

INSTRUCTIONS FOR DT100

Pitching booth speed measuring detector

GENERAL

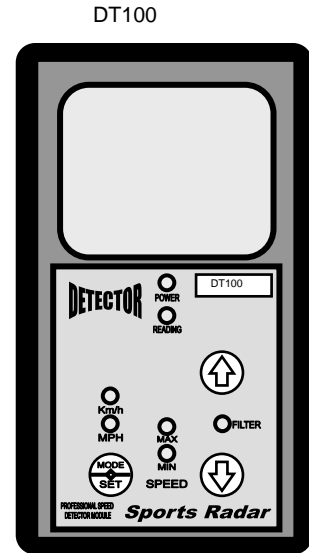
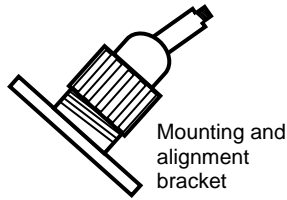
The DT100 is a Doppler radar unit that registers speeds and communicates this speed to a speed display or other connected device. Power is supplied via the permanently connected DATA/POWER cable, and requires a display option, or other device to provide power and display the communicated speed.

The DT100 is designed for mounting BEHIND, a receiving net to record the speed of the target moving into the net. Specifically designed for pitching or kicking booths: The advantage of the DT100 is that adjacent pitching booths (at least 8 feet away) will not give false readings. In addition, the DT100 is highly immune to noise sources such as motors and fans that are typically used for inflatable booths.

NOTE: The DT100 does not “DISPLAY SPEEDS”, it acquires speeds and sends the speed data to devices such as our LED or LCD displays, or a PC using our optional software.

FEATURES of the DT100 Speed Detector.

1. Speeds range from 25 to 175 MPH (40 to 240 Km/h)
2. Selectable Display units in MPH or Km/h
3. Range 8 feet typical
4. Programmable noise filter
5. Programmable MIN and MAX speed limit settings
6. Serial communications, 1200 baud
7. On board speed storage (EEPROM)
8. Power and Data to the display in one cable
9. Weather resistant



INSTALLATION:

The DT100 should be positioned behind the receiving net from 1 to 6 feet away. It is important to keep the DT100 in-line with the target line of travel to reduce the COSINE* error and assure optimum accuracy. Figure 1 and 2 show the typical mounting positions for pitching booths.

*See section 3 a technical discussion about the COSINE error.

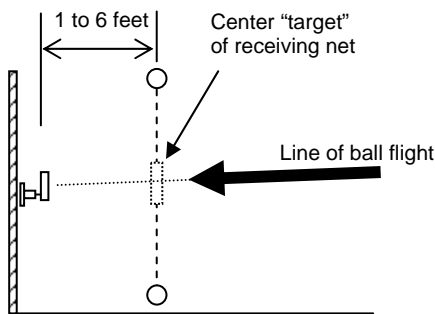


FIGURE 1: For a solid or chain link back wall, mount the DT100 on the net side of the wall

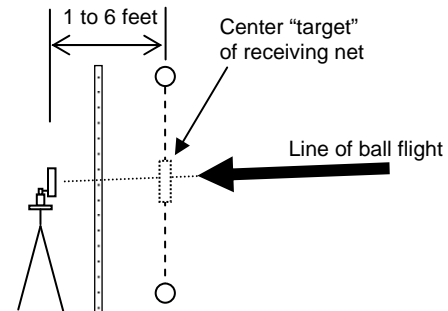
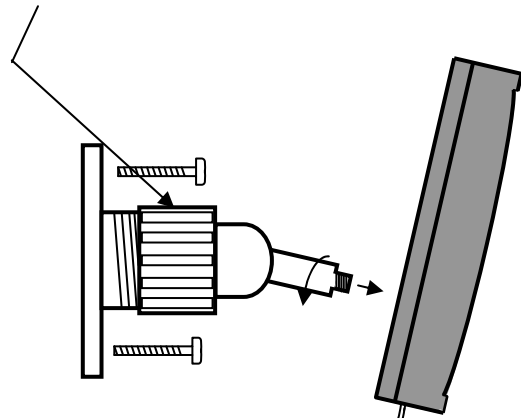


FIGURE 2 For an inflatable, or vinyl back wall, the DT100 can be mounted on the outside.

