

SC 063 SIGHT COMPASS

USER INSTRUCTION MANUAL
M/N: SC 063, P/N: 101-01200

Doc. P/N: 56-101-01200

Revision D

September 9, 2010

BARFIELD, INC.

SC 063 is designed to be used as
Ground Support Test Equipment.
Not for aircraft installation.



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CONTACT INFORMATION

Users are requested to notify the manufacturer of any discrepancy, omission, or error found in this manual. Inquiries should include specific questions and reference the publication title, number, chapter, page, figure, paragraph, and effective date.

Please send comments to:

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ATTENTION

Although every effort has been made to provide the end user of this equipment with the most current and accurate information, it may be necessary to revise this manual in the future. Please be sure to complete and return the enclosed **OWNER WARRANTY REGISTRATION CARD** to Barfield in order to validate the warranty and to ensure that you will receive updated information when published. You MUST have your name and address on file at Barfield as a registered user of this equipment, to be able to obtain the service covered by the warranty.

Visit the company website, <http://barfieldinc.com/>, for publication updates.

Please send the Registration Card to:

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REVISION RECORD

REV.	ECO #	REV. DATE	DESCRIPTION OF CHANGE
-	N/A	January, 1983	Initial Release
B	260-00680	Oct. 5, 2006	Page number sequence was changed.
C	260-00702	Jul. 16, 2007	List of Approved Repair Facilities was updated. Description Section was modified to reflect current accessories package (short handle is no longer provided)
D	260-00782	Sep. 9, 2010	Non-applicable sections were removed. Disclaimer and Recertification paragraphs were added.

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LIST OF APPROVED REPAIR FACILITIES

The manufacturer of this equipment does not recommend the user to attempt any maintenance or repair. In case of malfunction, contact the manufacturer, to obtain the list of approved repair facilities worldwide, ensuring that this equipment will be serviced using proper procedures and certified instruments. A Return Maintenance Authorization (RMA) number will be assigned during this call, to keep track of the shipment and the service.

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INTRODUCTION

1. PUBLICATION BREAKDOWN

This User Instruction Manual establishes the standards of operation for the SC 063 Sight Compass, P/N 101-01200. Its purpose is to provide sufficient information, for the personnel unfamiliar with this unit, to operate it in accordance with proper procedures, operating techniques, precautions and limitations.

2. INFORMATION PROVIDED WITH THE UNIT

Besides this User Instruction Manual, the Sight Compass is delivered with the five information items described below.

- A. An identification label, similar to Figure 1, and attached to the instrument, provides the following information:

Manufacturer Name
Designation of Instrument
Instrument Part Number
Instrument Model Number and Serial Number



Figure 1 IDENTIFICATION LABEL

- B. A laminated card, with a summary of the most frequently used operating instructions indicated in this manual. This card is not intended to be a substitute of this manual, it is provided as a quick reference card that can be conveniently carried to the location where the procedures involving the aircraft will be performed.

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- C. The Owner's Warranty Registration card (Figure 2), is to be completed by the owner and returned to Barfield, Inc. within **ten (10) days** of purchase to ensure automatic update of printed matter and validation of warranty.

OWNER WARRANTY REGISTRATION

RETURNING THIS CARD COMPLETED ENABLES US TO KEEP YOU
AUTOMATICALLY INFORMED OF TECHNICAL UPDATES and VALIDATES YOUR WARRANTY.

NAME _____ TITLE _____
 DEPARTMENT _____
 COMPANY _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____
 P/N _____ S/N _____ MODEL # _____
 PURCHASED FROM _____ DATE _____
 AIRLINE ☐ REPAIR STATION ☐ OEM ☐
 OTHER _____

INFORMATION GIVEN ON THIS BARFIELD, INC. WARRANTY CARD IS AND WILL REMAIN
 STRICTLY CONFIDENTIAL AND WILL NOT BE SHARED. OW-28 REV / 04.00

Figure 2 Owner Warranty Registration Card

- D. The Limited Warranty Statement Card (Figure 3), which lists the manufacturer's obligation to the original purchaser.

