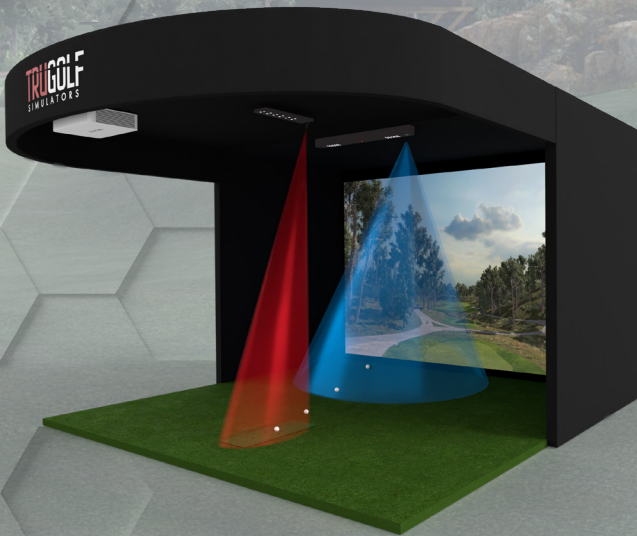




TRUGOLF
SIMULATORS



TRUFLIGHT 2
SBC MANUAL

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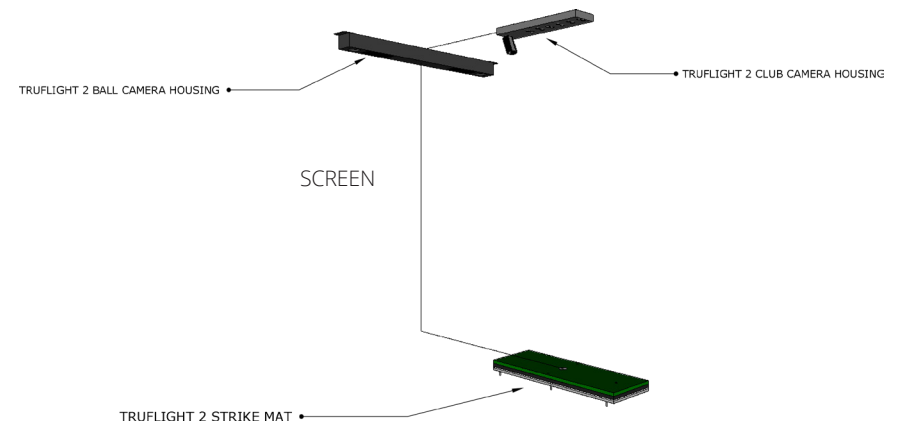
18

20

TRUFLIGHT2™: HOW IT WORKS

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

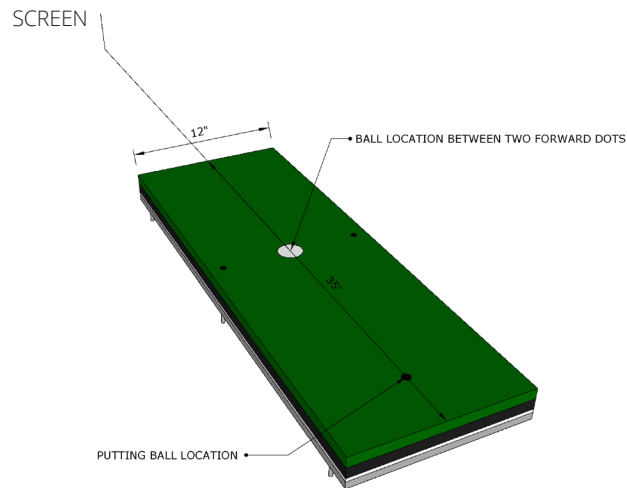
Direct Line: 801-677-1123

<https://trugolf.com/support>

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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 two open USB ports on the motherboard
 - » Intel i7 4 Core Processor
 - » 16 GB RAM
 - » 1-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 and laser level (for precise alignment)
- Masking tape
- Level
- Two golf balls
- 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/>

