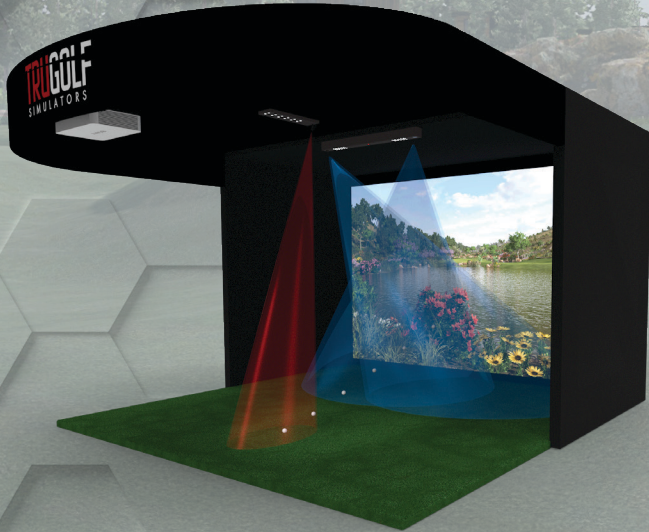




TRUGOLF

SIMULATORS



TRUFLIGHT 2

MANUAL

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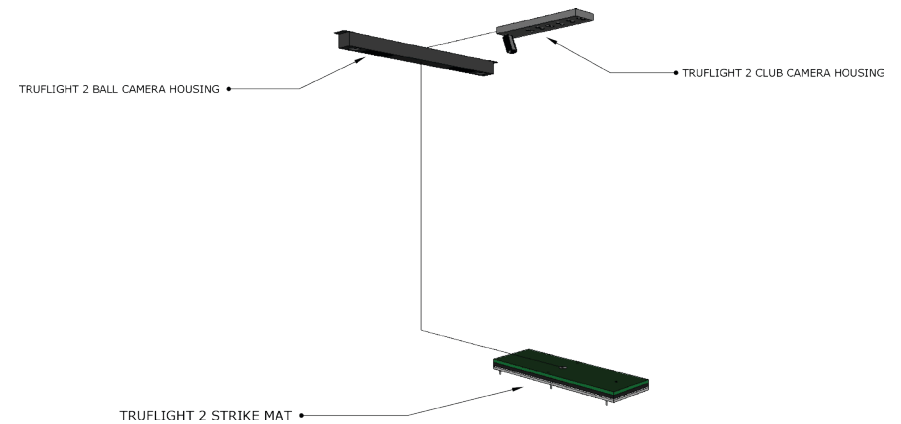
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TRUFLIGHT2™: HOW IT WORKS

The TruFlight 2 high-speed camera tracking system utilizes three cameras simultaneously to capture Club and Ball data: one Club Camera, which captures Clubhead Speed, Face Angle, Swing Path, Ball Direction and Ball Speed, and two Ball Cameras, which capture Launch Angle.

Together, the TruFlight 2 cameras combine to provide extremely accurate shot data, whether you're hitting a drive, an iron, a chip or a putt.



TRUFLIGHT 2™ COMPONENTS

WHAT COMES IN THE TRUFLIGHT 2 BOX

1. Club Head Camera Housing
2. Ball Camera Housing
3. 35"x12" (89cm x 30.5cm) Replaceable Hitting Surface
4. 33' USB 3.0 Fiber Optic Cable (10m length)
5. 6' USB 3.0 Extension Cable A-B (2m length)
6. 6' 2 Pin Molex Cable (2m length)
7. 2-33' USB 2.0 Cables (10m length)
8. 3' Computer Power Cable
9. TruFlight 2 Calibration Grid
10. Reflective Club Stickers
11. Replacement Fuses
12. Mount
13. Mounting Screws

CONTACT CUSTOMER SUPPORT

Monday-Friday

9:00 am-5:00pm MST

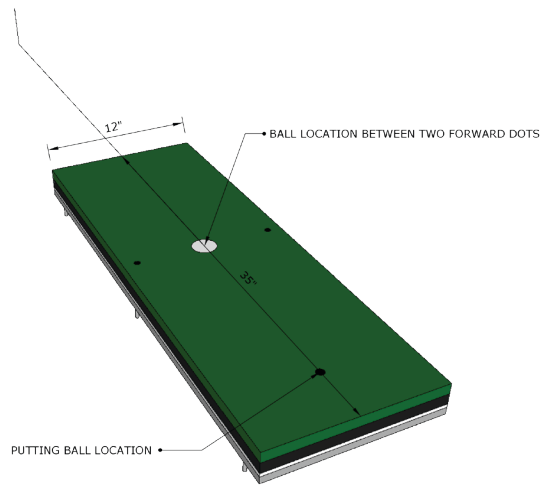
Toll Free: 877-711-6691

Direct Line: 801-677-1123

<https://trugolf.com/support>

BALL PLACEMENT

IMPORTANT! WHEN USING THE TRUFLIGHT 2 CAMERA SYSTEM, THE BALL IS PLACED IN THE TEE POSITION WHEN HITTING A FULL SHOT; WHEN PUTTING, THE BALL MUST BE PLACED BEHIND THE TEE POSITION AS SHOWN. IF BALL IS NOT PLACED IN THE CORRECT POSITION, SHOTS WILL FAIL TO REGISTER CORRECTLY.



INSTALLATION

Before installing, you must have:

- A computer with three open USB ports on the motherboard
 - » Intel i7 4 Core Processor
 - » 16 GB RAM
 - » 2-USB 2.0 and 1-USB 3.0
- Turf floor covering: Required: **PL307 Forrest Green Turf**
 - » If other, please contact your sales rep at TruGolf
- Ladder
- Measuring Tape
- A drill w/screw bits
- Precision Phillips screwdriver
- A plumb bob or laser level (laser level preferred)
- Masking tape
- Level
- A golf ball
- Golf Clubs (Wood, Iron, Wedge, and Putter)

- 1 | Download and install E6 Connect and TruFlight 2 Installation file on your computer.