**LIMITED
ONE YEAR
WARRANTY**

BARFIELD INSTRUMENT CORPORATION warrants to the original purchaser of this unit sold by us and/or our agent, and all the parts thereof, to be free from defects in material or workmanship under normal use and service within the specified ratings and operating conditions.
 Its obligation under this warranty is hereby limited to the repair or replacement of this unit, or part thereof, which is returned to us within one year after date of invoice, suitably packaged in the original container or equivalent and which shall prove, after our examination, to be defective under terms of above paragraph.
 No other warranty is expressed or implied. We are not liable for consequential damages.
 Some states do not allow the exclusion or limitation of incidental or consequential damages so that the preceding limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may have other rights which vary from state to state.
 This warranty does not include the cost of transportation charges to and from the factory.
 The repair or replacement of this unit, or any part thereof, does not void or extend the original warranty.
BARFIELD INSTRUMENT CORPORATION reserves the right to discontinue this unit without notice, or to make modifications in design at any time, without incurring any obligation to make these modifications in units previously sold.

BARFIELD INSTRUMENT CORPORATION
 4101 N.W. 29 Street
 Miami, Florida 33142 U.S.A.

FORM 991-00001

Figure 3 Limited Warranty Statement Card



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- E. Each new or re-certified unit is delivered with a Certificate (not pictured) that shows the date when the unit was tested by the manufacturer, its serial number and when the next certification is due. This certificate confirms that the unit performed according to its specifications.

3. RECERTIFICATION

Barfield Sight Compass, Model SC 063, P/N 101-01200, has a one-year recertification requirement. Qualified technicians in a shop equipped with the necessary tooling, facilities, and Barfield-approved procedures must perform the maintenance required by this unit.

4. DISCLAIMER

BARFIELD, INC., neither a vendor nor supplier of airworthy compasses or an airframe manufacturer, has no control over aircraft calibration and certification procedures. The information provided in this Instruction Manual is presented as reference only, and therefore the compass manufacturer calibration procedures and aircraft maintenance manual shall take precedence over this Manual. However, the information presented is correct to the best of our knowledge at the time of publication.

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GENERAL INFORMATION

1. DESCRIPTION

The SC 063 Sight Compass (Figure 4) is a modified version of a standby type Aircraft Compass which has had its compensating assembly removed and a collimator sight attached.

Modified features include:

- A. Reversed magnetic polarity, which permits the operator of the Sight Compass to view the aircraft being checked from the front. This makes communications (hand signals) between the Aircraft occupant and the Sight Compass operator convenient.
- B. Attached to the front of the Sight Compass is a combination magnifying lens (to increase the readability of the dial) and a collimating lens (to ensure precise sighting alignment).
- C. Attached to the rear of the Compass is an adjustable Sight Lens. The lens is precisely aligned to ensure that the overall accuracy of the dial falls within $\pm 1^\circ$.
- D. The Compass is mounted on a bracket, which can be attached to a monopod assembly (supplied with the Sight Compass).
- E. The Sight Compass is painted red and has a caution label attached to it to prevent inadvertent installation in an Aircraft.
- F. The SC 063 Sight Compass is packaged in a protective carrying case.



Figure 4 Sight Compass

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2. DIMENSIONS AND WEIGHT

- A. Length: 2.75 in. (7 cm)
- B. Width: 2.36 in. (6 cm)
- C. Height: 3.34 in. (8.5 cm)
- D. Weight: 0.72 lbs. (0.325 Kg)

3. CAPABILITIES

The Sight Compass is a small, readily portable, convenient instrument which can be used to:

- A. Determine the magnetic suitability of a Compass swinging area.
- B. Check and layout Compass swinging bases.
- C. Determine the magnetic heading of an Aircraft.

NOTE: Since the Sight Compass is used extensively when a prepared base is not available, operating personnel should be familiar with its three uses and with the method of checking its accuracy.

4. ACCESSORIES PROVIDED

- A. A monopod assembly, which is provided in assorted lengths. Combinations of lengths may be chosen to support the Sight Compass at the operator's eye level. Although the Sight Compass can be hand held, experience has shown that the use of the monopod provides more stable sightings.

