INSTRUCTIONS FOR USING THE PRISMATIC COMPASS

To learn about the prismatic compass quickly and easily you should read this chapter with a compass in your hand and refer directly to the compass for illustrations of the text.

DESCRIPTION OF THE PRISMATIC COMPASS

The compass described is the Service Prismatic Compass, oil filled, MkIII. When closed it is a circular box of brass, lacquered black. In the lid is a circular glass window possibly protected by two metal bars, and engraved with a hair-line. The compass card can be seen through the window. The compass is never used closed except to get a very rough indication of North.

To open the box, press upwards on the prism guard that extends from the lid opposite the hinge.

The body of the box has a double glass cover and below it can be seen the compass card. The North point of the card is marked by a luminous white triangle or bar, and the East, South and West by engraved letters. The compass card is of mother of pearl and the compass itself is fixed to its underside out of sight. The card circle reads clockwise from 9 degrees to 360 degrees.

Starting at the North point each small division is 5 degrees. The outer circle reads clockwise from 0 degrees to 360 degrees, starting at the South point, each small division being 1 degree. The card swings on a pointed pivot working in a sapphire jewel boss.

The box is filled with liquid to damp the movement of the card so that it swings gently and comes to rest quickly. A bubble trap is incorporated in the box to prevent small bubbles in the liquid interfering with the compass card. Turning the compass over so that its base is uppermost and then slowly and gently turning it back again may trap these bubbles.

The upper glass cover (index ring) is marked with black figures, which show up against a white ring between two covers. The figures read between 0 to 36 clockwise, each division being 10 degrees. Opposite the figure 36 is a luminous strip. This upper glass cover is held in a brass ring with a milled edge and can be turned in any desired position. It can be clamped into position by the screw on the outside (clamping screw) of the box just to the right of the hinge. There is a deep groove in the outer milled edge, opposite the figure 36 and the luminous strip.

On the white ring below the upper glass cover, near the hinge, is a black line with a luminous patch. It therefore shows up in the dark. It is extended by a hairline on the lower glass cover, reaching to the inner circle on the compass card. This is called the lubber line. Inside the lid the lubber line is further extended by the hairline on the glass and a luminous white line reaching to the end of the tongue where there is a notch. On the outside of the ring attached to the bottom of the box, the thumb loop, opposite the hinge, is another notch. When the compass is opened out flat all these lines and two notches are in a straight line passing through the pivot and mark the axis of the compass. At each end of the engraved hairline in the lid are two small holes to allow a hair or thread to be fixed as a substitute should the glass get broken.

Opposite the hinge, and covered by the tongue on the lid when the box is closed, is a small triangular metal block hinged to the side of the box. This contains the magnifying prism. When the box is open the prism unit can be turned over into the reading position. This reveals the eyehole and the sighting slit above it. When you look through the eyehole you see the figures magnified on the outer circle of the compass card.

The prism assembly is fitted to slides, which enable it to be raised slightly to get a good focus if necessary. On the bottom of the box on the inside, directly below the prism, is a luminous patch against which the markings of the compass card can be read at night.

Round the outside of the box the points of the compass are engraved in reverse order and painted white. North is opposite the lubber line, West to the right of North and East to the left. Each quadrant has sixteen subdivisions. There is no relation between these markings and the graduations in degrees on the glass cover and on the compass card.

Fixed under the base is a rubber ring (friction ring) to prevent the box from slipping on a smooth surface.

TAKING A BEARING

Hold the compass in both hands with a thumb through the ring. The exact method of holding it is not important; find for yourself the best way to hold it steady. The lid must be vertical and the prism turned over into the reading position. Take care to hold the compass level; if it is tilted too much the card touches the glass and will not swing freely.

Look through the sighting slip and line up the hairline in the lid with the object on which the bearing is to be taken. At the same time through the eyehole observe the readings on the card. When the card comes to rest read off the bearing against the hairline. A bearing to the nearest degree can be read without difficulty. With practice and a stead hand a bearing can be read to half or even a quarter of one degree. It helps if the hands or elbows can be rested on a convenient wall.

TO FIND THE DIRECTION OF A GIVEN BEARING

First, look through the eyehole and turn the compass until the hair line cuts the required bearing, then note some distant object that is in line with the hairline. This object will be on the required bearing.

Alternatively, to set out a bearing, a man with a long stick should ben sent to a distance of 100 metres and directed to move right or left until the stick, planted in the ground, is on the correct bearing. The position from which the observation was made must also be marked.

USING THE COMPASS WITHOUT THE PRISM

Either of the above operations can be carried out without using the prism, but with much less accuracy. To take a bearing, open the compass out flat and line it up so that the axis is directly in line with the object. The bearing is read from the inner circle of degrees on the compass against the lubber line.