E6 CONNECT: <https://e6golf.com/update/e6-connect/>

Run and ensure that TruFlight 2 is the selected Tracking System.

TRUFLIGHT 2 UTILITIES: <https://trugolf.com/support/>

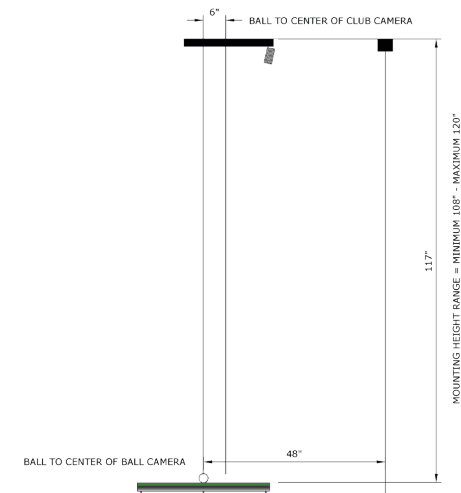
This installs all the drivers necessary for TruFlight 2. Continue through every window of the installer and accept all default decisions.

- 2 | Position Hitting Mat

- Hitting mat is **35" x 12"** or **89cm x 30.5cm**
- Hitting Mat should be located in a position where a golfer would not hit the walls while swinging.
- Commercially recommended at least **7'6"** or **2.3m** off left/right walls
- The Hitting Mat can be set off center in a simulator but, depending on space, may eliminate some golfers from being able to swing without hitting the wall behind them.
- For safety reasons position the mat at least **9'** away and perpendicular to the hitting screen.

- 3 | Position the Club Camera housing:

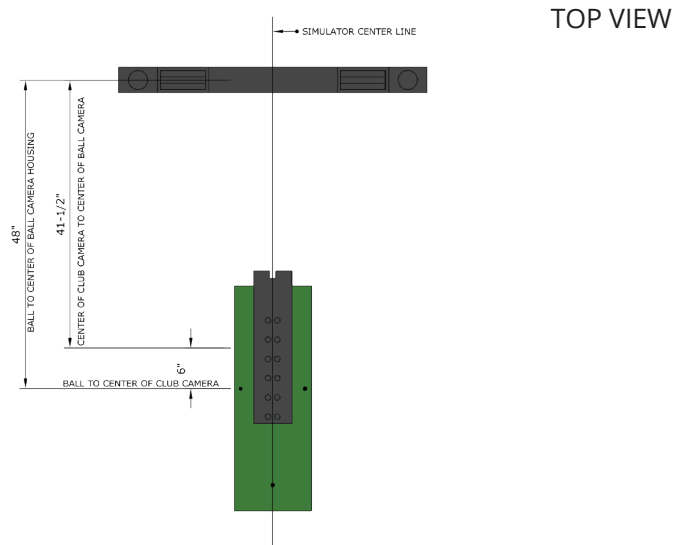
- To identify the center point where the Club Camera enclosure should be mounted, place a piece of tape on the ground on the centerline of the simulator **6"** or **15cm** toward the screen from the ball position.
- Use Plumb Bob or laser level and make a mark for exact placement on the ceiling.
- Install the mount for the Club Camera housing centered on this mark.
- Must be placed **108"-120"** or **275-305cm** above the floor and be level on all axes.



SIDE VIEW

4 | Position the ball camera housing:

- To identify the center point where the Ball Camera(s) enclosure should be mounted, place a piece of tape on the ground on the centerline of the simulator **48"** or **123cm** toward the screen from the ball position.
- Use Plumb Bob or laser level and make a mark for exact placement on the ceiling.
- Install the Ball Camera(s) housing centered on this mark.
- The unit should be installed **108"-120"** or **275cm-305cm** above the floor and level on all axis



IMPORTANT! 110" IS THE DEFAULT HEIGHT - SEE "ADJUSTING SETTINGS FOR CUSTOM BOOTH HEIGHTS" IF YOUR INSIDE HEIGHT BOOTH IS TALLER.

WIRING

IMPORTANT! DO NOT PLUG USB CABLES INTO COMPUTER BEFORE INSTALLING SOFTWARE.

1 | Power Cable

- Plug the computer power cable provided into the Ball Camera(s) enclosure and then plug the other end into an outlet.
 - » You will likely need an extension cord for this; make the length adequate so that it plugs into a location where you will have access to unplug when not in use.
 - » If putting an outlet in the ceiling, it will need to be wired to a switch on the wall.

2 | The two USB 2.0 cables and the USB 3.0 Fiber optic cable should be run from the computer to the Ball Camera(s) location.

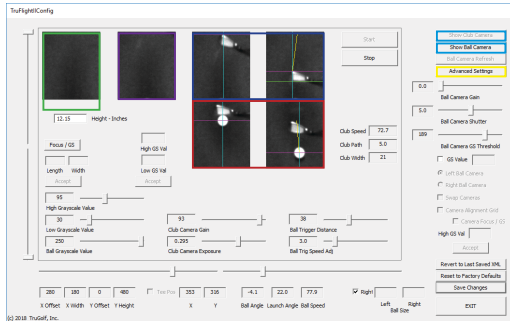
- Handle the USB 3.0 Fiberoptic Cable with care as a bend or kink in the cable will cause a signal degradation or complete loss of signal.
- The USB 3.0 Cable can either be tucked into the Ball Camera(s) enclosure or placed on top of the simulator enclosure.
- Plug the two USB 2.0 cables into the two USB ports coming out of the Ball Camera(s) enclosure.
- Plug the 2 pin Molex cable into the power plug coming out of the ball camera enclosure.

3 | The 6' USB 3.0 Extension and 2 Pin Molex cable should be run from the Ball camera Enclosure to the Club Head Camera Enclosure

- USB 3.0 Cable will plug into the Club Head Camera
- To plug in the 2 Pin Molex cable, remove the endcap of the enclosure and slide out the lighting cover 3" to reveal the power plug for the 2 Pin Molex cable.
- Insert the 2 Pin Molex power cable through the hole on endcap facing the impact screen.
- Insert the 2 Pin Molex power cable into the power plug.

