

OWNER’S MANUAL
GLOVE RADAR™
MODELS NO. 363



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(illustration)

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Congratulations on purchasing your GLOVE RADAR™. If used and cared-for as described in this Manual, you should enjoy many hours of fun and constructive use.

The Glove Radar™ is a small inexpensive Doppler radar velocity sensor which attaches to a baseball or softball glove to measure the speed of the ball just before it is caught. It is easily attached to, and removed from, virtually any ball glove. Clever design results in a small, versatile low-cost device affordable for youth and senior level teams and individual players.

The purpose of the Glove Radar™ is to assist in developing players' throwing capabilities by providing a measure of velocity improvement which results from using proper throwing techniques. By learning the proper way to condition, train, warm-up and throw, players can achieve their best accuracy and velocity performance, while reducing the risks of injury to their arm and body.

The Glove Radar™ can aid any player--infielders and outfielders, as well as pitchers and catchers, throwing from any distance. Professional and high-level amateur players can use the Glove Radar™ when warming-up. Young ballplayers will benefit from velocity information when tossing or training. Everyone will have fun using it.

Worn by the receiver of the ball, or by multiple tossing partners in non-game situations, the Glove Radar™ "sees" through the glove and responds to the approaching ball just before it reaches the glove. Thus, unlike most "radar speed guns", a long range capability is not required. Powered by a single cell lithium battery, the Glove Radar™ transmission level is well below that of most "wireless" consumer products such as cellular and portable telephones, for example. Transmission characteristics are well within FCC requirements and prescribed safety levels. The Glove Radar™ is microprocessor controlled, like a mini-computer, and indicates calculated miles-per-hour ball speed on a liquid crystal display.

FEATURES

The Glove Radar™ is packaged in a rugged plastic housing assembly, sealed to protect the internal electronics from the dust, dirt and moisture encountered during normal use. However, the unit is not hermetically sealed and is not intended to be immersed in water. Two screws hold the cover in place, which can be removed to replace the internal battery. A rubber pad, molded onto the housing surface adjacent to the glove, absorbs ball impact “shock” forces.

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Measuring speed improvements resulting from applying proper throwing techniques is an important aspect of developing position players as well as pitchers and catchers. However, experienced pitchers, for example, can also profit from the data that can be obtained by comparing the relative speed of their fastball to that of their change-up, breaking ball, knuckler, riser, split finger, etc. or other pitches that they throw. The optimum amount for a pitcher to “take off” their fast ball is different for each pitcher, depending on their fastball speed, their motion and delivery technique, and other variables unique to them. Glove Radar™ can help quantify the relative target speeds for each pitch and provide real time feedback during practice and warm-up.

The Glove radar™ is an excellent training device to provide RELATIVE SPEED READINGS by which throwing improvement and progress can be measured. It is affordable for parents, coaches and players of all ages. Remember, baseball and softball are games to be enjoyed. HAVE FUN WITH YOUR GLOVE RADAR™ !!

*”The Physics of Baseball”, 2nd Edition, Revised, Updated and Enlarged, Harper Perennial, written by Robert Kemp Adair, Sterling Professor of Physics, Yale University, and Physicist to the National League, 1987-1989.

It is of interest to note that the ball speed measured by any radar is that of the **ball velocity vector directly toward the radar**. If the radar is not aligned with the actual flight path of the ball from the thrower to the receiver, the radar speed reading will be reduced by the cosine of the angle by which the radar is displaced from the ball travel path. This difference is insignificant when the radar is located essentially in-line, or near alignment, with the ball flight path. However, if any radar is positioned on the ground, or on a tripod, such that it is appreciably away from the ball flight path, speed measurement inaccuracies can occur.

GLOVE RADAR™ VARIABLES

The broad antenna pattern and unique signal processing of the Glove Radar™ facilitate speed measurements of virtually any ball which is caught in the glove. However, if the glove is held such that the Glove Radar™ is facing downward, looking toward the ground without facing at least somewhat in the direction of the ball, some balls can be “missed” by the radar. No radar gun can see the ball when looking away from the balls’ flight path. Since the Glove Radar™ is measuring and calculating the speed as the ball is approaching the glove, the flight path vector created by any “break” on the ball is inherent in the speed measurement. This feature is unique to the Glove Radar™, unlike that of radar guns reading the ball velocity at a greater distance from the catcher, before the break.

