ROYAL CANADIAN ARMY CADETS

RED STAR

INSTRUCTIONAL GUIDE

SECTION 3

EO M222.03 – IDENTIFY COMPASS PARTS

Total Time: 30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-702/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Calculate the magnetic declination for the map being used.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP1 to present basic material, orient the cadets to the compass, and generate interest.

Demonstration and performance was chosen for TP2 as it allows the instructor to explain and demonstrate the navigation skills the cadets are expected to acquire, while providing an opportunity for the cadets to practice navigation under supervision.

INTRODUCTION

REVIEW

The review for this lesson is from EO M222.02 (Describe Bearings).

QUESTIONS

Q1. What are the four inter-cardinal points of a compass rose?

Q2. How many degrees and how many mils make a complete circle?

Q3. What symbols are used to represent the three norths?

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

ANTICIPATED ANSWERS

A1. North-east, south-east, south-west and north-west.

A2. 360 degrees and 6400 mils.

A3. True north is a star (Polaris), grid north is a square (map grid) and magnetic north is a needle (compass).

OBJECTIVES

By the end of this lesson the cadet shall have identified the parts of the compass.

IMPORTANCE

It is important for cadets to be able to use a compass while navigating during expedition training. Each part of the compass has a specific name used to identify the part and its function. Cadets will rely on this information throughout navigation and expedition training.

Teaching point 1 **Identify and Describe the Parts of the Compass**

Time: 5 min Method: Interactive Lecture

INTRODUCTION

The compass is an important tool used in wilderness navigation. It is not a replacement for good map techniques, but it is a trustworthy tool to compliment and complete navigation skills. A compass user must take care to be precise in their measurements with the compass. A small error in calculation or measurement can equal a significant error in the field.

A magnetic compass is still viable as a navigation aid, even with the advent of Global Positioning System devices, because it requires no batteries, and remains reliable year after year.

The Chinese discovered the orientating effect of magnetite, or lodestone as early as the 4th century BC. In 101 BC, Chinese ships reached the east coast of India for the first time, possibly with help from a magnetic compass. By the 10th century, they had developed a floating compass for use at sea. Western Europeans had developed one by 1187, Arabs by 1220, and Scandinavians by 1300. Columbus used a magnetic compass on his first trans-Atlantic trip in 1492 (see Figure 1).



CHINESE FLOATING COMPASS

A-CR-CCP-121/PT-001 (p. 5-33)

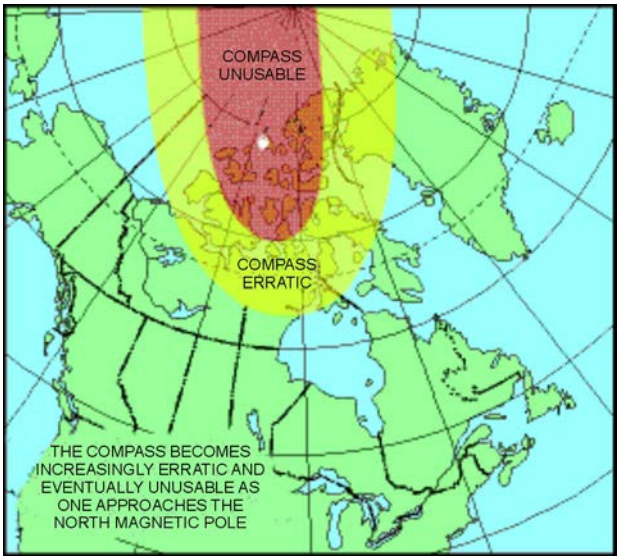
Figure 1 Chinese Floating Compass

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

HOW A COMPASS WORKS

Regardless of their intended purpose or the complexity of their construction, most compasses operate on the same basic principle. A small, elongated, permanently magnetized needle is placed on a pivot so that it may rotate freely in the horizontal plane. The Earth's magnetic field which is shaped approximately like the field around a simple bar magnet exerts forces on the compass needle, causing it to rotate until it comes to rest in the same horizontal direction as the magnetic field. Over much of the Earth, this direction is roughly true north, which accounts for the compass's importance for navigation. The Earth has a north and a south magnetic pole. These magnetic poles correspond roughly with the actual geographical poles. The north magnetic pole is located at approximately 78.9°N latitude and 103.8°W, about 1000 km from the geological north pole.

The horizontal force of the magnetic field, responsible for the direction in which a compass needle is oriented, decreases in strength as one approaches the north magnetic pole – the compass starts to behave erratically, and eventually, as the horizontal force decreases even more, the compass becomes unusable.



