

GY403 Structural Geology

Lecture 3: Pace & Compass Surveys



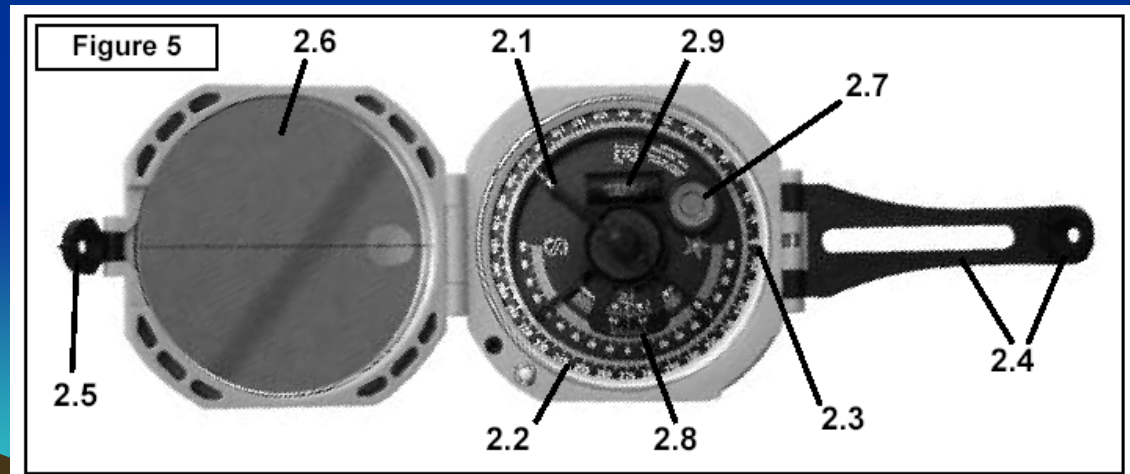
The Pocket Transit (Brunton)

- Used to measure compass directions
- Allows for magnetic declination correction
- Can measure vertical angles with clinometer.



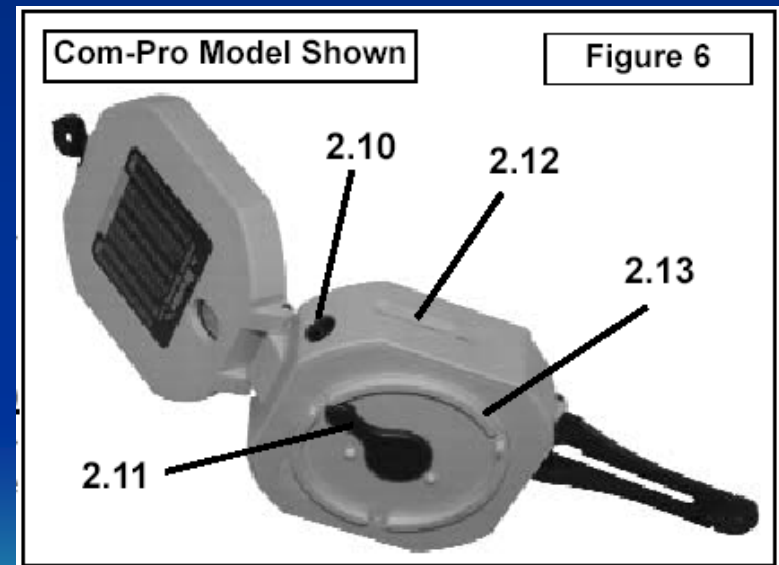
Components of the Pocket Transit

- 2.1: magnetic needle
- 2.2: graduated circle, azimuth or quadrant format
- 2.3: zero pin for setting magnetic declination
- 2.4: sighting arm
- 2.5: peep sight
- 2.6: mirror
- 2.7: round (bull's eye) level
- 2.8: clinometer scale (degrees and gradient)
- 2.9: clinometer level