INTRODUCTION TO THE TRUFLIGHT 2 CONFIGURATION UTILITY

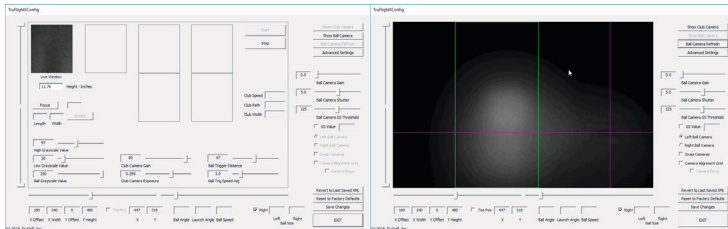
- Show Club Camera
- Show Ball Camera
- Advanced Settings
- Live Window
- Trigger Image
- Club Head Frames
- Ball Frames



TEST CAMERA CONNECTIONS

TEST CLUB CAMERA

- Open **TruFlight 2 Configuration Utility** located on the desktop.
- Ensure Club Camera Lights are turned on.
- Click **Show Club Camera**.
- Click on **Start**.
- Camera view should be visible through the **Live Window**.



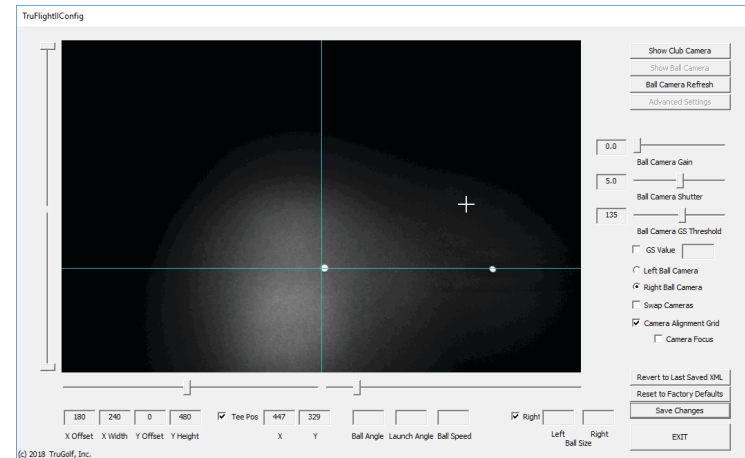
TEST BALL CAMERA

- Click on **Show Ball Camera**.
- Click on **Ball Camera Refresh**.
- Image should be visible through main window.
- Select right/left camera to ensure image is coming through on both cameras.

ALIGNMENT-VISUAL TOOL

TO ENSURE THAT CAMERAS WERE INSTALLED CORRECTLY:

- The tee position should be on the right side of the display. If it isn't, select the **Swap Cameras** checkbox, and then click the **Ball Camera Refresh** button.
- Toggle between the **Left** and **Right** camera buttons to confirm that both show the tee position on the right side of the screen.
- Using a plumb bob or laser level, determine the exact center (both side-to-side and front-to-back) of the ball camera housing and mark that location on the floor with a small piece of masking tape.
- Place one golf ball on the masking tape and another golf ball in the exact center of the tee position.
- Select the **Camera Alignment Grid** checkbox.
- Using your computer keyboard, use the Up/Down Arrows to move the LIGHT BLUE horizontal line and center it through both golf balls.
- Toggle between the **Left** and **Right** cameras. If the camera housing is properly aligned, there should little-to-no change in the position of the two golf balls.
- If the balls are approximately the same distance from the vertical line—but not on the same horizontal line—the camera housing must be moved right or left.

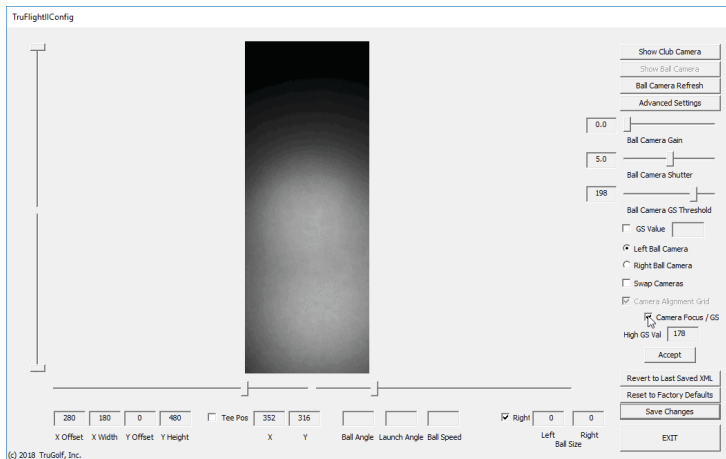


- If the balls are not parallel to the horizontal line, the camera housing is not perfectly perpendicular (90 degrees) to the tee position.
 - Move one end of the camera housing forward or backward until both balls are parallel to the horizontal line.

Note: Horizontal and Vertical lines help you visually see if the cameras have been installed square to the hitting mat and centered with the hitting mat.

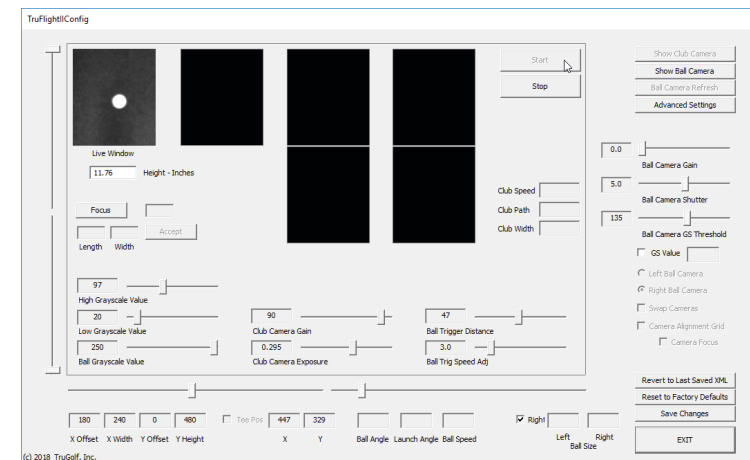
BALL CAMERA FOCUS

- While the **Camera Alignment Grid** check box is still selected and the ball is still on the ground from the previous step, select the **Camera Focus/GS** box.
- Remove the casing on the Ball Camera Enclosure to access the physical focus on the right/left Ball Cameras.
- While the Left Camera is selected, physically turn the lens of the camera on the left side of the enclosure until the ball is at its clearest.
- Select the Right Camera and repeat the previous step for the Right Camera.
- In the Ball Size (Left and Right) boxes you'll see two numbers adjust as it looks at the ball which should still be placed directly under the camera system.
- The goal is to get the two numbers as low (ex. 105) and as close to each other as possible.
- Discard Tape on Ground and replace the casing for the enclosure.