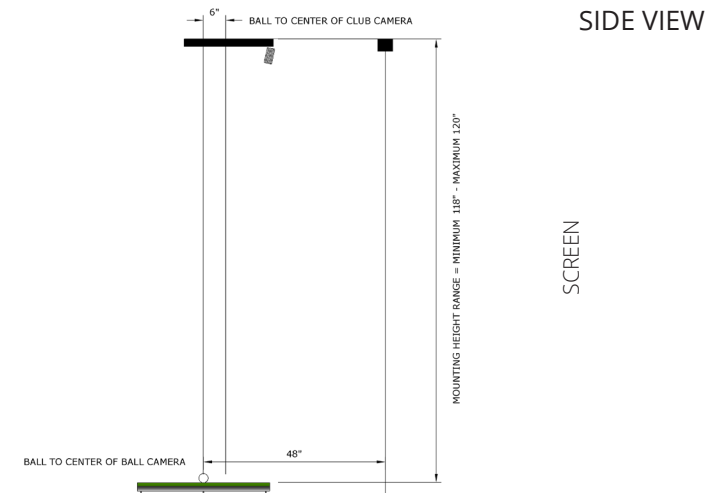
This installs all the drivers necessary for TruFlight 2. Continue through every window of the installer and accept all default decisions.

- 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.

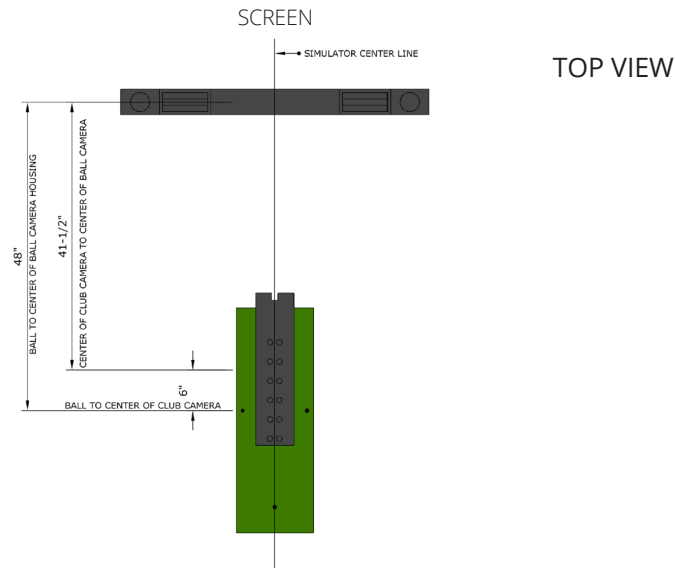
- 3 | Position the Club Camera housing:

- 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.



4 | Position the ball camera housing:

- To identify the center point where the Ball Camera 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 housing centered on this mark.
- The unit should be installed **108"-120"** or **275cm-305cm** above the floor and level on all axis



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 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 USB 2.0 cable and the USB 3.0 Fiber optic cable should be run from the computer to the back side of the Ball Camera Enclosure location where the cables are sticking out.

- 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.
- Any extra USB 3.0 should be kept on the computer side of the cable to avoid inadvertent damage to the cable.
- Plug the USB 2.0 extender cable into the USB connector cable coming out of the rear of the Ball Camera Enclosure.

3 | The 6' USB 3.0 Extension cable should be connected to the USB 3.0 Extender cable and run from the Ball Camera Enclosure to the Club Head Camera Enclosure

- Plug the 6' USB 3.0 extension cable into the back of the Club Head Camera

4 | Run the power cable with two 2 Pin Molex connectors from the Club Camera Enclosure to the back of the Ball Camera Enclosure

- Plug each of the 2 pin Molex connectors into their corresponding mating connector coming out of the rear of the ball camera enclosure



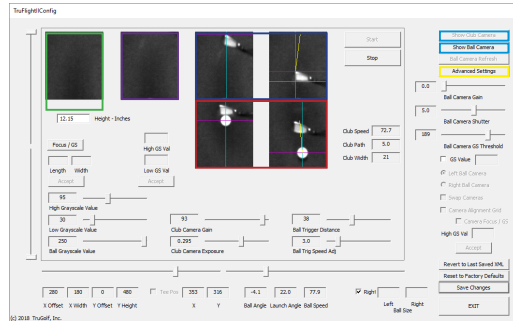
Ball Camera Enclosure Connectors



Club Camera Enclosure Connectors

INTRODUCTION TO THE TRUFLIGHT 2 CONFIGURATION UTILITY

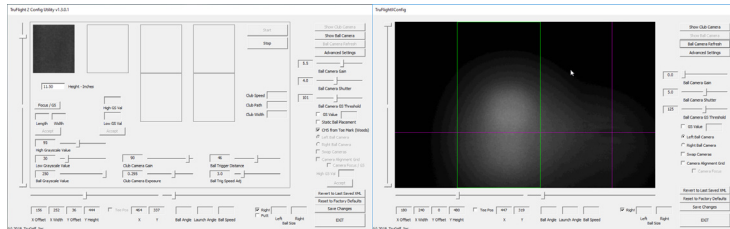
- Show Club Camera
- Show Ball Camera
- Advanced Settings
- Live Window
- Trigger Image
- Club Head Frames
- Ball Frames