A-CR-CCP-121/PT-001 (p. 5-33)

Figure 2 Earth's Magnetic Field

The nature of the magnetic field allows the magnetic north pole to shift geographic position about 5-10 cm per year. Other natural phenomena, like earthquakes, can change the magnetic field locally.

Teaching point 2 **Identify and Describe the Parts of the Compass**

Time: 10 min Method: Interactive Lecture



Divide cadets into equal groups according to the number of compasses available. Starting with the compass opened, use the diagram in Figure 3 to identify the parts of the compass from the top (sight) to the bottom (screwdriver).

PARTS OF THE COMPASS

A – Sight. Located at the top of the compass cover, the sight is used to align an objective or bearing.

B – Compass Cover. The compass cover protects the compass dial and houses the sighting mirror.

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

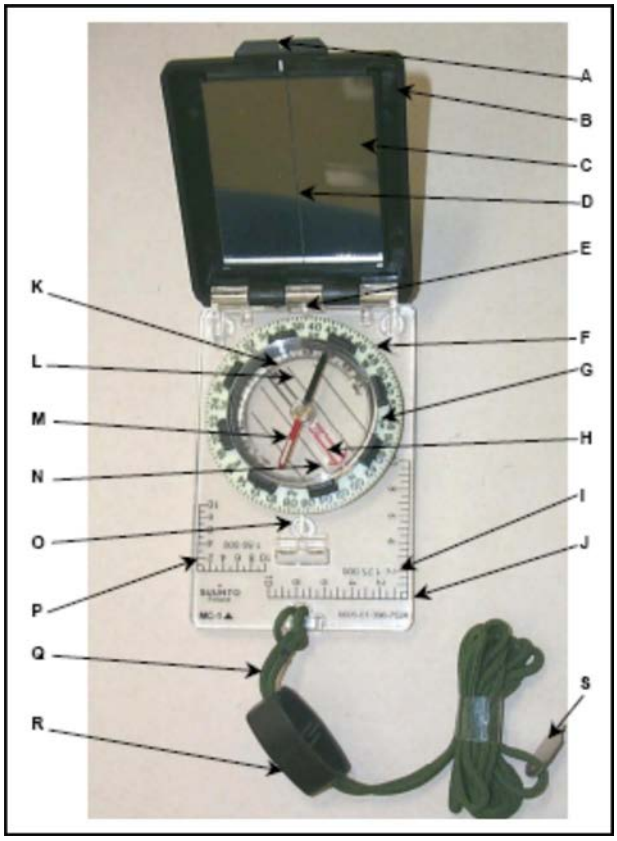
C – Sighting Mirror. The sighting mirror is used to see the compass dial while setting a bearing.

D – Sighting Line. The sighting line is used when aligning the objective or bearing.

E – Luminous Index Point. The luminous index point at the top of the compass dial is where a bearing is set and read from.

F – Compass Dial. The compass dial houses the magnetic needle, the orienting arrow and the declination scale on the inside and the dial graduations on the outside.

G – Dial Graduations. The compass dial is graduated in 50 mil divisions from 0 to 6400 mils, or 2 degree divisions from 0 to 360 degrees. The dial is rotated by hand.



A-CR-CCP-121/PT-001 (p. 5-33)

Figure 3 Compass



This Instructional Guide is good for use with compasses that have dial graduations in either mils or degrees.

H – Orienting Arrow. The red orienting arrow is located inside the compass dial and is used to line up the magnetic needle. The orienting arrow is always set at 00 mils/degrees.

I – Romer 1:25 000. This romer is used to measure GR on maps with a 1:25 000 scale.

J – Compass Base Plate. The compass base plate is a clear piece of flat plastic, to which the cover, dial and lanyard are attached.

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

K – Declination Scale. The declination scale is used to compensate for the variation of magnetic declination between the compass and the map being used.

L – Compass Meridian Lines. Compass meridian lines are black or red lines inside the compass dial and are used to line up the compass dial with the grid lines on a map.

M – Magnetic Needle. The magnetic needle spins freely and points to magnetic north. The south end of the compass needle is black and the north end, with a luminous patch, is red.

When the magnetic needle is lined up with the red orienting arrows, the mnemonic “Red in the Bed” is used to remember which end of the needle belongs between the arrows.

N – Luminous Orienting Points. There are two luminous orienting points located on either side of the orienting arrow.

O – Luminous Index Point. The luminous orienting point at the bottom of the compass dial is where a back bearing is read from.