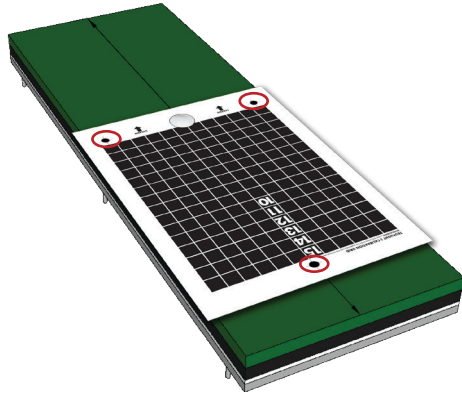
CLUB CAMERA FOCUS

- Click **Show Club Camera**.
- Click **Start**.
- Place a ball in the center of the **3 dots on the hitting mat**.
- Move the camera around until the ball is visible in the **Live Window**.
- Referring to the **Live Window**, manually turn the focus ring on the Clubhead Camera until the ball is focused.



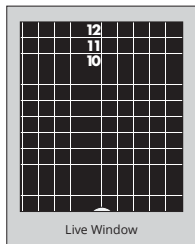
AIM CAMERA

- Place the TruFlight 2 Calibration Grid onto the hitting mat **aligning the three holes** in the calibration grid to the three dots on the hitting mat.

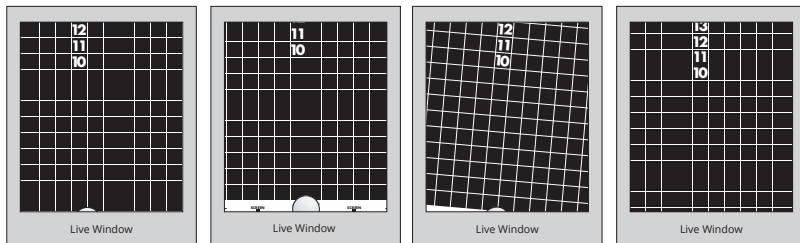


- Reduce Club Camera Gain to 0.
- Physically aim the Club Camera to the template so that grid is square in the Live Window.
- The ball should partially visible on the bottom and center of the Live Window.
- The Camera should be able to move on several axis to ensure that you can position the camera correctly.

CORRECT AIMING



INCORRECT AIMING

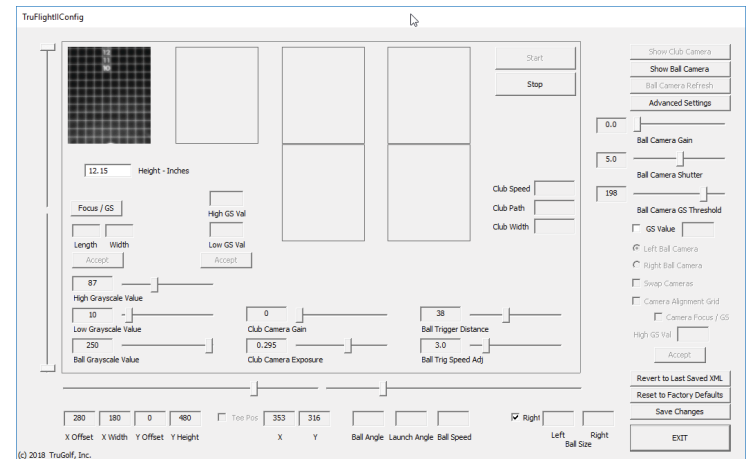


Off Set to the side Camera aimed too far down (White bar at bottom) Camera at Angle Camera aimed too high (ball not visible)

CLUB CAMERA SETTINGS

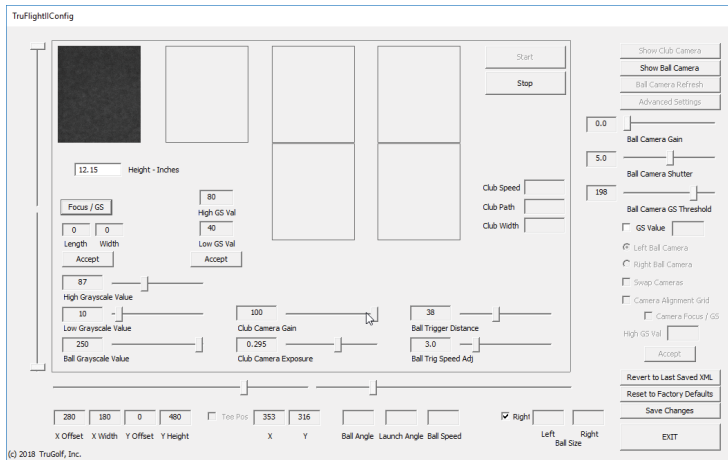
LIVE WINDOW HEIGHT MEASUREMENT

- Refer to the numbers visible in the **Live Window** and identify the height using the numbers on the Calibration Grid visible through the **Live Window**.
 - Example 12.2 squares
- Enter number of squares to equation into **Height - Inches** field.
- Click **Save Changes**.