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

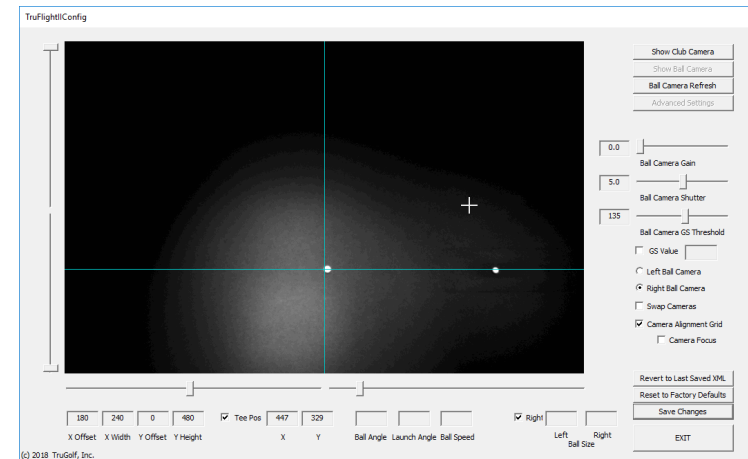
- Click on **Show Ball Camera**.
- Click on **Ball Camera Refresh**.
- Image should be visible through main window.

BALL CAMERA SETTINGS

ALIGNMENT-VISUAL TOOL

TO ENSURE THAT ENCLOSURES WERE INSTALLED CORRECTLY:

- 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.
- 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 two balls are not bisected by the horizontal line, similar to what is shown in the image below, move the left end of the camera housing forward or backward until both balls are parallel to the horizontal line and bisected equally. Adjust the **LIGHT BLUE** horizontal line up or down as needed.

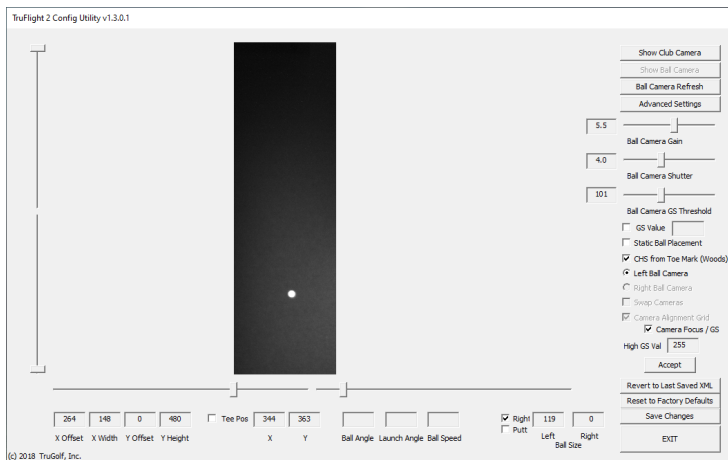


Note: The horizontal line helps you visually see if the camera case has been installed square and centered with the hitting mat. This is a **CRITICAL ADJUSTMENT** for the camera to accurately determine launch angle from the images it captures.

BALL CAMERA FOCUS

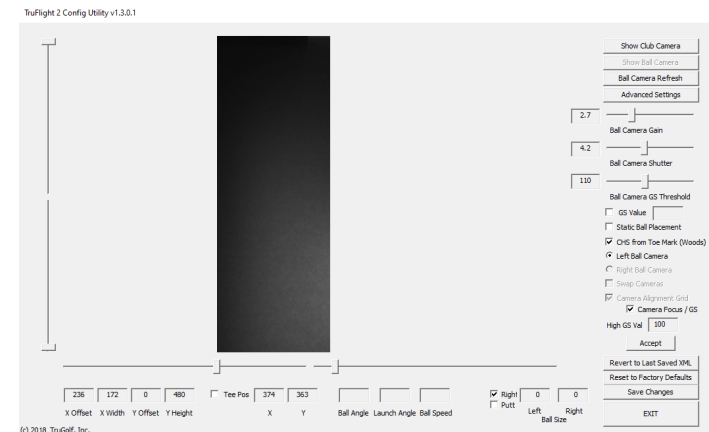
The focus of the camera lens in the Ball Camera Enclosure has been pre-focused for the system when it was tested. If the ball image looks fuzzy on the edges instead of clear and sharp then follow the steps below to adjust the focus of the lens.