Doppler radar speed measurements indicate the relative closing, or departure, velocity between the object being illuminated by the radar and the radar itself. If, in the act of catching the ball, the glove is moved vigorously toward the ball, a slightly higher speed reading can occur. If the receiver “gives” with the ball, moving the glove away as the ball is caught, then a slightly lower velocity can be indicated. The normal movements in catching most balls are not a serious factor

in measurement accuracy, but lunging for wild throws, and scooping-up low throws near or hitting the ground can produce anomalous speed readings. As you use your Glove Radar™, you will become acquainted with its' "personality", recognizing good readings and ignoring anomalies. Don't be misled by an unusually high reading as an indication of sudden improvement, or a low reading as a loss of strength or technique. Averaging several readings, and/or discarding the high and low extremes is a good technique for assessing progress.

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The internal electronics are in the "sleep" mode until activated by depressing the push-button "on" switch. This action applies electrical power from the battery to the Doppler radar transmitter. The liquid crystal *km/hr* display will indicate the last velocity reading. Depressing the push-button again will cause the display to show a flashing "00", indicating that the Glove Radar™ is transmitting.

Upon receipt of a velocity signal produced by a ball about to be caught in the glove, the ball speed is calculated and shown on the display in *kilometers-per-hour*. Receipt of a velocity signal turns-off the radar transmitter until the "on" switch is depressed. If a velocity signal is not received within twenty seconds after depressing the push-button "on" switch, electrical power is automatically removed from the radar transmitter until the switch button is again depressed. Limiting the "on" time of the radar transmitter conserves battery power in order to maximize battery life. The last velocity reading continues to be displayed. However, after prolonged inactivity (about one minute) battery power is also removed from the display and the electronics go into the "sleep" mode.

GLOVE ATTACHMENT REFERENCE

Instructions for attaching the Glove Radar™ to any ball glove/mitt are described later in this Manual. The prescribed attachment techniques have been developed to assure safe, reliable operation of the Glove Radar™ while experiencing the significant impact forces created when catching balls thrown at very high velocities.

USING THE GLOVE RADAR™

1. Attach the Glove Radar™ to the glove, as explained in the GLOVE ATTACHMENT instructions.

2. Press the push button “on” switch (denoted by the Glove Radar™ logo) to energize the Doppler radar transmitter. The *km/hr* display will show the last reading.

3. Press the push button “on” switch a second time. Two flashing zeros indicate that the radar is transmitting. The Glove Radar™ is now ready for measuring the velocity of a ball being caught.

4. After the ball is caught, observe the *km/hr* display to read the ball speed.

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5. Before returning the ball back to the thrower, reset the radar transmitter by depressing the push button “on” switch. This sequence is recommended to avoid the situation where the person catching the ball will not be concentrating on the next throw, when the thrower is preparing to throw. (The push button “on” switch is large and conveniently located such that it can be found and depressed without actually looking at it.)

6. If the next throw does not occur within twenty seconds, the power saving timer will turn off the radar transmitter. Therefore, when preparing to receive the next throw, again depress the push button “on” switch. Flashing zeros on the *km/hr* display indicate that the radar is transmitting and ready to record the ball speed.

7. When speed-measuring throwing activities have been concluded, and the Glove Radar™ is dormant for about one minute, it will automatically switch into the “sleep” mode, which conserves battery power. The display will then be blank until the sequence in 2. above is resumed.

THROWING PREPARATIONS

Taking care of your arm and body and learning proper techniques are vital to achieving success in throwing/pitching. Consult your coach, trainer, doctor or parent for guidance. The following steps are strongly recommended:

1. Undertake a conditioning program to get your arm and body in shape for baseball/softball.

2. Before throwing, stretch and warm-up your arm and body.
3. Begin throwing at slow speeds and over short distances. Gradually extend the distance and increase the speed. The Glove Radar™ can help monitor this process.
4. Be sure you know and practice the proper throwing/pitching techniques. By throwing correctly, you will be able to achieve your best velocity and hit your target, while reducing the likelihood of injuring your arm or body. As you learn and master the proper techniques, you will see improvements in your performance. The Glove Radar™ will provide the measurements by which velocity performance improvements can be readily seen. This reinforcement creates player enthusiasm for seeking improvement by applying proper throwing/pitching techniques.
5. If you experience pain while throwing/pitching, or afterward, consult your doctor, trainer, coach or parent immediately. Do not ignore pain!!