Conversely, to find the direction of a bearing, turn the compass until the inner ring below the lubber line reads the correct number of degrees and sight along the axis.

Be careful to read with your eye vertically over the lubber line or you may make unnecessary errors.

SETTING THE COMPASS FOR NIGHT MARCHING

First find the bearing on which you have to march, either by measurement from the map or by observation during the day with the compass. The latter is best.

To set the compass, turn the glass cover until the reading of the gradulations against the lubber line shows the required bearing. Clamp the index ring in this position. The axis of the compass will now be in the required bearing when the North point on the card coincides with the luminous light on the index ring.

The compass can be set rather more accurately by laying it on the required bearing using the prism and then turning the index ring until the night light coincides with the North point. Check the bearing before clamping the index ring. When this method is used the compass must be laid on a table for setting or it will move off the bearing while the index ring is being turned.

A very rough setting, but one which may be good enough for some purposes, can be achieved by turning the index ring until the groove in the milled edge coincides with the compass direction shown by the markings on the outside of the box, e.g. SE or SSE or somewhere between.

If more than one compass bearing is needed for the march, have a compass ready set for each bearing. Mark the compasses unmistakably to ensure they are used in the right order. The compass can be set in the dark, as the bearings can be read through the prism against the night light in the bottom of the box, but it is not easy and should not be attempted unless absolutely necessary.

NIGHT MARCHING

The normal way to maintain direction on a night march across country is to use the prismatic compass. The methods are described below.

Before any night march the bearings should be worked out and the compass set, by day. As much as possible of the route should be reconnoitred by day, even if only from a distance. The ground should be studied by air photographs if they can be obtained. Conspicuous features, which would be visible at night, roads, hedges, etc., which have to be crossed, should be carefully noted as a check on distance and direction.

It is not easy under any circumstances to hold a constant course in the dark. Every precaution should be taken. Plenty of practice is needed before it can be done with confidence.

NIGHT – NOT VERY DARK

Even at night it is often possible to distinguish objects at some distance, particularly against a skyline. On moonlit nights they may be seen from a considerable way off. When things can be seen in this way the best method is to pick out an object on the required bearing, as far distant as clearly can be seen, and march to it. Then select another object and march on that, and so on.

To find an object on the right bearing, open the compass out flat and turn it until the North point on the card coincides with the night light on the index glass. The axis is then on the required bearing. Sight along the axis and select an object to march on. It need not be directly on the bearing; you can estimate how much right or left of it to move.

USING STARS

This method is similar to above but the object selected is a star. This is convenient, as the star can be followed over a much longer distance, but some precautions must be observed: choose a star that is conspicuous and easily identified. You cannot march far without taking your eyes off it. You must be able to pick up the right star easily and quickly each time you look up to it. Choose a star not too high in the sky,

nor too low. If the star is more than about 30 degrees above the horizon you will have to march with your head in the air, which is inconvenient, particularly in the dark, across country. Near the horizon stars lose their brightness and are more difficult to pick up. Choose one that you can keep it and the ground in your vision at the same time. You will have to take your eyes off it now and then to look at your feet. Stars move. A star fairly low down may move about 5 degrees sideways in twenty minutes. An error of 5 degrees is about 150 yards in a march of one mile. The length of time you can march on a star will depend on how accurately you need to hit your destination. Generally you will have to choose a new star every fifteen or twenty minutes.

DARK NIGHT – NO STARS

Often the night will be dark and cloudy and neither of the above methods will do. On such a night the method is to send a man ahead on the bearing as far as you can see him, follow up to him and then send him ahead again.

When there is no necessity for silence the man can be sent ahead, called to a halt before he disappears, and then old to move right or left until he is dead on the bearing.

When silence is essential, work like this. Before starting, find out how far forward the man can go and still be seen sufficiently well, say 20 paces. Use a stick to give the man a good direction and tell him to go forward twenty paces each time, keeping as straight as he can, and then halt. Judge how far he has gone to the right or left and move up into the correct position.

The man can be seen at a greater distance if he wears a square of white paper or cardboard tied to his back. Longer bounds can then be made and progress will be quicker. There is obviously a greater liability to error by this method than the other two. The longer each bound can be made, the less the error will be.

DISTANCE

On a night march you tend to imagine that you have gone much further than you really have and you may think you have missed your objective when in fact you are far short of it. Unless there are frequent landmarks to help you it is always wise to arrange a check on your distance. Sometimes you may have to move a certain distance on a specified bearing, with no obvious feature to mark your destination. Pacingt is not accurate enough.