MOUNTING THE DT100:

1. Mount the bracket base at the desired location(s) using the appropriate hardware:
 - a. For mounting to a masonry or wooden structure drill two 5/32 holes and secure bracket base with the screws provided.
 - b. For mounting to a metal fence, post or bar, use tie wraps. Secure 2 tie wraps per hole and attach as required based on the installation.
2. Mount the DT100 to the mounting bracket as shown. Note the DT100 has a standard tripod mounting nut, and can be directly mounted to a standard camera tripod.

Loosen this nut, and screw in the post to the DT100, align the face, and tighten the nut.



DISPLAY and POWER OPTIONS

The DT100 gets power through the single POWER/DATA cable. Therefore the connected display (or device) must be capable of supplying the proper power requirements through this cable. **DO NOT CONNECT THIS CABLE** directly to a PC or other terminal equipment, damage to the Detector and/or the connected equipment can occur.

Sports Radar's line of displays provide this power requirement. Visit www.sportsradargun.com for details on displays and products outlined below for the DT100.

For a PC connected application Sports Radar offers a special adapter to provide power to the DT100 and a Windows based PC program that can display speeds from DT100 and offers [various other options for recording and displaying speeds](#).

Three digit LED displays:

DL 834 display

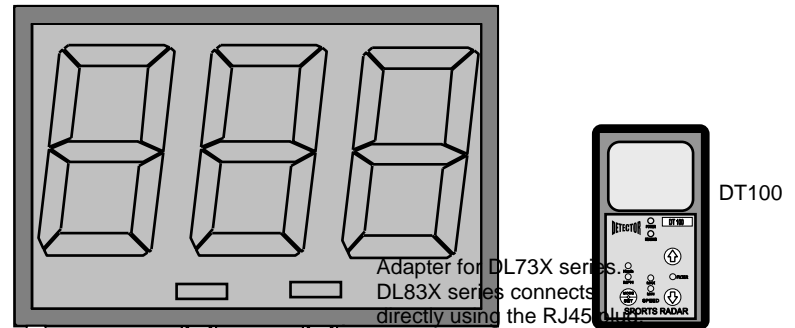
DL834, 8" tall ultra bright LED displays:

These displays offer visibility upto 350 feet away, and have an unsurpassed viewing angle. The DL834 will display the speed registered from 4 DT100s.

An indicator bar lights indicating which DT100 recorded the highest speed.

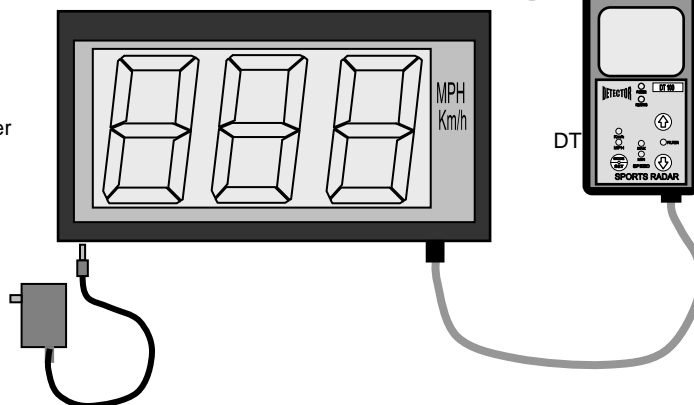
The DL834 is great for head-to-head fast pitch competition in adjacent pitching booths.