NOTE: All external parts of the Sight Compass, such as the mounting bracket and monopod, have been selected to contain no materials which could affect the magnetic accuracy of the Sight Compass. Any other support, such as a camera tripod, must be carefully checked for the presence of any ferrous materials before being used.

- B. A case, which facilitates protecting and carrying the Sight Compass.
- C. The reference laminated card described in page 1, paragraph 2.B.

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5. BACKGROUND INFORMATION

A. A compass swing must be performed whenever any ferrous component of the system (i.e. flux valve compensator, or Standby Compass) is installed, removed, repaired or a new compass is installed. Additionally a compass swing must be performed on the following occasions:

- (1) When the accuracy of the compass is suspected
- (2) After any cockpit modification or major replacement involving ferrous metals
- (3) When compass has been subjected to shock from a hard landing or turbulence
- (4) After aircraft has passed through a severe electrical storm
- (5) After a lightning strike
- (6) Whenever a change is made to the electrical system
- (7) Whenever a change of cargo is likely to affect the compass
- (8) Whenever an aircraft operation is changed to a new geographic location with a major change in magnetic deviation
- (9) After aircraft has been parked on one heading for over a year
- (10) When flux valves are replaced

B. Understanding Compass Errors

The error of any Compass is the angular difference between true North and Compass North. This angle is the algebraic sum of the deviation and variation. These are two terms commonly used in connection with Compasses that should not be confused.

- (1) Compass deviation is the difference between the heading of the aircraft, as indicated by the Compass, and the actual magnetic heading of the Aircraft. The deviation is called plus or minus (East or West respectively) to indicate how it must be applied to the Compass heading to obtain the actual magnetic heading. The deviation and its sign are determined by subtracting the Aircraft Compass reading from the magnetic heading of the Aircraft.
- (2) Variation is the difference between the direction indicated by an undisturbed magnetic Compass and the true direction measured in relation to the earth's geographical North Pole.

C. Causes of Compass Errors

There are several causes for inaccuracy in Aircraft Compasses: namely faulty installation, vibration, the Aircraft's magnetism (metallic and electrical), northerly turning error and acceleration error. Installation and vibration error can and should be corrected. Northerly turning error and acceleration error are common in magnetic needle type Compasses incorporating a sensitive element, which may be tilted and cannot be corrected. Errors caused by the Aircraft's magnetism should be corrected insofar as is practically possible. The Aircraft Compass is compensated to accomplish this. Magnetism in Aircraft, which is likely to affect the Compass, can be caused by:

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- (1) Hard Iron: This term is given to those parts of the Aircraft, which may be regarded as permanent magnets; that is, parts in which the magnetism tends to remain the same. The effect of hard iron can be determined with fair accuracy during a Compass swing. By the use of other permanent magnets (compensating magnets) near the Compass, it usually can be compensated for completely. Once such compensation has been accurately made, it will remain effective so long as the magnets do not alter their strength or position. If the compensation is not complete and some error remains in the Compass, the error will alter as the Aircraft changes magnetic latitude. For this reason, the accurate correction of the Aircraft's permanent magnetism is extremely important.
- (2) Soft Iron: This term is given to those parts of the Aircraft which continuously change their magnetism, depending on the influence of other magnets (such as earth) on them. The soft iron magnetism will change the Compass deviation with the change of magnetic latitude if it results from the presence of unsymmetrical, vertical soft iron near the Compass. The compensation of an Aircraft for soft iron magnetism is so complicated as to be impractical and should be performed only by an expert. It is important, therefore, that the Compass location be such that there is no soft iron near it.
- (3) Electrical Magnetism: This term is given to the magnets (magnetic fields) which are produced by a direct electrical current flowing through a wire. Since the direct current, causing electrical magnetism, is liable to change frequently during a flight, it is of the utmost importance that any single-pole wires carrying a direct current should not pass anywhere near the Compass. If it is impossible to avoid this wiring, then it is essential that the wiring be of the two-pole type. Experience has shown that the use of single- pole electrical wiring near the Compass has such a serious effect that it cannot be tolerated.