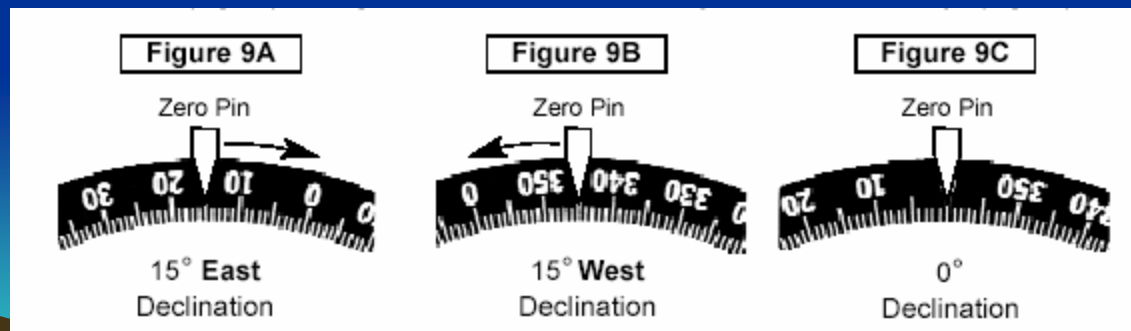
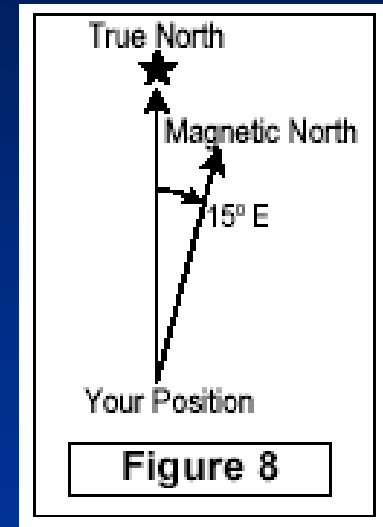
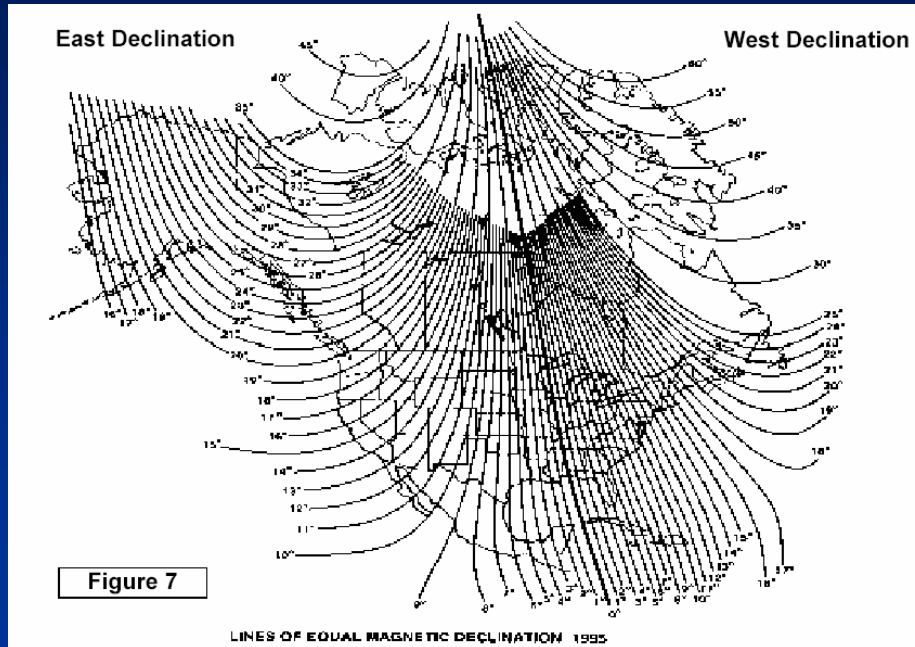


Components of the Pocket Transit

- 2.10: magnetic declination set screw
- 2.11: clinometer adjustment lever
- 2.12: alidade mount