- 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 cover on the Ball Camera Enclosure to access the physical focus of the Ball Camera on the left end of the Enclosure.
- Physically turn the lens of the camera on the left side of the enclosure until the ball in the image looks clear and sharp.
- Above Ball Size you'll see a number appear as it looks at the ball which should still be placed directly under the camera system.
- The goal is to get the number as low as possible then you have the focus set correctly.
- Discard Tape on Ground and replace the cover for the enclosure.



GREYSCALE SETTINGS

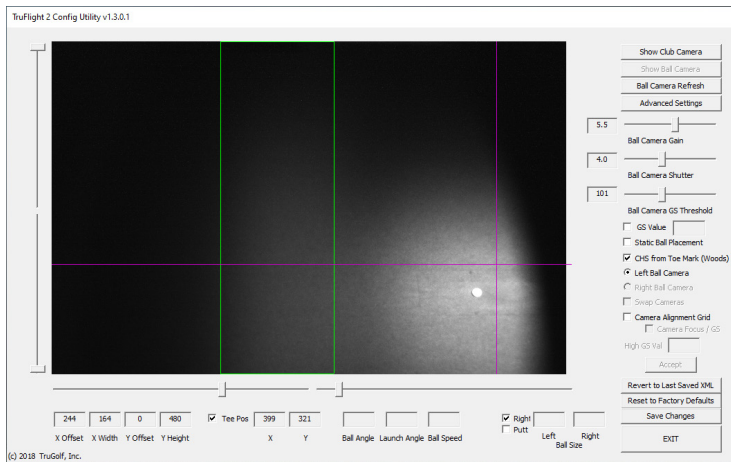
- Click the **Show Ball Camera** button, then click the **Ball Camera Refresh** button.
- Select **Camera Alignment Grid**
- Select **Camera Focus/GS**
- The **High GS Val** field will show values being refreshed, the result of the area being continuously scanned.
 - For best results, the final ball camera **GS Threshold** values should be close to **110**. If the GS Value is too high or low, move the **Ball Camera Gain slider** left or right to reduce or increase the background value.
 - For more precise adjustments, click on the **Ball Camera Gain slider**, and then use the left/right arrows on the keyboard.



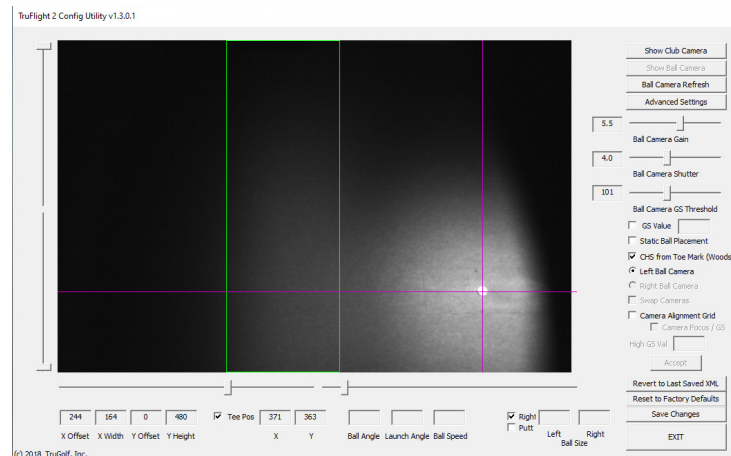
- When the refreshing numbers are just under **100**, click the **Accept** button.
- Click **Save Changes**.

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.
- Unclick the **Tee Pos** box.
- Click **Save Changes**.