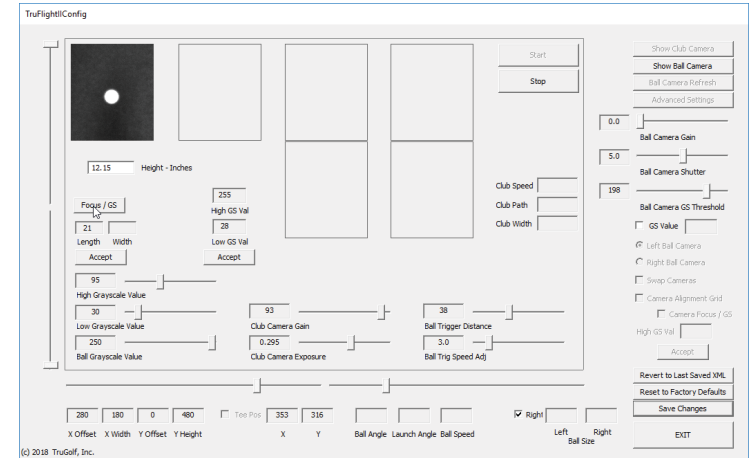
GREYSCALE SETTINGS

- Remove template.
- Click on the **Focus** button, to the right of this button you will see a continuous scan of the high and low greyscale values.
- For the greyscale setting to be correct, the greyscale numbers should appear between 35 and 80.
 - To adjust the values, move the **Club Camera Gain** slider up or down and check the **Live Window** for results (recommended starting point for gain is 85).
 - For more precise adjustments, click on the **Club Camera Gain** slider, and then use the left/right arrows on the keyboard.
- After the numbers scan between 35 and 80, click Accept.
- Click **Save Changes**.



FINE FOCUS

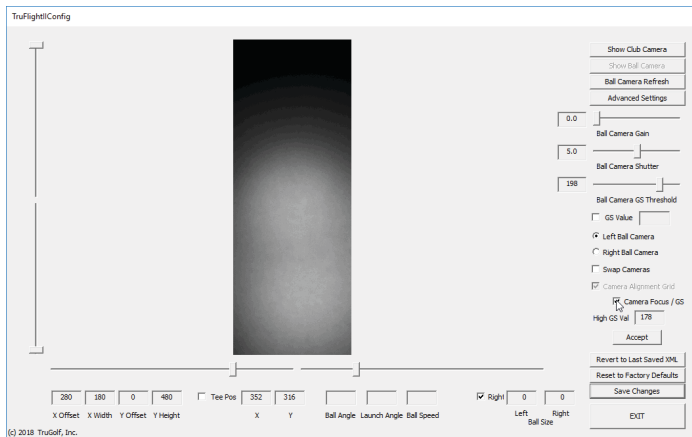
- Place a ball in the center of the 3 dots on the hitting mat.
- Click the **Focus** button within the clubhead calibration screen (under **Live Window**).
- Referring to the **Live Window** in the TruFlight 2 Configuration tool, manually turn the focus until the **Length** and **Width** numbers are as small as possible. 22 being the largest acceptable number.
- Click **Accept**.
- Click **Save Changes**.



BALL CAMERA SETTINGS

GREYSCALE SETTINGS

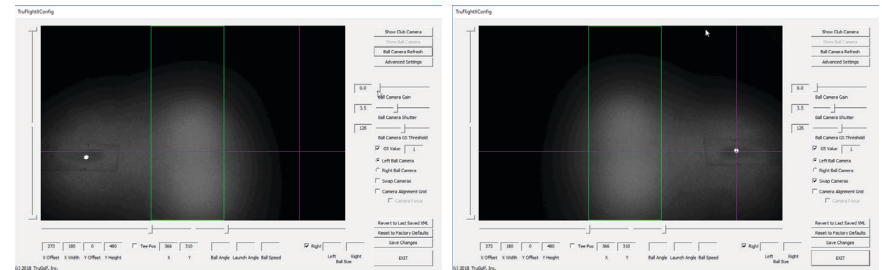
- Click the **Show Ball Camera** button, then click the **Ball Camera Refresh** button.
- Select **Camera Alignment Grid**
- Select **Camera Focus/GS**
- The **High GS Val** field will show values being refreshed, the result of the area being continuously scanned.
 - For best results, the greyscale values should be as close to 150 without going over. If the GS Value is too high or low, move the **Ball Camera Gain** slider left or right.
 - For more precise adjustments, click on the **Ball Camera Gain** slider, and then use the left/right arrows on the keyboard.



- When the refreshing numbers are just under 150, click the **Accept** button.
- Click the **Left/Right** camera not currently selected and repeat the previous steps.
- Click **Save Changes**.

TEE BOX LOCATION

- Place a golf ball in the tee position.
- Select the **Tee Pos** checkbox (left-center, bottom of the screen).
- Move the mouse cursor over the golf ball (this will turn the cursor into “crosshairs”), and then click in the exact center of the golf ball.
- Click the other **Right** or **Left** camera button and repeat the previous step.
- Unclick the **Tee Pos** box.
- Click **Save Changes**.



INCORRECT LOCATION
(need to select Swap Cameras)

CORRECT LOCATION

ADDITIONAL SETTINGS

ADJUSTMENTS FOR CUSTOM BOOTH HEIGHTS

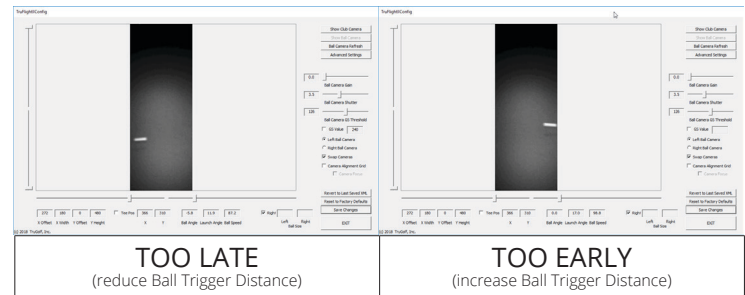
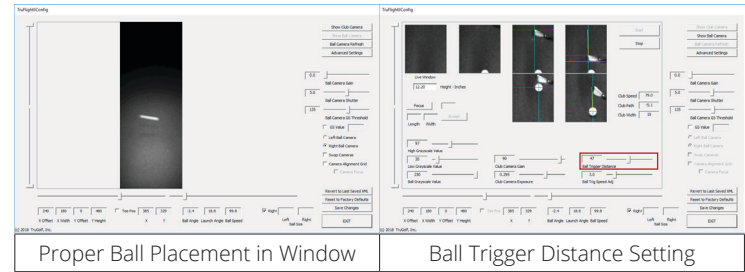
- The default settings shown in the previous sections are for a booth ceiling height of 110". For other heights, refer to the table below:
- To change the settings for your custom height, click the **Advanced Settings** button (in the upper-right corner).
- Adjust the following lines with the appropriate numbers according to the table below.