Magnetic Declination

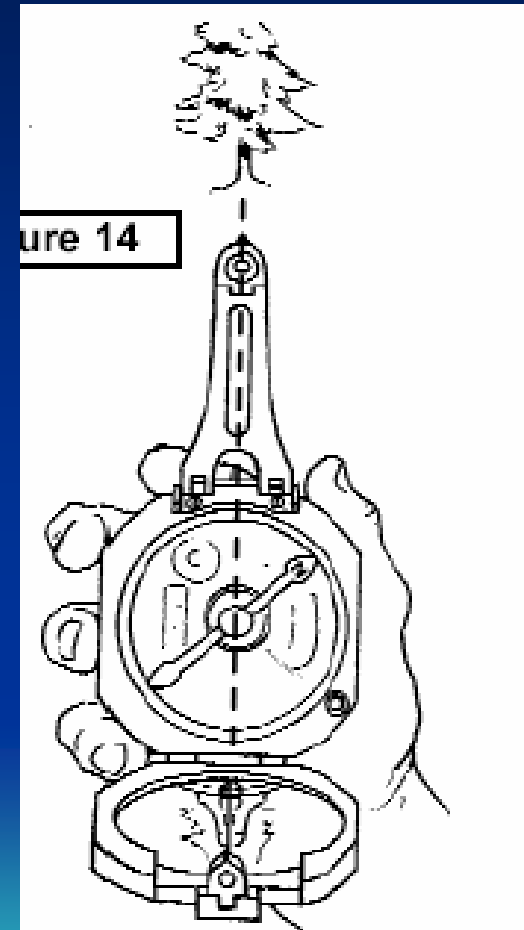
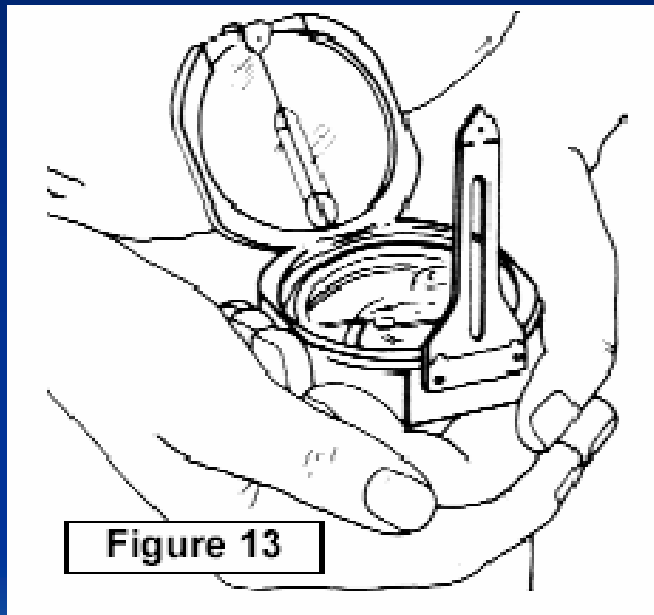


Using the Pocket Transit

- The pocket transit is used to measure either compass directions (azimuth or bearing), or vertical angles
- An azimuth or bearing is measured by pointing the sighting arm toward the target while leveling the round level
- The north (usually white) end of the needle will indicate the azimuth or bearing



Measuring Direction Example



Pace Count Measurement

- Pace count is used to measure distance by counting the number of paces between two points
- Pace counts typically range between 2.3 and 3.3 feet per pace
- Combined with a pocket transit the pace count can be used to map the location of objects or collected samples



Pace Count Measurement cont.

- Average pace count (feet/pace) is determined by measuring the number of paces over at least 200 feet in 20 different trials. The average in feet per pace is used to calculate the pace count

Trial	No. Paces	Dist.	P.C.	$(PC_i - Ave)^2$
1	95	200 ft.	2.10	0.0001
2	97	200 ft.	2.06	0.0009
3	95	200 ft.	2.10	0.0001
4	99	200 ft.	2.02	0.0049
5	93	200 ft.	2.15	0.0036
6	96	200 ft.	2.08	0.0001
7	94	200 ft.	2.13	0.0016
8	96	200 ft.	2.08	0.0001
			Ave=2.09	$\Sigma = 0.0114$

Pace Count Measurement cont.

- The precision of the pace count should be determined by calculating the standard deviation and % standard error

$$\text{Standard Deviation} = \sqrt{\frac{\sum (PC_i - Ave)^2}{N-1}} = \sqrt{\frac{0.0114}{8-1}} = 0.040$$

$$\text{Standard Error \%} = \frac{(2 (S.D.)) * 100}{Ave} = 3.83\%$$

Using the Pace Count Statistics

- A distance between two points measured 75 paces. What is the distance of the leg, and what is the accuracy of the estimate?