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OPERATION

WARNING: Before performing the procedures indicated in this chapter, remove all personal items which might contain ferrous material, such as keys, pocket knives, watches, cell phones, radios, pocket calculators, metal pens and pencils, etc. Beware of metal frame eyeglasses, sunshades and metal shirt or jacket buttons and steel belt buckles. All these items may be magnetic, thus affecting the functioning of the Sight Compass.

1. ESTABLISHING A PERMANENT REFERENCE POINT

When the SC 063 Sight Compass is first received, it is suggested that a permanent reference check point be established. If, at any time, there is reason to suspect the readings obtained during Aircraft Compass testing, the Sight Compass can be rechecked using this (these) reference point(s). The procedure to determine the reference(s) is as follows:

- A. Select an open area at least 100 yards away from any buildings, machinery, fences, power lines, etc. which could affect the magnetic environment. Beware of concrete runways with embedded steel mesh or of any underground cables or pipelines. Also, the area selected should be where future construction is unlikely.
- B. From the selected area, locate some prominent object at least 1 mile distant from the sighting location. Again, try to anticipate area where future construction is unlikely.
- C. Remove all magnetic personal items that could affect the Compass.
- D. Carefully align the compass sight on the chosen distant object(s). Note and record the Sight Compass reading(s).
- E. Mark the observation point with some non-ferrous item for future reference.
- F. Make a permanent record of the observation point, the referenced distant object(s) and the Sight Compass reading(s).

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2. TESTING SITE SUITABILITY

Before actually attempting to check and calibrate an Aircraft Compass, the area to be used should be tested. It is recommended that the area be as far as possible from any magnetic disturbance. Suggested distances are 50 feet from the Aircraft being swung and 100 feet from any buildings, large items of machinery, power lines, fences, etc. However, the area could appear to meet all of these requirements, but be unusable because of the steel mesh in the ramp or underground cables or pipelines. To ascertain if the chosen area is satisfactory, proceed as follows:

- A. Assure that the area is at least 100 feet in diameter or adequate to accommodate dimensions of aircraft being tested.
- B. Check that from any point within the chosen area, a prominent object, at least a mile distant, can be observed.
- C. Remove all magnetic personal items that could affect the Compass.
- D. From at least 8 points approximately equidistant on the perimeter of the chosen 100 foot diameter, observe the distant object(s) and note the Sight Compass reading(s).
- E. If all reading(s) are consistent within 1 degree, the area is satisfactory for Compass swinging. However, the area should be rechecked frequently for possible magnetic charges.

In general an area can be checked for Compass swinging suitability by taking bearings with the SC 063 from random positions within the area in question on an object at least a mile distant. If all bearings are the same, the area is suitable for use.

3. VERIFYING AN EXISTING SWINGING BASE

To check an existing base, the operator aligns himself successively with the marked lines on the base, (standing at least 50 feet from the base) and sights along the line being checked with the SC 063 hand held Sight Compass. If the bearings taken agree with the markings on the base, or the markings plus or minus 90 degrees (in cases where the aircraft wheels are placed on the line), the base is satisfactory. If a constant difference between the measured bearings and the markings of the lines exists, the lines on the base should be redrawn. If the difference varies, the base is unsuitable for use.

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4. DETERMINATION OF THE MAGNETIC HEADING OF AN AIRCRAFT

- A. Standing at least 30 feet from the Aircraft, the observer aligns himself with its longitudinal axis by reference to a radio mast and fin, row of central fuselage rivets or any suitable line or pair of objects on the Aircraft, and with a hand held Sight Compass, sights on one of the objects used for alignment. The Sight Compass is read when steadied. The reading obtained is the magnetic heading of the Aircraft if the observer is in front of the Aircraft.
- B. When using the Sight Compass, the Aircraft's nose is placed on the desired heading *according to the Aircraft Compass*. Alignment on the heading need not be exact, but should be within 5 degrees.
- C. The Sight Compass should be supported and held at a comfortable reading distance from the eye. A monopod is supplied with the SC 063 Sight Compass to aid in steadying the Compass. Again the observer must take care to remove all magnetic material from his person prior to using the Sight Compass.