12VDC power supply



DL431

9VDC power supply



DL431

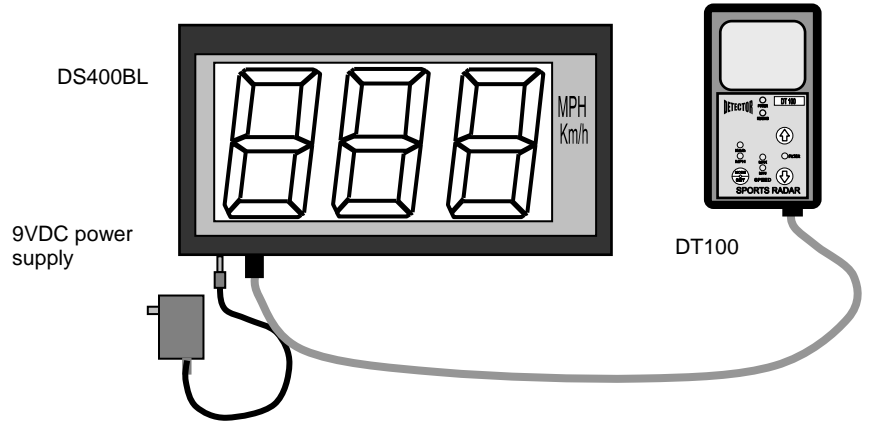
Three 4" tall high bright LED display
The DL431 is visible over 150 feet away and has a great viewing angle. The DL431 connects directly to the DT100 and displays speeds and units (MPH or Km/h).

Three digit LCD Displays

DS400BL: 4" tall Low power LCD displays.

These displays are visible over 100 feet away, include MPH or Km/H indicators and directly connect to a DT100.

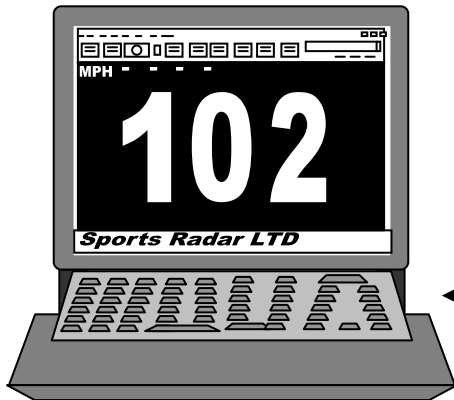
The DS400BL includes backlighting and provides good visibility in any lighting, day or night.



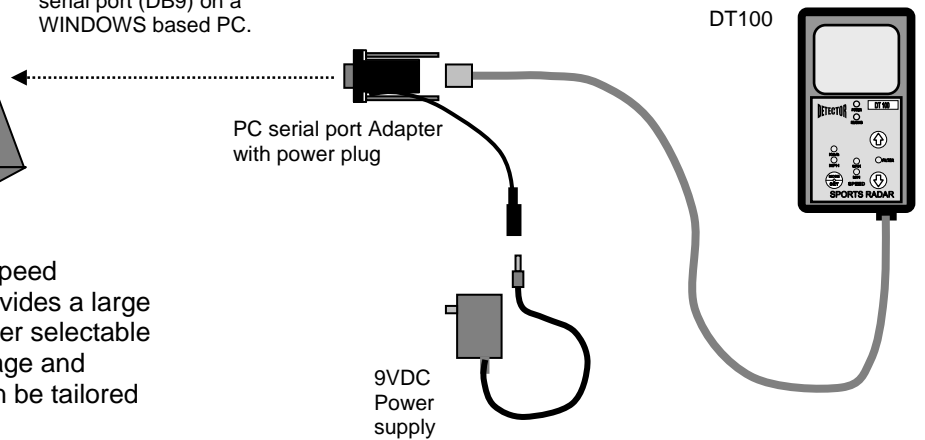
PC applications

Connect the DT100 to a PC using a special adapter with power pigtail and 9VDC power supply.

The adapter comes with a software CD that can display the speeds in large screen digits, record and store speeds for individual players, date and time stamp speeds, alarm on set speeds, and more.



Connects to an open serial port (DB9) on a WINDOWS based PC.



Sports Radar's WINDOWS based speed acquisition and display program provides a large readout of the speed, alarm on a user selectable speed, individual player speed storage and statistics and other features that can be tailored to your specific application. Visit www.sportsradargun.com for additional details.

Power / Data cable for the DT100.