INCORRECT LOCATION
(need to select Swap Cameras)

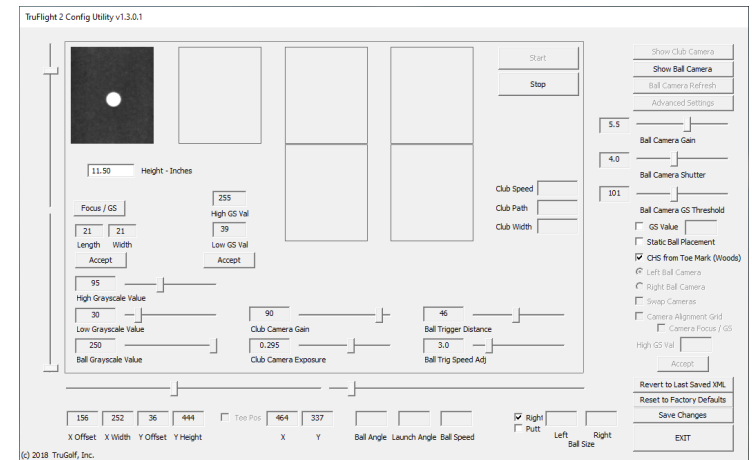


CORRECT LOCATION

CLUB CAMERA SETTINGS

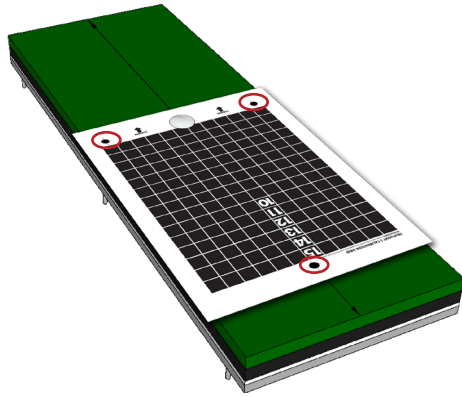
CLUB CAMERA FOCUS

- 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 appears clear and sharp. In the Length and Width windows the ball size appears and is usually 21 or 22 based on the ceiling height of 110”.



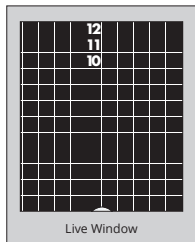
AIM CAMERA

- 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.

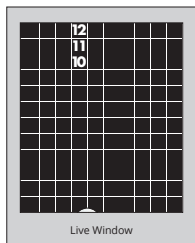


- Reduce Club Camera Gain to 0.
- Physically aim the Club Camera to the template so that grid is square in the Live Window.
- The ball should be partially visible on the bottom and center of the Live Window.
- The Camera should be able to move on several axis to ensure that you can position/aim it correctly.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

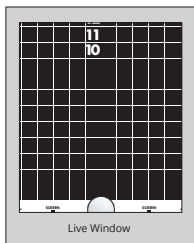
CORRECT AIMING



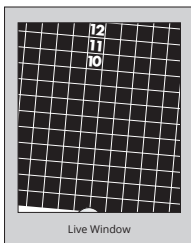
INCORRECT AIMING



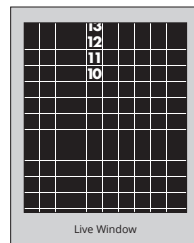
Off Set to the side



Camera aimed too far down
(White bar at bottom)



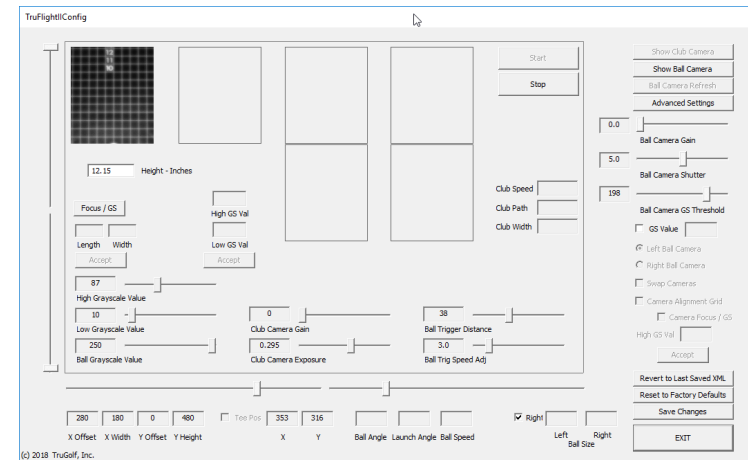
Camera at Angle



Camera aimed too high
(ball not visible)