5. PRECOMPENSATION AND PRESWING INSTRUCTIONS

- A. When using the Compass, the operator stands directly in front of the aircraft at a minimum distance of 30 feet, preferably 50 feet or more.
- B. The Compass is held as nearly level as possible and sighted through the sighting lens to the exact center of the aircraft.
- C. Sufficient time should be allowed for the Sight Compass to stabilize before taking readings. It is best to take a series of three readings before assuming that the readings are correct.
- D. Normal procedure is to either taxi or tow the aircraft to approximately the desired heading as read on the Compass to be compensated (within 5 degrees).
- E. The operator using the Sight Compass, then standing directly in front of the aircraft and with the Sight properly lined on the center line of the aircraft, observes the exact heading on which the aircraft is positioned, and notes any error that exists between the Sight Compass and the Aircraft Compass being compensated.
- F. Whatever error exists between the Sight Compass and the Aircraft heading is then corrected by moving the Aircraft the number of degrees difference existing until such time as the Aircraft heading and the reading of the Sight Compass are corrected for the desired heading (within 5 degrees).
- G. It is of the utmost importance that during the swinging procedure a minimum distance of 30 feet be maintained between the Aircraft being swung and the operator using the Sight Compass. Also, the operator and the Sight Compass must be a minimum of 50 feet from any other Aircraft, or at least 100 feet from any large building, power lines, or heavy objects which might cause interference.

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- H. Insofar as possible, all fixed or movable items containing ferrous materials should be placed in positions they will occupy in flight before beginning the swing.
- I. The Compass should be inspected for general serviceability.
- J. An Aircraft Compass is easily affected by stray magnetism from electrical circuits and moveable steel objects. Before swinging the Compass, the aircraft should be positioned approximately North, East, South and West. On each heading, the Compass should be observed with the engine(s) operating and indicating generator charging, and with the engine(s) stopped. If a significant difference is observed, the swinging should be done with the engines running and charging. Also, on each heading various electrical components should be turned ON and OFF to determine their effect on the Compass. A determination must be made as to what equipment will be used during the Compass swing. In some cases, multiple readings may be required to cover normal, abnormal and emergency conditions.
- K. When swinging the Aircraft, it should be kept (as nearly as possible) in the center of the chosen area. Since it is easier to move the Sight Compass than the Aircraft, it is not essential that the Aircraft be precisely positioned on the selected headings. However, the Aircraft should be within 5 degrees of the desired heading for best results. Also, during the actual compensating procedure on North, East, South and West, the alignment should be as close to the exact heading as practical.

6. COMPASS COMPENSATION PROCEDURE

NOTE: All these corrections shall be made using a non-magnetic screwdriver. The Compass shall be lightly tapped after each adjustment and be allowed time to settle before taking readings.

- A. Set the compensator for zero effect by matching the dots on the compensator screws with the fixed dots on the case.
- B. Align the Aircraft as nearly as possible (not to exceed 5 degrees error) to magnetic North (0°).
- C. Turn the N-S screw to cause the Aircraft Compass to read the same as the Sight Compass.
- D. Align the Aircraft as nearly as possible (not to exceed 5 degrees error) to magnetic East (90°).
- E. Turn the E-W screw to cause the Aircraft Compass to read the same as the Sight Compass.

CAUTION: IF THE N-S SCREW IS INADVERTENTLY TURNED, THE NORTH HEADING MUST BE RECHECKED AND COMPENSATED.

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- F. Align the Aircraft as nearly as possible (not to exceed 5 degrees error) to magnetic South (180°).
- G. Turn the N-S screw to remove one-half of the error between the Aircraft Compass and the Sight Compass.
- H. Align the Aircraft as nearly as possible (not to exceed 5 degrees error) to magnetic West (270°).
- I. Turn the E-W screw to remove one-half of the error between the Aircraft Compass and the Sight Compass.