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Some “Radar Speed guns” measure the speed of the ball after it has travelled 6.1-7.6 meters from the thrower. Anomalous readings due to the pitcher’s motion are less likely, and the signal processing of numerous “Doppler cycles” can result in an accurate measurement less influenced by false target “ghosts”. However, the travel distance after ball release results in a speed reading about 4.8 km/hr less than that of the guns which measure ball release speed. Thus, these devices are often referred to as “slow guns”, and their speed readings are closer to the average speed of the ball travelling between the pitcher and the batter.

The Glove Radar™ works on the same Doppler principles as the conventional “Radar Speed Guns” but transmits much less power, due to its’ smaller single-cell battery power supply. It also has a much broader antenna pattern to accommodate use with the variety of glove sizes and configurations to which it is designed to be attached. Thus, the Glove Radar™ illuminates the approaching ball with a much lower “microwave energy density” than the larger, more expensive guns.

The speed of the approaching ball is measured by the Glove Radar™ within a few feet of receipt of the ball into the glove to which it is attached. This is the ball velocity as it essentially reaches the batter, after slowing-down at approximately 1.6 km/hr per 2.1 meters of travel. At the 18.4 meters baseball pitching distance, the resulting velocity measurement will be about 12.9 km/hr lower than the “fast guns” and about 8 km/hr lower than the “slow guns”. For a youth pitching distance of 14 meters,

The GLOVE RADAR™ complies with current standards established for safety levels of human exposure to radio frequency energy, including the requirements of C95.1-1992.2 defined by the American National Standards Institute (ANSI) and the Institute of Electrical and Electronics Engineers (IEEE); those of the Canadian Department of Health and Welfare, Safety Code 6, *and comparable Japanese standards.*

Use of the GLOVE RADAR™, or any other radiating device, may create problems when in close proximity to electronic medical devices, such as heart monitoring equipment or pacemakers/regulators. Avoid such use.

CARE OF YOUR GLOVE RADAR™

The GLOVE RADAR™ is a unique electronics product intended for training, practice and tossing situations, not for game use. Although the rugged design will withstand the rigors of normal use, it should be protected from direct ball impacts, and should not be dropped, thrown, hit with a bat or other objects, and should not be immersed in water or other liquids. Do not use or leave outdoors during inclement weather. Store the Glove Radar™ in typical in-house environments, avoiding excessive temperature extremes, humidity, dust and dirt. The plastic assembly housing of the Glove Radar™ is sealed and not intended to be taken apart except for battery replacement. Remove the Battery if the unit will not be used for extended periods. The GLOVE RADAR™ can be cleaned with a slightly dampened, soft cloth. Do not use alcohol, solvents, or chemical cleaners which can cause permanent damage.

Replace the Battery when low power is indicated, as discussed in the following section.

With proper care, The GLOVE RADAR™ will provide many hours of service and fun for the users.

PROBLEMS/TROUBLESHOOTING

The GLOVE RADAR™ is designed to provide trouble-free performance when used properly, and given proper care.

Battery replacement is the primary corrective action that can be taken by the user. Symptoms of a low or dead Battery are:

- No flashing display after the radar “on” button is pushed;

No display or an erratic display.
Other abnormal operating characteristics can be caused by a weak battery or loose Battery contacts (see next paragraph).

BATTERY REPLACEMENT

Replace the Battery by removing the two screws which hold the Cover in place, exposing the Battery. Remove the Battery and replace it with a new one, being careful to insert the new Battery with the negative terminal toward the spring in the center of the contact nest, and the positive terminal (case) protruding outward toward the Cover which has been removed. Carefully place the Battery into the contact nest, being sure that the three upright contacts are snug against the Battery case. (Loose Battery contacts can cause intermittent electrical connection, indicated by a "188" reading on the LCD Display.) Engage the two tabs on the Cover with the slots in the Housing, and pivot the Cover down over the Battery, which is positioned in the contacts nest. Replace the two screws that hold the Cover in place. Tighten the screws snugly, but do not over-tighten. Depress the radar "on" button and perform the operating sequence described in the section of this manual entitled USING THE GLOVE RADAR™.