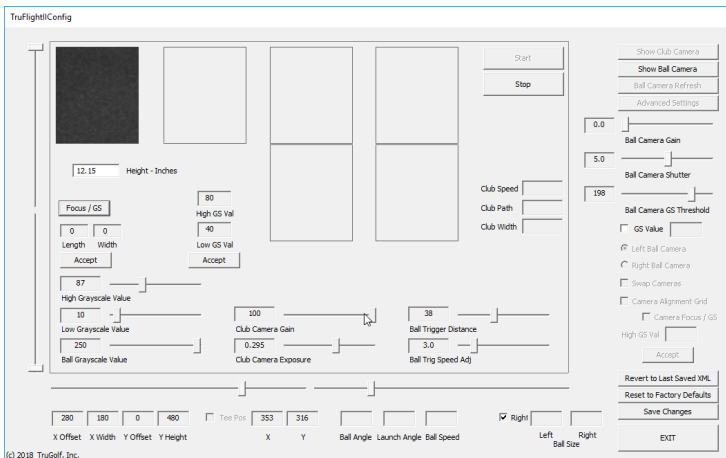
LIVE WINDOW HEIGHT MEASUREMENT

- 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 visible 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 grayscale values.
- For the grayscale setting to be correct, the grayscale numbers should appear between 25 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 25 and 80, click Accept.
- Click **Save Changes**.



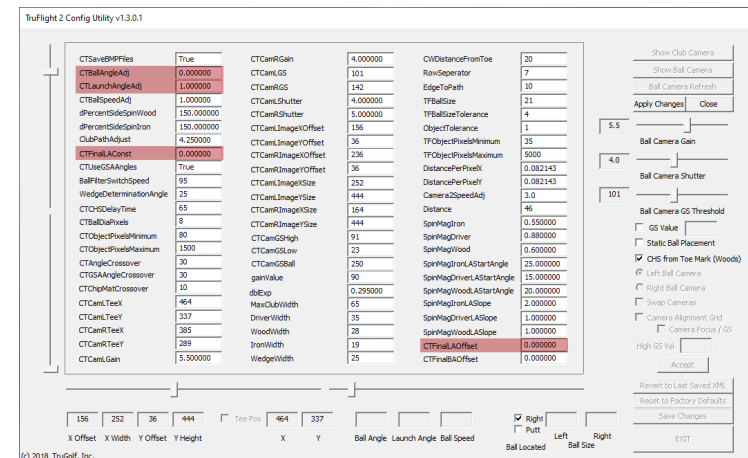
ADDITIONAL SETTINGS

CALIBRATING LAUNCH ANGLES

If you have done the **ALIGNMENT-VISUAL TOOL**, **AIM CAMERA** and **TEE POSITION** correctly then your launch angles should be accurate and need little if any adjustments.

If adjustments are needed because the launch angles are reported a degree or two high or low then you can change the value stored in the **CTFinalLAOffset**, to adjust the reported launch angle. If the launch angles are reporting 1 degree low then you would change the value in **CTFinalLAOffset**, which is located on the **Advanced Settings** screen near the bottom of the right most column, to 1.000. This would boost all launch angles by 1 degree. If the launch angles are 1 degree too high then you would change the value to -1.000.

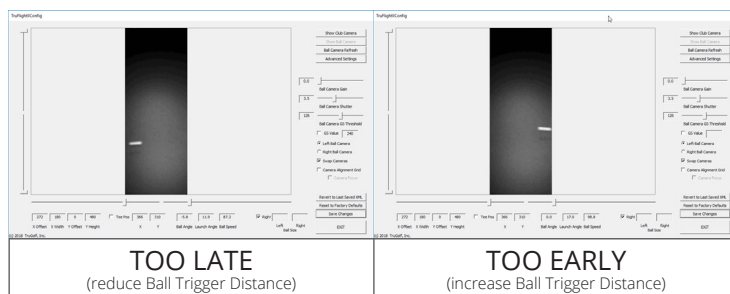
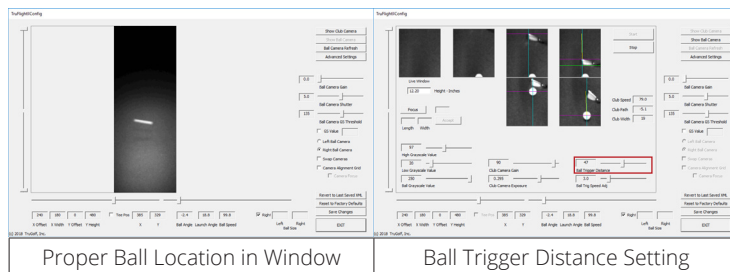
- To change an advanced setting for your simulator, click the Advanced Settings button (in the upper-right corner).
- Change an advanced setting as needed for your simulator or as instructed by Tech Support.
- When finished, click the **Apply Changes** button, then the **Close** button.
- To save these settings, click the **Save Changes** button.