7. COMPASS SWINGING PROCEDURE

- A. Prepare a worksheet similar to the one shown in Table 1 by first making a copy of the blank worksheet as shown in Table 2 then populating it with the data recorded and calculated by accomplishing the steps that follow..
- B. Starting on any convenient 30 degree heading, align the Aircraft so that the Sight Compass reads within 5 degrees of the desired heading.
- C. Record the Aircraft Compass reading in column 2 and the Sight Compass reading in column 3 adjacent to the appropriate heading in column 1.
- D. Repeat steps 7(B) and 7(C) for each subsequent 30 degree heading.
- E. Record the difference between the readings of the Aircraft and Sight Compass readings in column 4.

NOTE: If the Aircraft Compass reads higher than the Sight Compass, the error is positive (+). If the Aircraft Compass is less than the Sight Compass, the error is negative (-).

- F. Add or subtract the Compass errors in column 4, to or from, respectively, the desired headings in column 1. Enter the results in column 5. Refer to Table 1 as a guide to these calculations.
- G. There should not be more than plus or minus 10° difference between any of the aircraft compass readings and the Sight Compass readings. If the aircraft compass cannot be adjusted to meet the requirements, install another one.
- H. Enter the values from column 5 in the “STEER” portion of the Aircraft Compass correction card.

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Table 1 AN EXAMPLE OF A COMPLETED COMPASS CORRECTION WORKSHEET

(Column 1) DESIRED HEADING	(Column 2) AIRCRAFT COMPASS READING	(Column 3) SIGHT COMPASS READING	(Column 4) AIRCRAFT COMPASS ERROR	(Column 5) CORRECTED AIRCRAFT COMPASS
N	356	359	-3	357
030	032	034	-2	028
060	062	063	-1	059
E	088	086	+2	092
120	125	121	+4	124
150	150	148	+2	152
S	177	175	+2	182
210	213	213	0	210
240	245	246	-1	239
W	268	270	-2	268
300	300	297	+3	303
330	333	335	-2	328

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Table 2 COMPASS CORRECTION WORKSHEET

(Column 1) DESIRED HEADING	(Column 2) AIRCRAFT COMPASS READING	(Column 3) SIGHT COMPASS READING	(Column 4) AIRCRAFT COMPASS ERROR	(Column 5) CORRECTED AIRCRAFT COMPASS
N				
030				
060				
E				
120				
150				
S				
210				
240				
W				
300				
330				

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CARE OF THE SIGHT COMPASS

There are no field maintenance procedures for the SC 063 Sight Compass, only care in handling and storage are required.

1. HANDLING

- A. Care should be taken to keep the Sight Compass clean and moisture free. If needed, the front and rear lens should be cleaned using a mild detergent, followed by a clean water rinse, and dried using a soft cloth or facial tissue.

NOTE: DO NOT CLEAN THE SIGHT COMPASS USING CHEMICAL SOLVENTS, AS THEY MAY ATTACK THE PLASTIC PARTS.

- B. Over a period of time, the Sight Compass may develop a bubble in the fluid. If the bubble does not exceed one half inch in diameter (when the Compass is held face up), there will be no adverse effect on the accuracy.
- C. The Sight Compass is a delicate instrument, keep it from or being dropped or knocked.
- D. Should any part be broken, the Sight Compass should be returned to Barfield, Inc. for repair.

2. STORAGE

- A. To store the Sight Compass, select a cool and dry place that is not adjacent to any device which uses high electrical power. The magnetic field generated by this equipment could cause demagnetization of the Compass magnets.
- B. The Sight Compass should be kept in the carrying case when not in use to protect the pivot, jewel, and lenses.
- C. For long time storage, place a bag of desiccant inside the case.
- D. Close and latch the cover of the case.

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RECEIVING AND SHIPPING

1. RECEIVING

No special unpacking procedures are necessary. It is recommended that the factory shipping container and packing materials be retained, for those occasions when the Sight Compass needs to be re-shipped, such as for the annual recertification.

It is also recommended that, upon receipt, the Test Set and its carrying case be carefully inspected for damage. If damaged, immediately notify the carrier and the manufacturer.

2. SHIPPING

Use standard delicate equipment packaging procedures when packing the Test Set for reshipment.

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