REPLACEMENT PARTS

Batteries can be purchased at many stores which sell camera supplies or similar electronic devices. Batteries can also be ordered from Sports Sensors, Inc. by mail, telephone, FAX, or via our Web Site ordering form.

ATTACHMENT OF THE GLOVE RADAR™ TO ANY GLOVE

The Glove Radar™ is attached to any ball glove, large or small, baseball or softball, by a strong, weather-resistant nylon cord. The cord is inserted through the three Glove radar™ eyelets, carefully routed, secured around selected glove features, such as the leather lacing and/or the wrist strap, and tied in place. This attachment technique is compatible with the

designs and dimensions of virtually any conventional ball glove or mitt commonly in use. The strong nylon cord, and attachment of the Glove Radar™ on the back of the glove finger area, provide safe, reliable performance even after encountering the severe impact forces created by high velocity ball impacts (ball speeds greater than 145 *km/hr*). Design of the Glove Radar™, and its attachment system, to withstand the maximum likely thrown ball velocities assures considerable margin for most users who are involved with much lower ball speeds. For small gloves (less than 254 *mm* patterns), and for ball velocities less than 80 *km/hr*, the Glove Radar™ may be attached behind the glove web, if necessary. However, the finger area is recommended for attachment whenever possible, and must be used for ball speeds over 80 *km/hr*. One step-by-step attachment technique is described as follows:

1. Insert each end of the cord down through the top two eyelets and pull upward such that the cord ends are about even in length.
2. Place the Glove Radar™ behind the glove fingers, about one to three inches below the glove finger tips. (See TIP below.) Pull each end of the cord up toward the glove finger tips. Wrap the cord ends around the glove lacing between the glove fingers, with one cord end around the lacing between the first and second fingers, and the other cord end around the lacing between the third and fourth glove fingers.

8. The three things that make a good ballplayer are:
--PRACTICE
--PRACTICE,
--and PRACTICE!!

SPECIFICATIONS

The specifications of the Glove Radar™ are summarized as:

Size: Triangular , 63.5 mm w; 88.9 mm lg; 30.175 mm th.
Weight: 85 gm
Display Type: 2 1/2 Segment LCD
Speed Units: *kilometers-per-hour*
Speed Range: 32.2-193 km/hr
Accuracy: Within 1.609 km/hr of typical sports radar speed guns at comparable receiving positions
Battery: 3 Volt, 160 mAh, Lithium
CR-1/3N, DL-1/3N, 2L76BP
Battery Operating Life: Approx. 30 Hours of continuous use; over 5000 transmission cycles (5000 speed measurements)
Operating Temperature: 4.4-43 degrees C
Storage Temperature: 0-48.9 degrees C
U.S. Patent 5,864,061
Patent pending in Canada and Japan

7. Place the two free cord ends within the band loop, sliding the band to the proper place to encircle the cord bundle. Long loose ends can be tucked between the Glove Radar™ and the glove. The Glove Radar™ is now ready for use.
8. The lower cord attachment can also be made by wrapping the lace around the wrist strap of a small glove.

respective
eyelets.

- 4 Route each cord adjacent to the Glove Radar™ cover and down through the bottom eyelet. Pull out the slack in the cord. Slip the two cord ends into the small rubber band and slide the band up toward the lower eyelet.
- 5 Wrap one cord end (the longer one, if different lengths) around a lower glove lace, or other glove feature that the cord can securely wrap around.
- 6 Adjust the cord for a snug fit around the Glove Radar™, removing slack. Pull and tie the two cord ends together into a tight knot, locating the knot near the bottom where the cord is attached to the glove.

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EMISSION AND SAFETY STANDARDS

The GLOVE RADAR™ has been tested and certified to meet requirements established by the Federal Communications Commission. The FCC ID is NVE 360. "This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that might cause undesired operation." *Industry Canada has assigned Technical Acceptance Certificate No. 35431021769 to Sports Sensors, Inc. for the Glove Radar™. Japan has assigned -----*

9. If the glove does not have fingers, such as a catcher's mitt or first baseman's glove, use the top edge lacing for the top two cord attachments. Slip the cord tip under the lacing and wrap the cord around the lace for a secure attachment.
10. The Glove Radar™ can also be attached behind the thumb of a catcher's mitt.