	48" Camera Spacing				
Teet to Ceiling Height	103"	110"	113"	118"	122"
CTBallAngleAdj	0.45	0.45	0.46	0.47	0.48
CTLaunchAngleAdj	5.05	6.5	6.25	6.25	6.3
CTFinalLACost	3.4	4.4	4.35	4.15	4.0

- When finished, click the **Apply Changes** button, then the **Close** button.
- To save these settings, click the **Save Changes** button.

BALL DETECTION TIMING

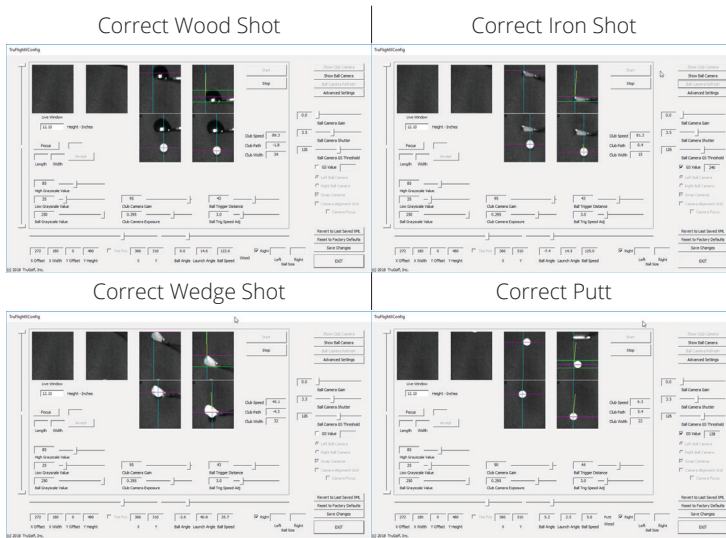
- Click **Show Club Camera**.
- Click **Start**.
- Hit test shot.
- Select **Show Ball Camera**.
- Examine image of both **right** and **left** Camera to see where the ball enters into the frame.
- To adjust where the ball appears in the frame adjust the **Ball Trigger Distance** setting under **Show Club Camera** area.
 - Sliding to a higher number captures the shot later (effectively moving the ball to the left), sliding to the lower number captures the shot earlier (moving the ball to the right).
- Adjust so that the ball appears in the middle of the frame, this will require trial and error.
- Click **Save Changes**.



CLUB HEAD AND BALL TRACKING TESTING

THIS IS WHERE YOU MAKE SURE THE CAMERAS ARE TRACKING CORRECTLY.

- The top two images (below) show the **club head** is tracking correctly; the bottom two show the **ball** is tracking correctly.



Note: If the club head or ball is not tracking correctly, return to the Greyscale section and repeat those steps.

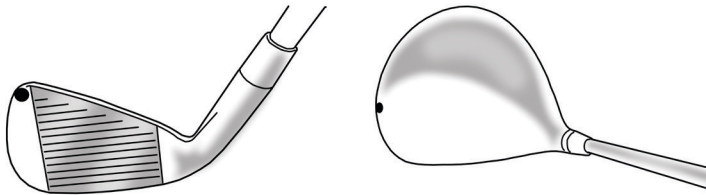
IF EVERYTHING IS TRACKING CORRECTLY, IT'S TIME TO TEST IT IN-GAME:

- Exit out of the TruFlight 2 Configuration tool.
- Launch E6 Connect and hit multiple shots with Wood, Iron, Wedge and Putter.
- If there are any issues exit E6 Connect and enter back into the configuration utility and hit the shots that are having issues.
 - Make sure to watch the frames to ensure that the ball and club are marked properly and the ball is showing up correctly in the ball detection window.

TROUBLESHOOTING & FREQUENTLY ASKED QUESTIONS

WHAT IF THE SYSTEM ISN'T TRACKING MY CLUBHEAD SPEED ACCURATELY?

There are clubs that are difficult for the Club Head Camera to properly track. This can be solved by placing one of the included reflective stickers on the top far edge of the club head/face.



WHAT IF THE TRUFLIGHT 2 CONFIGURATION TOOL DOESN'T LAUNCH?

Check connections and the device manager to make sure that the cameras have been installed properly.

WHAT IF CAMERAS DON'T INITIALIZE DURING TESTING?

Check connections and the device manager to make sure that the cameras have been installed properly.

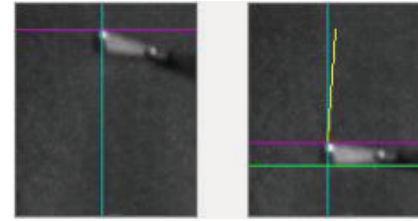
HOW TO ADJUST BALL SPEED

Ball speed is measured by taking the number of pixels that the ball travels in an allotted time by the club head camera. Adjust the "CTBallSpeedAdjust" number up or down from the default 1.0 value. 1.1 would be a 10% increase in ball speed, .9 would be a 10% decrease.

WHAT IF I'M GETTING A ZERO-DEGREE LAUNCH ANGLE?

Repeat the step for Ball Camera Gain and Ball Camera Threshold settings on both ball cameras.