*See **GLOSSARY** (pg 20) for description of highlighted settings.

BALL DETECTION TIMING

- Click **Show Club Camera**.
- Click **Start**.
- Hit test shot.
- Select **Show Ball Camera**.
- 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 hitting several shots until you determine the best value.
- Click **Save Changes**.

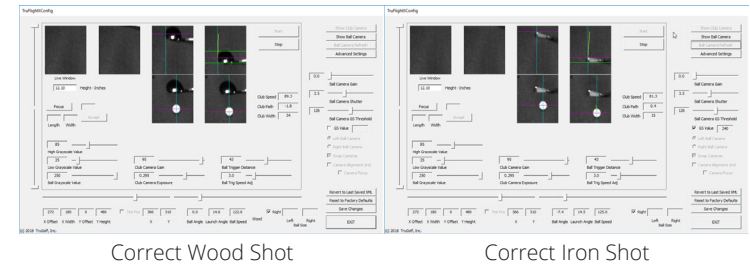


CLUB HEAD AND BALL TRACKING TESTING

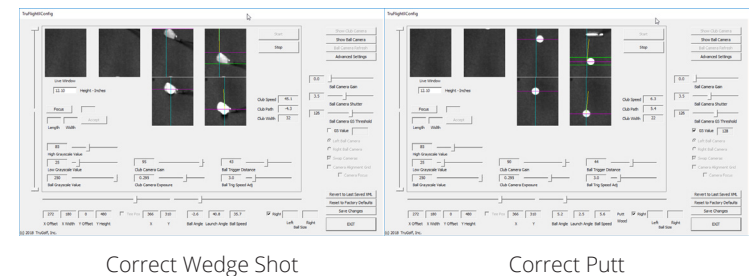
THIS IS WHERE YOU MAKE SURE THE CAMERAS ARE TRACKING CORRECTLY.

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

CLUB HEAD



BALL



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

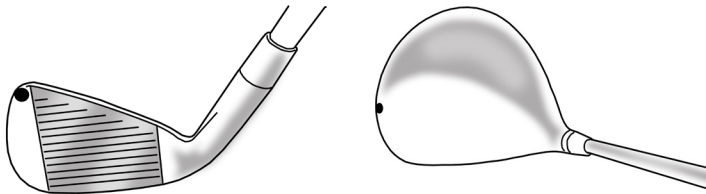
IN-GAME:

- 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.

FAQ & TROUBLESHOOTING

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.

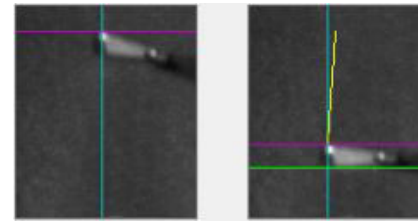
HOW TO ADJUST BALL SPEED

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.

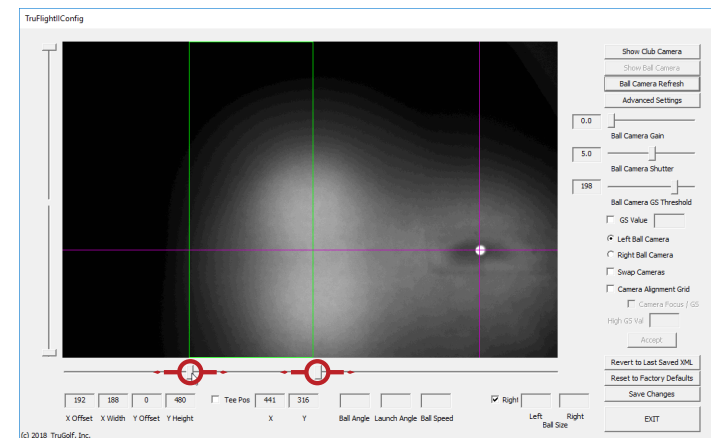
WHAT IF CLUB HEAD SPEEDS ARE OFF (EXAMPLE BELOW)?