P – Romer 1:50 000. This romer is used to measure GR on maps with a 1:50 000 scale.

Q – Safety Cord or Lanyard. The safety cord is used to fasten the compass to the body.

R – Adjustable Wrist Lock. The adjustable wrist lock is used to attach the compass to the wrist.

S – Screwdriver. The tiny screwdriver at the end of the safety cord is used to turn the screw to adjust the declination scale.

T – Declination Adjustment Screw. The declination adjustment screw is located on the back side of the compass dial and is used to adjust the declination scale (not shown).

When exposed to direct light, all luminous parts of the compass will glow in the dark making operating the compass at night possible.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the maximum number of mils or degrees on the dial graduations?

Q2. What mnemonic is use for putting the magnetic needle between the orienting arrows?

Q3. What direction does the red part of the magnetic needle point?

ANTICIPATED ANSWERS

A1. 6400 mils or 360 degrees.

A2. “Red in the Bed”.

A3. Magnetic north.

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

Teaching point 3 **Explain, Demonstrate and Have Cadets Practice Setting Declination**

Time: 10 min Method: Demonstration and Performance



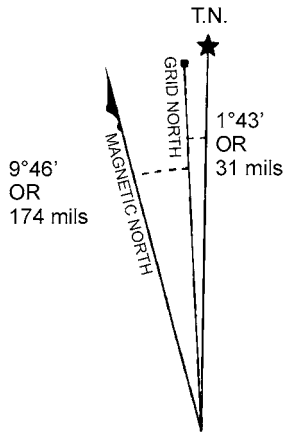
Explain and demonstrate setting declination as listed below, prior to cadets practicing this procedure. Cadets will only learn how to set declination on the compass with a value provided by the instructor. Calculating declination will be taught in Silver Star.

As mentioned in EO M222.02 (Describe Bearings), there is a difference in angle between true and magnetic north.

DECLINATION

Also called magnetic declination, it is the difference in angle measured in degrees and minutes between true north (map) and magnetic north (compass). Declination will change depending on geographic position and it also changes annually due to the shifting magnetic pole.

Declination is further described by stating whether the declination is east or west of true north. The declination for the map being used is calculated using the information in the declination diagram found in the margin of the map.



USE DIAGRAM ONLY TO OBTAIN NUMERICAL VALUES
APPROXIMATE MEAN DECLINATION 1982
FOR CENTRE OF MAP
ANNUAL CHANGE (INCREASING) 4.4'

A-CR-CCP-121/PT-001 (p. 5-39)

Figure 4 Declination Diagram

SETTING DECLINATION ON A COMPASS

The compass's declination scale must be set to compensate for the difference between true north and magnetic north. To do this we must first have the amount of declination in degrees east or west. Then, turn the compass over and look at the back of the dial.

From the zero point, using the screwdriver on the end of the safety cord, turn the declination screw to the right for west and to the left for east declination. Each small black line is two degrees.

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

When setting declination on a compass, it is easier to hold the screwdriver and turn the compass, especially in cold weather. The declination shall never be turned past 90° on the declination scale.



D Cdts 3, 2007, Ottawa, ON: Department of National Defence

Figure 5 Declination Screw

If you were to follow a compass bearing for 1 km without adjusting for declination, for every 1 degree not accounted for, you would be 178 metres to the left or right of the plotted bearing. This is how important declination is.

CONFIRMATION OF TEACHING POINT 3

Divide cadets into equal groups according to the number of compasses available. Giving a different declination setting each time, have cadets take turns setting the declination on a compass. Verify each setting before continuing to the next setting.

The cadets' participation in setting declination will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What is the screwdriver on the compass used for?

Q2. What two directions are used to describe declination?

Q3. What direction is the declination adjusting screw turned to set an east declination?

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

ANTICIPATED ANSWERS

A1. To turn the declination adjusting screw.

A2. East and west.

A3. Left.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Compasses are used during navigation and trekking training exercises. Identification of the parts and the proper use of the compass is essential to ensuring accurate navigation.

INSTRUCTOR NOTES/REMARKS

N/A.