TIP—Be sure to keep the Glove Radar™ attached snugly to the glove. If it becomes loose, untie the knot, pull out the cord slack, and re-tie the knot.

TIP—The top of the Glove Radar™ should be positioned within about one to three inches below the glove fingertips. If the ends of the cord are too long, take up the extra length by attaching to a glove lower glove feature, or locating the Glove Radar™ lower from the glove finger tips. Move it closer to the tips if more cord length is needed.

and slower ball speeds, the difference between the “fast guns” and the Glove Radar™ readings will be about 8.8 km/hr . A softball pitched from $12.2\text{-}13.1 \text{ meters}$ will be about 8 km/hr lower at the catcher, depending upon the variables cited above.

The accuracy of the Glove Radar™ compares closely with that of the more expensive radar guns when positioned to measure ball speed in the same location. Comparisons can be made by facing the nearby ball receiver who is wearing the glove-attached Glove Radar™ and pointing the radar gun toward the receiving glove. The distance from the receiver of the ball should be the minimum practical at which the radar gun will measure the ball speed.

VARIABLES OF BALL SPEED RADAR MEASUREMENTS

BALL SPEED SLOW-DOWN

When a ball leaves the throwers hand, it is travelling at its' maximum velocity. Air resistance (drag) causes the ball to decrease in velocity as it travels away from the thrower. The rate at which the ball slows-down is dependent upon many factors. Robert K. Adair, Sterling Professor of Physics, Yale University, describes in great detail the flight of a thrown (and batted) baseball in his outstanding book, “The Physics of Baseball”*. Written for the layperson, but appropriately supported by theory, the book summarizes the Professor’s conclusion (page 33) that **a typical (Major League) fastball slows-down at a rate of about 1.6 kilometers per hour for every 2.13 meters of travel. Thus, a ball thrown by a pitcher will reach home plate, 18.4 meters away, at a speed about 13 kilometers per hour slower than when it left the pitcher’s hand.** Many variables which affect the air resistance “drag” on the ball, and associated air turbulence, enter into this conclusion, including air density, temperature, altitude, barometric pressure, wind velocity and direction, etc.; as well as the ball cross-section area, surface roughness, stitch height and stitch orientation relative to ball spin axis; and ball velocity. However, for the purposes of this discussion, and the applicability to using ball speed measuring devices, it is

WARRANTY & SERVICE

What is covered?--This limited warranty covers all defects in workmanship or materials in your Glove Radar™ that is purchased either directly from Sports Sensors, Inc. or from an authorized reseller. This warranty applies only to defects that occur while your Glove Radar™ is being used in the normal manner described herein. This warranty does not apply to any defects that are caused by misuse, abuse, neglect or improper storage, handling or maintenance, or any modifications or re-pairs performed by anyone other than Sports Sensors, Inc. Except as expressly stated in this warranty, Sports Sensors Inc. makes no implied warranties, whether of merchantability or fitness for a particular purpose or use or otherwise with respect to Glove Radar™, for more than *six months* from the date of purchase.

How long is the coverage period?--This limited warranty runs *for six months* from the date that you buy the Glove Radar™, as shown on your completed and returned Purchase Registration Card.

What will Sports Sensors Inc. do?--If your Glove Radar™ fails during the warranty period and you return it before the end of this period, Sports Sensors Inc. will, at its discretion, and at no additional charge, repair or replace the defective unit. In no event shall Sports Sensors Inc. be liable for, or pay, any indirect, special, incidental or consequential damages in connection with your Glove Radar™.

How can you get service?--You must send the Glove Radar™, appropriately protected and packaged, shipping charges prepaid, to Sports Sensors, Inc., c/o Electronics Development Corp., 9055F Guilford Rd., Columbia, MD 21046. Evidence of date and place of purchase, such as a copy of your sales receipt or other "proof of purchase", must accompany the returned unit. Please describe the nature of the problem or reason for return.

How does state law apply?--This warranty gives you specific legal rights which vary from state to state. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty is governed by the State of Ohio, *USA*.

For technical support or service information, call, toll-free:

(800) 394-6650. For ordering information, or other non-technical questions, call toll-free: (800) 589-3805. Visit our Web Site for the latest information about the Glove Radar™ or other new products at: www.gloveradar.com

HAVE FUN WITH YOUR GLOVE RADAR™