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**.



GLOSSARY

ADVANCED SETTINGS

There are many settings shown in the Advanced Settings section of the Configuration Utility. Below is a description for those that you may need to adjust when working with Tech Support.

CTFinalLAOffset

This correction value can modify launch angle in degrees up or down. To reduce final launch angle value put a – at the beginning of the number. Use this setting if the calculated launch angles are consistent in the amount above or below the actual launch angles.

CTBallAngleAdj

This is a correction value used to tweak the ball direction as determined by the club camera. If the overhead club camera is slightly off of being square to the hitting mat as described on page 12 AIM CAMERA then slightly adjusting this value could help dial in the launch angles. Depending on which direction the club camera is oriented off of square to the hitting mat will determine if you need a positive or negative value. The default value is 0.00.

CTLaunchAngleAdj

This value is a multiplier for the overall final launch angle. For example, if you want the launch angles overall to be 5% higher you would change the default value from 1.00000 to 1.05000.

CTFinalLACnst

This is a correction value used if the camera in the ball camera case is not square to the target line down the middle of the hitting mat as described on page 7 ALIGNMENT – VISUAL TOOL. The default value is 0.00.

CTBallSpeedAdj

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

CTFinalBAOffset

Correction that can modify Ball Angle Direction in degrees up or down. To reduce final ball angle value put a – at the beginning of the number.

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 in inches.

Wood Width

Minimum size of wood in inches.

Iron Width

Minimum size of iron in inches.

Wedge Width

Minimum size of wedge in inches.

TFBallSize

Size of the ball that the camera expects to see in pixels.

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.

TruFlight 2 Config Utility v1.3.0.1

CTSaveBPFiles	True	CTCamGain	4.00000	CTDistanceFromToe	20
CTBallAngleAdj	0.00000	CTCamGS	101	RowSeparator	7
CTLaunchAngleAdj	1.00000	CTCamGS	142	EdgeToPath	10
CTBallSpeedAdj	1.00000	CTCamShutter	4.00000	TFBallSize	21
dPercentSideSpinWood	150.00000	CTCamShutter	5.00000	TFBallSizeTolerance	4
dPercentSideSpinIron	150.00000	CTCamImageOffset	156	ObjectTolerance	1
ClubPathAdjust	4.25000	CTCamImageOffset	36	TFObjectPixelsMinimum	35
CTFinalLACnst	0.00000	CTCamImageOffset	236	TFObjectPixelsMaximum	5000
CTLaunchAngleAdj	True	CTCamImageOffset	36	DistancePerPixelX	0.082143
BallFilterSwitchSpeed	95	CTCamImageSize	252	DistancePerPixelY	0.082143
WedgeDeterminationAngle	25	CTCamImageSize	444	CameraSpeedAdj	3.0
CTOSDelayTime	65	CTCamImageSize	164	Distance	46
CTBallDiapixels	8	CTCamImageSize	444	SpinMagIron	0.550000
CTObjectPixelsMinimum	80	CTCamImageSize	91	SpinMagDriver	0.880000
CTObjectPixelsMaximum	1500	CTCamGSHigh	23	SpinMagWood	0.600000
CTCamGSBall	30	CTCamGSLow	250	SpinMagIronASlope	25.000000
CTSSAAngleCrossover	30	gamiValue	90	SpinMagDriverASlope	15.000000
CTChipShotCrossover	10	MaxClubWidth	0.295000	SpinMagWoodASlope	20.000000
CTCamTeekX	464	DriverWidth	65	SpinMagDriverASlope	2.000000
CTCamTeekY	337	WoodWidth	35	SpinMagWoodASlope	1.000000
CTCamTeekZ	385	IronWidth	28	CTFinalLAOffset	0.000000
CTCamTeekW	289	WedgeWidth	19	CTFinalBAOffset	0.000000
CTCamGain	5.50000		25		

156 252 36 444 X Offset X Width Y Offset Y Height X Y Ball Angle Launch Angle Ball Speed Right Left Right Ball Located Ball Size

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#DRIVINGREALITY #GOLFCONNECTED