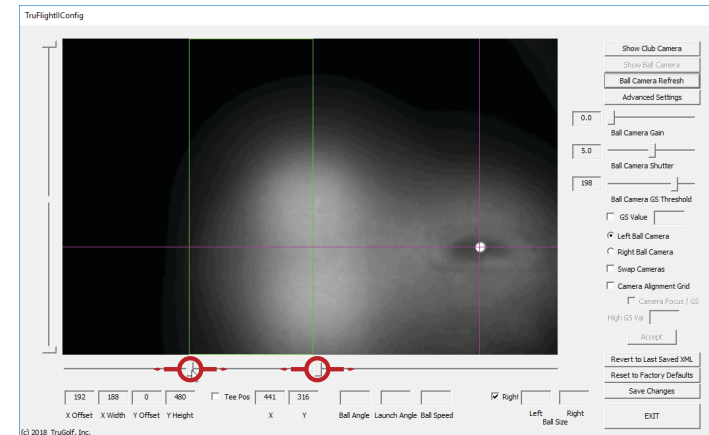
WHAT IF CLUB HEAD SPEEDS ARE OFF (EXAMPLE BELOW)?



Repeat steps for **Club Camera Gain**.

ADJUSTMENTS SHOULD BE DONE IN THE CASE THAT THERE ARE OBSTACLES ON THE FLOOR THAT WOULD INTERFERE WITH THE CAMERA OR THE GOLFER'S CLUB STARTS ENTERING INTO THE BALL CAMERA WINDOW.

- To adjust the spacing, start by clicking the **Ball Camera Refresh** button, then **Ball Camera Refresh** button.
- There are two sliders below the image. Move the sliders to border the area that the cameras should be looking at. The **X Width** number should stay at 180.
- Click **Ball Camera Refresh** to view the new border lines.
- Click the other (right or left) camera button and enter in the same settings for X Offset and X Width.
- Click **Save Changes**.



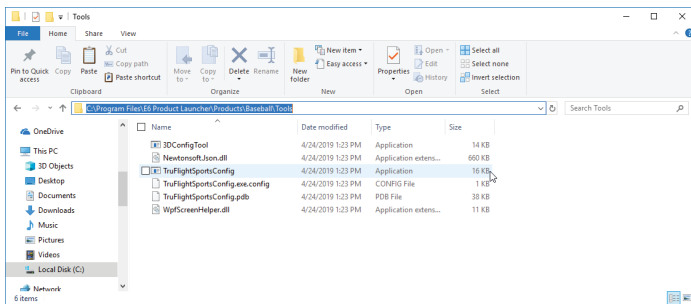
MULTISPORT CALIBRATION

The Multisport calibration is dependent of the calibration done for Golf and E6 Connect, ensure that you complete that calibration before continuing onto Multisport calibration.

Also download all the Multisport Games before beginning the Multisport installation process.

ACCESSING AND USING THE CALIBRATION TOOL

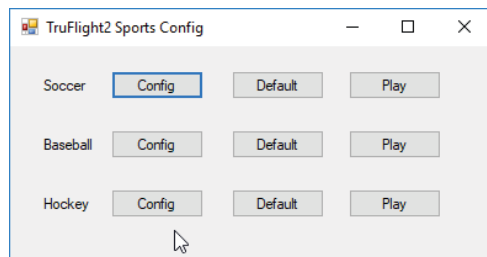
Open the File Explorer and type **C:\Program Files\E6 Product Launcher\Products\Baseball\Tools** and press enter. **Double click** on the program **TruFlight2SportsConfig**.



CONFIG: Allows you to edit the calibration file

DEFAULT: Takes you back to a default calibration file (Golf Calibration File)

PLAY: Launches each game

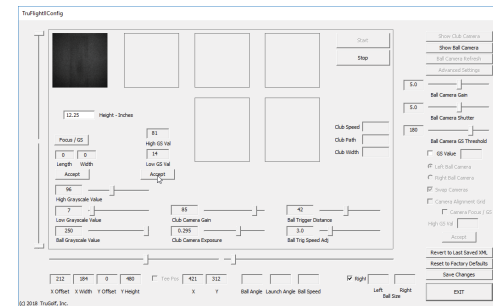


SOCCER

Click on **Configure** next to Soccer to launch the Utility.

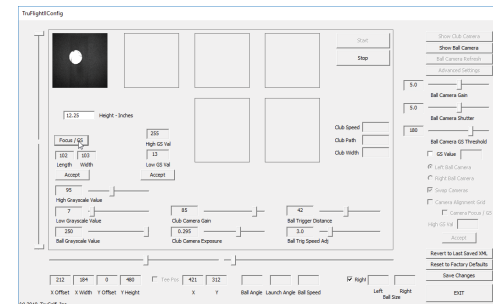
GREYSCALE SETTINGS

- Click **Show Club Camera**.
- Click **Start**.
- Click on the **Focus/GS** button, to the right of this button you will see a continuous scan of the high and low greyscale values.
- Click **Accept**.
- Click **Save Changes**.



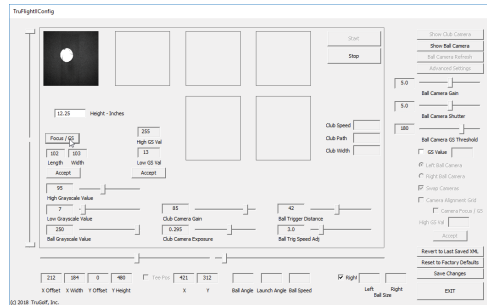
BALL SIZE

- **Place a Soccer Ball** in the center of the 3 dots on the hitting mat.
- Click the **Focus/GS** button.
- Click **Accept**.
- Click **Save Changes**.



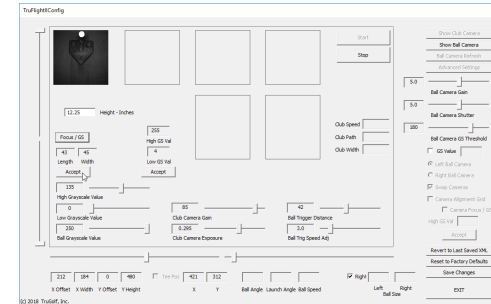
KICK TEST SHOT

- Place a **Soccer Ball** just behind the putting dot so that it is out of the live camera view.
- **Kick the ball** towards the screen.
- Check to make sure that the Ball is marked in the same location in both images as it crosses through the camera.
- Click **Exit**.