The DT100 has a permanently attached Power / Data cable with an RJ45 plug. This is a dedicated plug and should only be connected to equipment using the proper adapter. DO NOT CONNECT THIS DIRECTLY TO A PC, other equipment or network connection, damage to the Radar unit and / or the connected equipment can occur. The Data / Power cable should be routed and secured at each 5 foot length so as to avoid stress on the cable.

Extender cables, in 25 and 50 foot lengths are available from Sports Radar.

Operating instructions

Once the installation is complete and the DT100 is connected to a display or PC and a power supply is attached, the following will occur:

1. The display will count down from 999 to 000. Verify all digits are operating properly.
2. The POWER (Green) LED on the DT100 unit turns on, then after about 3 seconds all LED indicators blink on and off and the READING (red) LED will turn on. The DT100 is now ready to take readings

Test the installation by striking the tuning fork, and holding it in front of the DT100. The connected display should blank then show 65MPH.

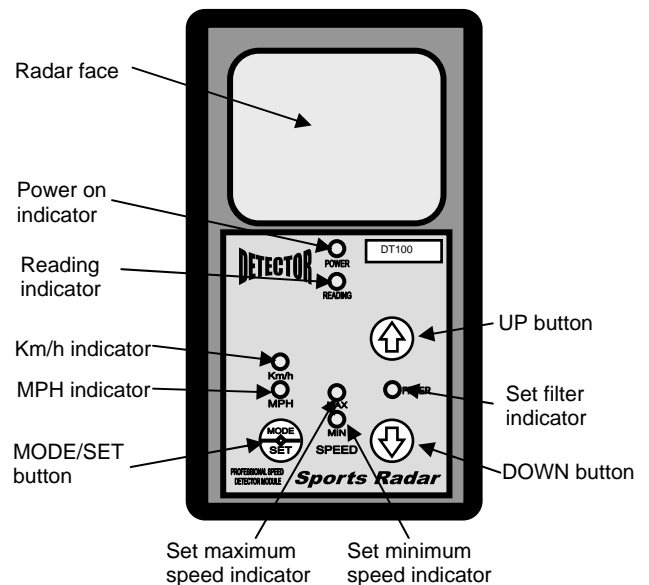
There is a delay between readings of about 3 seconds and the RED LED will turn off during this delay when a reading is recorded and then turn back on after this 3 second delay. When the READING LED is on, the DT100 is ready to take a reading.

The DT100 is factory set for optimal performance in most applications, however there are features that allow the DT100 to be customized for the specific application being used.

On the front of the radar unit there are three buttons MODE/SET, UP arrow, and DOWN arrow.

MODE Function of the MODE/SET button:

1. **MPH or Km/h selection:** Pressing the MODE/SET button changes the speed units, either MPH or Km/h. The speed units are indicated by the indicator light above the units.
2. **Minimum and Maximum speed limits:** Press and hold the MODE/SET button for about 3 seconds until the MIN (red light) turns on. Then the minimum speed limit can be adjusted up or down using the up and down buttons. When the desired minimum speed is set, press MODE/SET again, and the SET MAX (red light) turns on, and you can set the maximum speed using the up and down buttons. When the desired maximum speed limit is set, press MODE/SET and the radar is ready to read, and will only register speeds that are within the MIN and MAX speed limits set.



FILTER:

The FILTER is a method to increase the immunity to unwanted readings, and is useful to reduce unwanted readings from adjacent court play, or troublesome noise sources near the radar unit. Increasing the FILTER (the up button) filters out these unwanted readings. Decreasing the FILTER (the down button) gives the radar unit more range, or the ability to register the speed of a target farther away, but also makes the radar unit more susceptible to undesired readings.

To increase or decrease the filter, press the UP or DOWN button (without first pressing the MODE/SET button), the red FILTER indicator light turns on, and the filter can be adjusted up or down as required. When the desired filter number is displayed, press the MODE/SET button.

The FILTER is factory set for typical installations; however, the specific installation may require some adjustments to the FILTER number. The filter number should not be set less than 8 or more than 50.

SPEED storage: The DT100 stores up to 1000 speeds recorded in memory. These speeds can be downloaded to a PC using the Sports radar acquisition and display program.