Distance = No. Paces * Pace Count Average = 75 paces * 2.09 feet per pace
= 157 feet (rounded to nearest foot)

Accuracy = Distance * (Standard Error %)/100 = 157 feet * 3.83%/100 = 6.01 feet

Therefore the distance and accuracy = 157 feet ± 6.01 feet



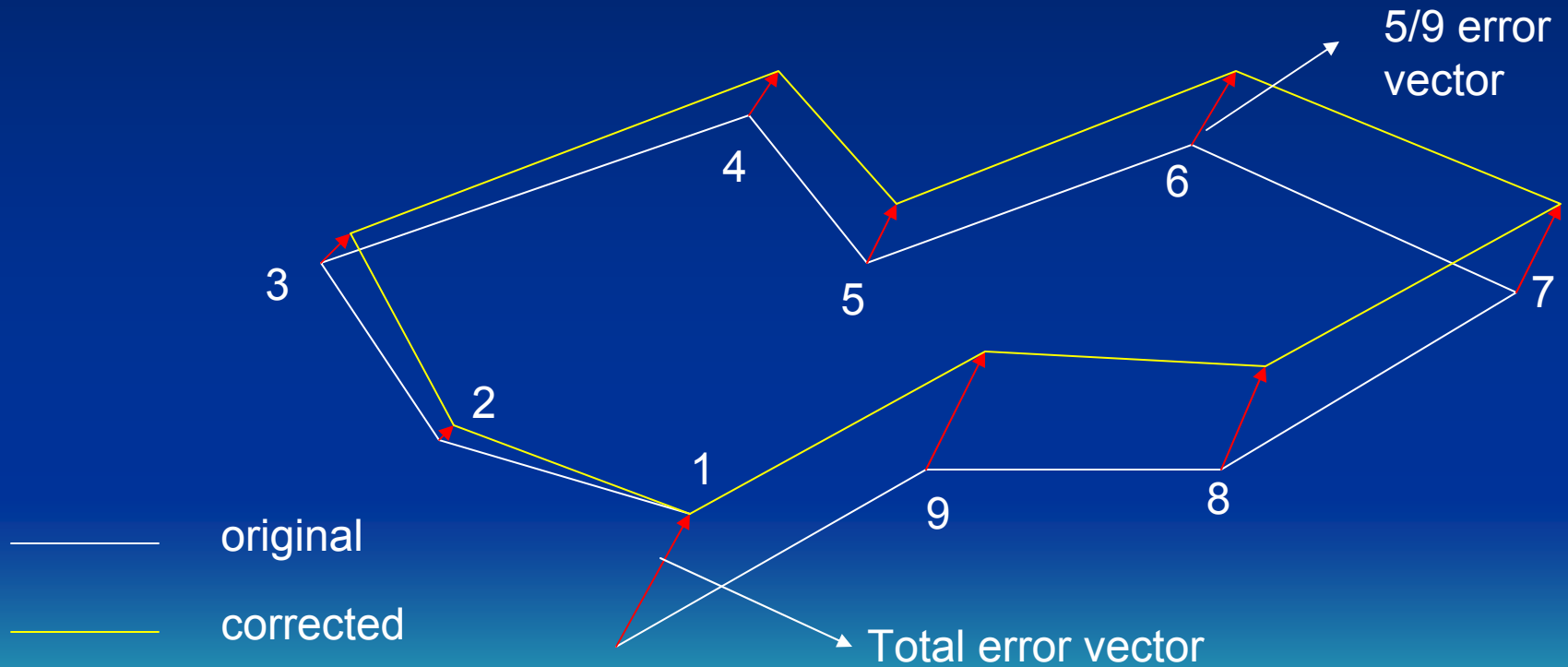
Pace & Compass Closed Traverse

- A pocket transit and pace count are used to track the position of sampling locations
- Use this method when a 1:24,000 topo. map is not sufficiently detailed
- The azimuth and pace from the last sample location to the starting location are taken to “close” the traverse
- Inevitable errors should be distributed around the traverse



Distributing the Error of a Closed traverse

- Error is distributed cumulatively through closed traverse



Summary

- For exam purposes know:
 - How to calculate a pace count with mean and standard deviation
 - How to calculate the standard error of a pace distance
 - How to distribute the error of a closed pace & compass traverse
 - How to set the declination on a pocket transit
 - How to measure strike & dip or plunge and bearing with a pocket transit