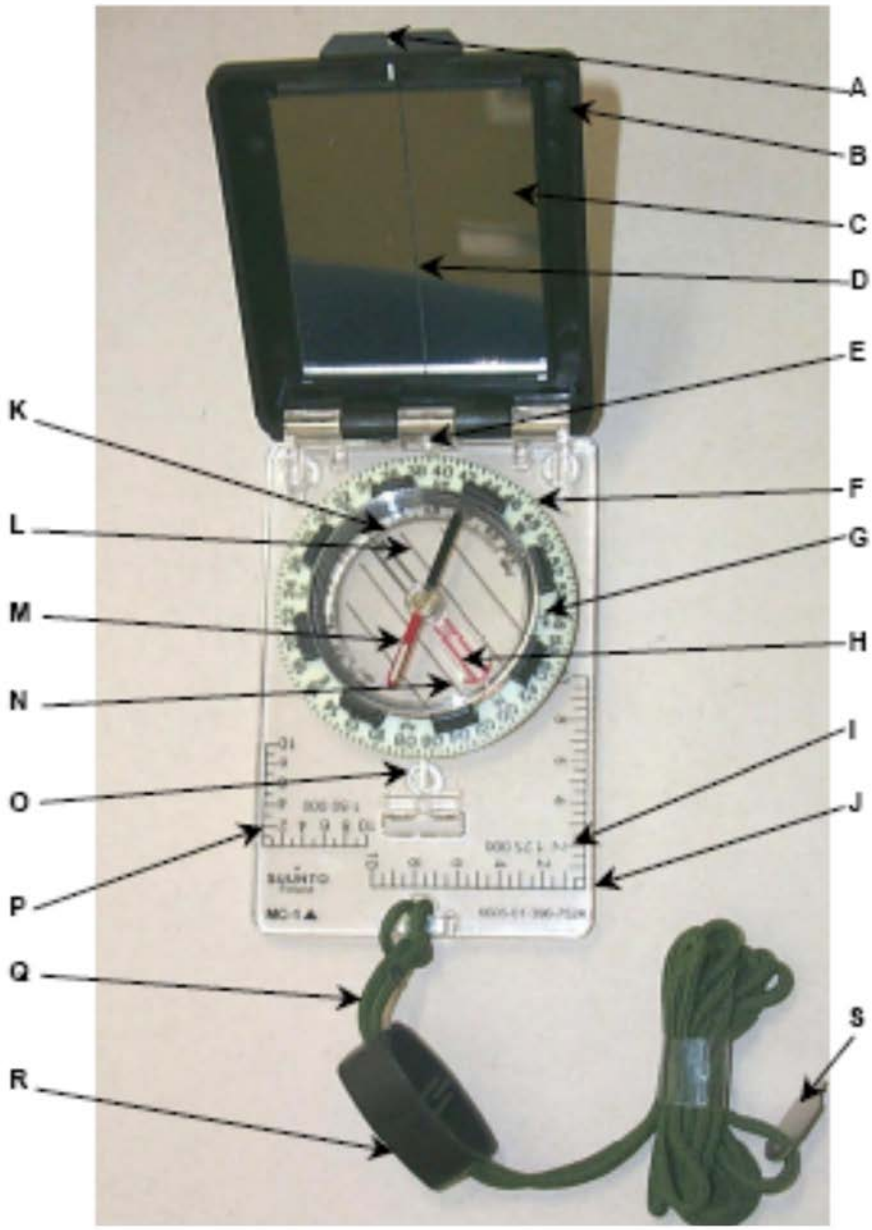
REFERENCES

A2-036 A-CR-CCP-121/PT-001 D Cdts (2003). *Royal Canadian Army Cadet Reference Book*. Ottawa, ON: Department of National Defence.

A2-041 B-GL-382-005/PT-001 Canadian Forces. (2006). *Maps, Field Sketching, Compasses and the Global Positioning System*. Ottawa, ON: Department of National Defence.

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

COMPASS PARTS



LEGEND

A - Sight	**B** - Compass Cover	**C** - Sighting Mirror	**D** - Sighting Line
E - Luminous Index Point	**F** - Compass Dial	**G** - Dial Graduations	**H** - Orienting Arrows
I - Romer 1:25,000	**J** - Compass Base Plate	**K** - Declination Scale	**L** - Compass Meridian lines
M - Magnetic Needle	**N** - Luminous Orienting Points	**O** - Luminous Index Point	**P** - Romer 1:50,000
Q - Safety Cord or Lanyard	**R** - Adjustable Wrist Lock	**S** - Screwdriver	**T** - Declination Adjusting Screw (not shown)

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.

THIS PAGE INTENTIONALLY LEFT BLANK

Unofficial convenience copy of A-CR-CCP-702/PF-001, cached 2026-11-08 from https://app.cadets.gc.ca/cadet-publications/A-CR-CCP-702-PF-001/A-CR-CCP-702-PF-001.pdf.
Verify against the official publication.