRUMENT WARRANTY

Instrument proven defective in either workmanship or materials will be repaired or replaced (at LASICO's option) free of charge within 1 year from the date of the original purchase.

The warranty is void if the instrument has been abused, modified or repaired by non authorized personnel.

LASICO and its distributors and dealers shall have no liability of any kind, consequential or otherwise, resulting from the use or inability to use this product.

ADDENDUM FOR MODEL 42/52 P/C INSTRUCTIONS

FOR INSTRUMENTS WITH A "B" SERIAL NUMBER PREFIX

PAGE 5

Planimeter Parts : The remote switch (3) was relocated into the Attachment Post for the linear handle.(5)

PAGE 16

Chapter 14. Trouble Shooting Tips.

The encoder in "B" type Planimeters generates 1024 pulses per shaft revolution. In order to check the encoder for proper operation, proceed as outlined below:

Program 1 into the processor.

Make a mark on the measuring wheel and align it with the red tracing guide.

Clear the display and rotate the measuring wheel clockwise and counter-clockwise both fast and slow.

Then, while observing the display, rotate the wheel until the display shows zero (0) again.

If the mark on the wheel is aligned with the red fiber, the encoder is working correctly.