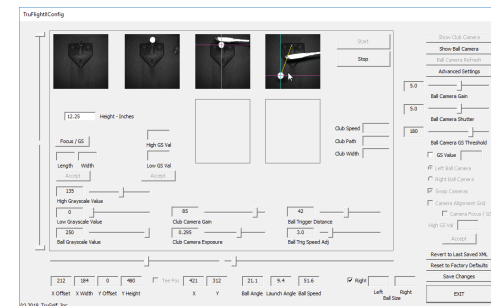
BALL SIZE

- Place a **Baseball** on top of the tee.
- Click the **Focus/GS** button.
- Click **Accept**.
- Click **Save Changes**.



HIT TEST SHOT

- Place the **Baseball** back on the tee.
- **Hit the ball** towards the screen
- Check to make sure that the Ball is marked in the same location in both images as it crosses through the camera.
- Click **Exit**

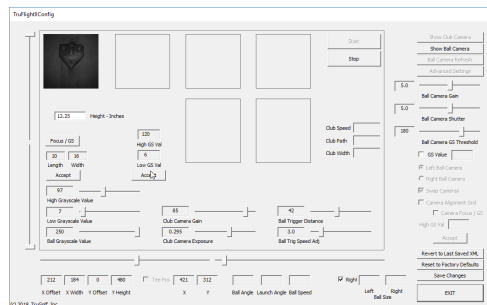


BASEBALL

Click on **Configure** next to Baseball to launch the Utility.

GREYSCALE SETTINGS

- Click **Show Club Camera**.
- Click **Start**.
- Click on the **Focus/GS** button, to the right of this button you will see a continuous scan of the high and low greyscale values.
- Place the **black tee** so that it just barely covers the putting dot near (see image below)
- Click **Accept**.
- Click **Save Changes**.

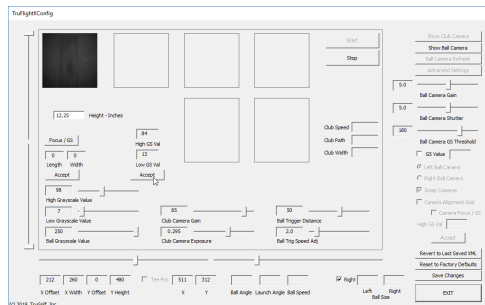


HOCKEY

Click on **Configure** next to Hockey to launch the Utility.

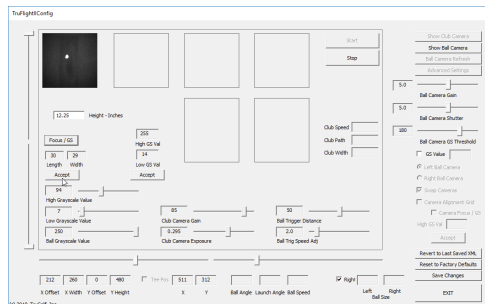
GREYSCALE SETTINGS

- Click **Show Club Camera**.
- Click **Start**.
- Click on the **Focus/GS** button, to the right of this button you will see a continuous scan of the high and low greyscale values.
- Click **Accept**.
- Click **Save Changes**.



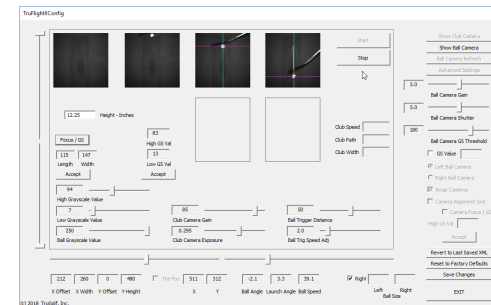
BALL SIZE

- **Place the Hockey Ball** in the center of the 3 dots on the hitting mat.
- Click the **Focus/GS** button.
- Click **Accept**.
- Click **Save Changes**.



HIT TEST SHOT

- **Place a Hockey Ball** just behind the putting dot so that it is out of the live camera view.
- **Hit the ball** towards the screen
- Check to make sure that the Ball is marked in the same location in both images as it crosses through the camera..
- Click **Exit**



GLOSSARY

CTBallAngleAdj

This value is used to tweak the ball direction. It is a pretty solid value that doesn't need to be adjusted too much depending on booth height. The default value is 0.46.

CTLaunchAngleAdj

Increasing this value decreases launch angle more as the ball angle (direction) increases away from straight. This value increases slightly as the ceiling height increases. The default value is 6.25.

CTBallSpeedAdj

This is a global ball speed adjustment value that affects the ball speed of all shots. Increasing this value increases the ball speed. The value starts out as standard at 1.0.

CTBallSpeedLAAadj

This value is fairly constant at .20 for most camera mounting heights. Increasing this value decreases ball speed more as the launch angle increases. (Use for final adjustment.)

CTBallSpeedLAAadj2

Increasing this value increases ball speed more as the launch angle increases. So if the ball speed on wedge shots seems slower than it should be, increasing this value will have the greatest effect on ball speeds on higher launch angles. The default value is 165.

CTFinalLACnst

This value is a global launch angle adjustment that affects all shots. Increasing this value increases launch angle. The default value is 4.35.

Note: *The default values are based on a camera mounting height above the floor of 113". Please refer to page 19 in our TruFlight Installation Guide for values at different mounting heights.*

CTObjectpixelsMinimum

Number of pixels, under which will be disregarded as being a ball or club.

CTObjectPixelsMaximum

Number of pixels, over which will be disregarded as being a ball or club.

Driver Width

Minimum size of driver.

Wood Width

Minimum size of wood.

Iron Width

Minimum size of iron.

Wedge Width

Minimum size of wedge.

TfBallSize

Size of the ball that the camera expects to see.

TfBallSizeTolerance

Tolerance given to ensure the ball is seen at different speeds, anything outside of tolerance will not be transmitted to the game.

DistancePerPixelX

measurement of pixel size on X axis in Live View.

DistancePerPixelY

measurement of pixel size on Y axis in Live View.

CTFinalLAOffset

Correction that can modify Launch angle in degrees up or down.



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