Detail two men to carry a tape of specified length, say 50 yards. At the start, A stands still, B moves forward with you at the other end of the tape. When the tape tightens, B halts and signals to A to come on by jerking on the tape. A moves on past B, comes up to you, halts in his turn as the tape tightens and signals to B to come on. Every time A halts you have gone a hundred yards, every time B halts you have gone fifty. Be sure to have a simple means of totting up the hundreds. It is easy to miscount if you rely on memory. A and B will usually be able to move fast enough to keep up with you carrying the compass. If there is much rough ground, or many obstacles, have a third man to help with the tape and keep it clear of snags.

TRAINING

It is not enough to know how a night march should be made. To carry out even a simple night march successfully the “drill” must be perfect. Everyone must know just what he has to do and must have complete confidence in the rest of the party. If the enemy is near, nervous tension increases the chance of

an error, and also may intensify its consequences. Training is essential. An officer should know at what speed he can expect t move over different sorts of country, under various conditions, and with what accuracy he should expect to reach his destination.

COMPASS ERRORS

Individual variation

Every compass has its individual variation, that is, it does not point exactly to magnetic North. The compass needle itself may not be quite true with the markings on the card and slight divergences may be caused in other ways. The error may be negligible or comparatively large. Every compass should be checked before it is used and, in any readings taken, allowance must be made for its individual variation. You should always know the individual variation of your own compass and check it from time to time in case it has changed. To test the individual variation of a compass, first find the magnetic bearing between two points. The bearing should be measured on a map not smaller than 1/25,000 and the two points must be clearly defined on the ground. They should be not less than a mile apart. Read the bearing on the compass and note the amount of variation and whether it is East or West of the bearing measured on the map. This should be done on two or three bearings taken from different places. The variation should be the same in each case. If one is very different there is probably local magnetic attraction (see below) and a check should be made on further bearings.

LOCAL MAGNETIC ATTRACTION

Local magnetic attraction is quite a different thing. It is due to the presence of iron or iron ore nearby. The compass is a sensitive instrument and quite small quantities of iron have a surprisingly large effect on its behaviour. A wristwatch on your wrist when your are using it could throw it out. A steel helmet on your head will cause entirely wrong readings. Steel spectacle frames will affect it. Steel buttons too. Take the precaution of ensuring that anything of the sort is at a safe distance before you start. Small articles will be safe in a trouser pocket, but large articles, such as a rifle, should be two or three yards away. The table below shows the safe distances form various common objects.

Tank	75 yards
Heavy Gun	60 yards
Field Gun	40 yards
Metal Fence	10 yards
Steel helmet	3 yards
Keys, whistle etc	half a yard.

Iron on the surface can be avoided but there may be iron below ground that cannot be seen. Buried pipelines, shells, mines etc will all affect the compass if they are close. You may get an obviously incorrect reading, which will warn you that something is wrong, but often this error is not big enough to be immediately obvious.

There are two ways of checking:

a. Take a bearing on a distant object. Move a few yards in various directions and take more readings. The readings should be the same provided the object is far enough away. If they are different it shows that there is local disturbance. If they are the same it is not final proof that there is no disturbance. There may be a wide spread magnetic field that affects all the positions equally, though that would be rare.
b. Select two points about a hundred yards apart. From one take a bearing on the other. Then move to the other and take a bearing back to the first. The two bearings should differ by on hundred and eighty degrees. If they do no there is a disturbance at one point or the other, or at both. Take care to be in direct line of the two points when you take the bearings. The further apart the two points are the better, but it takes longer walking from one to the other. If you suspect local magnetic attraction, even though you cannot prove it, you should move your position.

DAMAGED PIVOT

Most forms of damage to a compass are immediately obvious. A damaged pivot is the only one that is not. It is a rare problem that results in the card being sluggish and uneven in its movement and giving incorrect readings. To test for a damaged pivot, bring a nail or some other piece of iron up to the compass from the side. If the pivot is in good condition the pointer will swing gently and steadily towards the nail and will return to its former position when the nail is removed. If the pivot is damaged the pointer will move jerkily or not at all and will probably settle on a new reading when the nail is removed. The only thing to do when the problem is discovered is to send the compass for repair.

VARIETIES OF PRISMATIC COMPASS

Compasses privately bought may vary in some details from the type described and there may be a few earlier types still in the service. The principles on which they work however, are the same, and by comparing them with the description and instructions it should be an easy matter to work out the practical effect of any differences. The old air filled compasses, for instance, had a stop at the side to check the swing which other wise continued indefinitely, and the graduations corresponding to those on the index glass were on the outside of the box.

The lensatic compass is a variation of the prismatic compass, which may be encountered. It is similar to the prismatic compass, but a lens replaces the prism. The lens is in a metal frame hinged to the case; there is a a sighting slit in the metal frame. For reading, the lens is upright and the hairline on the lid is sighted on the distant object through the sighting slit. The bearing is read through the lens direct on the compass card opposite the lubber line.