Resetting to FACTORY settings:

The Radar unit can be reset to initial factory settings by holding the MODE/SET button down when power is applied.

The factory settings are:

- Minimum speed = 25MPH (40Km/h)
- Maximum speed = 175MPH (282Km/h)
- Filter = 8
- MPH on
- All stored speeds are cleared on factory set.

SECTION 3,

COSINE ERROR

The COSINE error affects all Doppler radar speed measuring devices. When the COSINE of the angle is zero, the Doppler “sees” the target at 100% of its real speed. When the angle between two lines (defined below) is greater than zero, the Doppler radar device “sees” the speed LESS than the actual target speed. Two lines make up the COSINE angle (reference figure 3-1) and are defined as:

1. The line of the radar unit to target when it registers a speed
2. The line of target travel

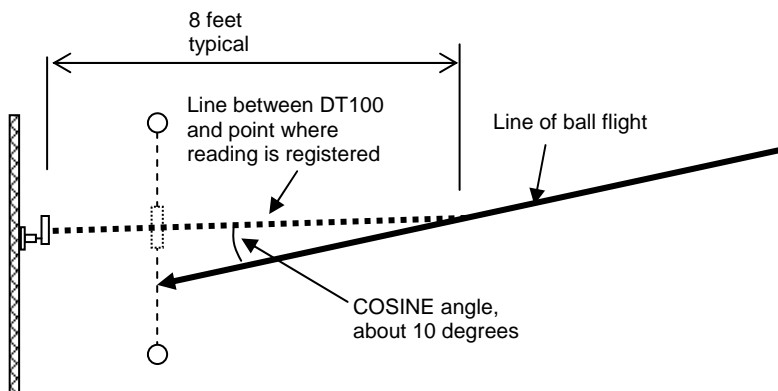
For purposes of the effect on Doppler radar units this is called the COSINE angle. The COSINE factor, is a percentage of the actual target speed and is based on the COSINE angle. The COSINE angle and the COSINE factor are not linear, that is to say that if the angle changes by 10%, the factor will NOT change by 10%. Table 3-1 gives examples of COSINE angles and factors.

In real applications, such as measuring the speed a baseball pitch into a net, there are an infinite number of angles during the time the radar unit is measuring the speed (time taken when the ball is released and stops in the net). This is inherent because the ball flight is never straight, it always has some “arc” to it. For practical purposes, this arc is minimal during the time the speed is being calculated, and is beyond the scope of discussion. Another, somewhat insignificant fact is that once the ball leaves the hand it is decelerating due to the friction of air, which is also ignored for this discussion.

For optimum accuracy to eliminate the COSINE error, if a line were drawn extending the line of flight of the ball and the DT100 was positioned on this line (a collision course) the speed measurement would be accurate to the accuracy of the processing device. Any position of the radar unit off this “collision course” makes a COSINE angle, and results in a registered speed that is less than the actual target speed. The actual reduction in calculated speed based on the COSINE angle is called the COSINE factor, examples of which are given in table 3-1.

TABLE 3-1, Cosine angles and factors

ANGLE	COSINE Factor	ANGLE	COSINE Factor
0 deg	1.000	8 deg	0.990
2 deg	0.999	10 deg	0.985
4 deg	0.997	12 deg	0.978
6 deg	0.994	14 deg	0.970



In this case, the COSINE angle is about 10 degrees: The resulting COSINE error is 0.985. The registered speed would be 0.98 x actual ball speed. So an actual ball speed of 100MPH would register at 98MPH.

In a pitching booth, the COSINE factor can be a useful tool to “maximize” a registered speed value when the pitch is in the center of the receiving net target, and if the pitch is off center, it will be registered at a slower speed. This would make “accuracy of the pitch” (hit the center of the net) an important factor to realize the maximum displayed speed.

CALIBRATION: The radar units are factory calibrated when shipped, and are assured within specifications for 1 year of ship date. If the facility requires radar units to be calibrated at specific intervals for competitive events, Sports Radar offers a calibration service: The DT100 can be returned for calibration for \$75 each plus shipping costs.

TROUBLE SHOOTING:

1. Radar unit will not register a speed: First, reset the system by removing power from the display for 10 seconds, then re-applying power.
 - a. On the radar unit, the POWER indicator (green LED) should be lit. If not, verify power is connected to the display (the radar units get power from the Power/Data cable from the display) If the display is active (counts down upon power up) then power is connected properly, at least to the display. If not, check the outlet where the power supply is connected for proper 110VAC (standard household power). If the display operates (counts down) then check that the cable connections and adapter (if used) are securely connected. If the Green POWER LED is not lit, then there is most likely a connection problem with the power data cable. If connecting to a PC, make sure the power supply is connected to the adapter, and is plugged into to an operating outlet.
 - b. Verify the READING (Red LED) is on. If not on, make sure the MIN, MAX and FILTER indicator LED's are off. If any of these are on, press the MODE/SET button, until all these indicators are off and the MPH and Km/H indicators toggle each time the MODE/SET is pressed. If the reading indicator does not turn on after a few seconds, the Radar unit may be defective.
 - c. Verify the MIN and MAX speed limits are set within the speed you are reading. To check this, press and hold the MODE/SET button until the MIN speed light comes on, the current minimum speed limit is shown in the display. Press the MODE/SET button again, and the MAX speed limit is displayed. Press the MODE/SET button again to exit the set speed limits mode.
 - d. Verify the operation with a tuning fork. If the POWER indicator, and the READING indicator are both on (MIN and MAX and FILTER indicators are off) strike the tuning fork to make it ring, and hold it a few inches in front of the unit. If the Reading indicator goes off, but the display still does not register a speed, this indicates the radar unit is operating properly, and the problem may be in the cable, cable connection, adapter, or possibly in the display. Check the connection pins on the cables for corrosion, clean or replace as necessary. If no input configuration operates with multiple radar units, then the Display input(s) may be defective, and will need factory service.
2. Radar works with a tuning fork, but will not read a pitch speed. If all items in 1 above are OK check the following:
 - a. Verify the FILTER setting is not too high. With the POWER and READING indicators on (and MIN and MAX and FILTER indicators are off) Press the DOWN button, the FILTER indicator turns on, and the display shows the filter number. Adjust this to 8 using the UP and DOWN buttons, then press MODE/SET button. This low of a filter setting may give false readings, but it provides for maximum range. The maximum range of the radar unit is typically 8 feet, so make sure the distance from the radar unit to the net line is less than 6 feet.
 - b. If step a above allows the radar unit to read the ball speed, it is recommended that the filter number be increased to the point where it will not read the speed (MAX number, then adjusted back down, ½ way between 8 and the MAX number.
 - c. If step a above makes the radar unit continuously false read, press the UP button, then the MODE/SET button, repeating this until the false readings stop. Verify the radar unit reads the intended target (pitch a ball). If the speed cannot be registered, then there is a noise source too close to the radar unit. The noise source must be shielded or moved, or the radar unit must be positioned CLOSER to the net.

One Year Warranty

This product is warranted to be free of manufacturing defects for a 1-year period from the original consumer date of purchase. The warranty does not include damage to the product resulting from accident, misuse, improper installation, operation, or unauthorized repair or alteration. Opening the product case will void this warranty. If the product should become defective within the warranty period, Sports Radar Ltd., will repair or replace it at our option, free of charge. You must fill out and return the enclosed registration form to ensure warranty coverage failure to fill out registration form may void warranty. To obtain warranty service, first contact Sports Radar's warranty repair department 352-563-5298, then upon approval, send the unit at purchaser's cost to:

Sports Radar, Ltd., 9119 W. Veterans Dr., Homosassa, FL 34448

Return shipping to purchaser will be at Sports Radar Ltd.'s cost inside the 48 continental United States, international shipping is the sole responsibility of the purchaser.

The consumer's sole remedy shall be such repair or replacement as is expressly provided above, and we shall in no event be liable for any incidental or consequential damages arising out of the use or inability to use this product for any purpose whatsoever. 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 gives you specific rights. You may also have other rights, which vary, from state to state. Manufactured by Sports Radar, Ltd. in the U.S.A.