

REF LIGHTS

Cabled User Manual

(HTML File version 4.5.0)

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General Description

Ref Lights is an easy-to-use system designed to signal referees' decisions in powerlifting or weightlifting events. White 'Good-lift' and red 'No-lift' lights are displayed on a video screen attached to a laptop/PC. The system comprises three ref boxes (for the Left, Centre and Right Referees), a controller box and an HTML file containing a JavaScript program that presents the lights and a countdown clock in a standard browser running on a Windows based PC or laptop. A video monitor or TV will also be needed to display the lights in a location visible to the lifters, officials and the audience.



Pushbuttons on the ref boxes send signals through cables to the controller box. The controller box sends these signals to the computer through a standard USB port.

Send me an email if you would like a copy of my guidelines for making your own cable-connected version similar to the one shown in the photo.

Ref Lights also has an on-screen countdown clock that can be used to show the time remaining for the current lifter to commence their lift. You can also use it to count down time remaining in session breaks during a competition. Smaller timers are also provided to help lifters and the competition timekeeper by displaying the time remaining for lifters to submit their next attempts to the desk.

The computer software is in a JavaScript/HTML file that runs in a Chrome, Firefox or Microsoft Edge web browser. The code is therefore accessible to the user and can be customised by someone with knowledge of JavaScript.

Always use the latest version of the HTML file, which is available for download on the web page: <https://weightraining.nz/ref-lights>. Please report any bugs you find in the program so I can fix them promptly.

For powerlifting, Ref Lights can display the coloured infraction cards used by the International Powerlifting Federation (IPF). When the system is run in IPF mode, the cards appear below each 'no-lift' light. The ref boxes have white, red, blue and yellow buttons for use in this mode. When not in IPF mode, only the red and white buttons are used to signal decisions.

A small green spot appears in place of each light when a referee makes their decision. Once all three decisions have been signalled, the three lights will appear. The spots provide confirmation to the referees that the system has received their button presses. They also show when a ref may have forgotten to press their decision button, or when a button may have been pressed by accident.

Ref Lights is optimized to run on a screen with a 16:9 aspect ratio and a resolution of 1920 x 1080 pixels.

As well as the referees' pushbuttons, keys on the computer keyboard can also be used for certain functions as explained in the Lights Operation section of this document. See also:

Components

Essential items:

- Three referee boxes and a controller box
- The latest version of the Ref Lights HTML file
- Laptop/PC running Windows 10 (or higher) with keyboard, mouse and an available USB port
- An up-to-date version of the Chrome, Firefox or Microsoft Edge browser installed on the PC
- Driver program for the controller box
- A suitable external display screen, TV or projector

Although you can run Ref Lights on-line from the internet in your computer's browser, it's highly recommended that you download the HTML file to your computer or a USB memory stick and run it 'off-line'.

Optional:

- The supporting files in the compressed package **ref-lights.zip**
- Sound system to amplify the countdown timer warning buzzers.

The compressed file package contains sample warning buzzer sound files for the countdown timer, a sample banner file and a sample file for a customised lights shape. Users can replace any of these files with their own but must use the same file names. A banner file is used to display a static image on the screen, for example, a club logo before the competition starts or during session breaks. Two different banner files can be loaded and displayed at different times.

Setting Up for the First Time

Installing the Files on the PC/Laptop

Open your browser, go to the Downloads section of the Ref Lights web page <https://weighttraining.nz/ref-lights> and download the HTML file (**ref-lights.html**) and the zipped file package (**ref-lights.zip**). The files in the zip package are:

- **warning.mp3** (lift countdown warning buzzer sound)
- **timeout.mp3** (lift countdown time expired buzzer sound)
- **banner.jpg** (the sample banner file)
- **custom.png** (the sample customized lights file)

Extract the files in the zip to a folder in your file system (or a USB stick). *Make sure the extracted files are put in the same location as the HTML file.*

The only essential file is **ref-lights.html**. (Optionally, you can run Ref Lights online from <https://weighttraining.nz/ref-lights/ref-lights.html> without having to download any files.)

Installing the Driver Program on the PC/Laptop

When you plug the controller into a given computer for the first time, a driver program may need to be installed on the computer. Make sure you have an internet connection at this time so the computer can check for driver updates. Once the driver has installed (you should see a message), unplug the controller and plug it in again. You may also need to restart the PC before the driver will work.

Relaying to an External Monitor

Several methods can be used to relay the screen displayed on the PC/Laptop to an external screen for viewing by the lifters, referees and the audience. Only two will be mentioned here, each with its own pros and cons.:

- Video monitor or TV connected to the PC/Laptop by an HDMI cable and used with the second screen function available on most modern PCs or laptops.
- Running Ref Lights in a Chrome browser and using Google's Chromecast technology to relay the screen to an external TV which either has an inbuilt Chrome casting function, or a Google Chromecast dongle plugged into one of its HDMI inputs.

Direct connection between the PC/Laptop and the external monitor via an HDMI cable has the advantage of not being reliant on the Internet and a local WiFi network for use and being able to drive more than one external monitor by using an HDMI splitter. The only disadvantage is that it requires sometimes quite lengthy HDMI cable(s) for interconnecting the devices. In my experience, this is the most used and a well-proven method of driving external monitors at lifting meets. The procedure for enabling and configuring a second screen can differ between computers, so you may need to consult your PC/Laptop documentation to find out how to do it.

Alternatively, the fewer cables on the floor around where heavy weights are being lifted – the better, and Chromecast has the advantage of not requiring an HDMI cable connected between the PC/laptop and the external monitor. However, it does require access to a reliable, local WiFi network with internet access at the site. Chromecast dongles are inexpensive and readily available so, if the TV doesn't have an inbuilt Chrome cast function, purchasing one shouldn't be a problem.

To the best of my knowledge, casting is also limited to one device at a time, so if you want more than one external monitor, you're going to have to get the HDMI cables out to interconnect them!

Finally, an issue has been reported when attempting to Chrome cast Ref Lights in some situations when using HTML file versions earlier than 4.3.4. Please check the website regularly to make sure you have the most up-to-date HTML file version.

At the Start of Every Use

- Plug each of the ref box cables into one of the sockets on the controller and, if provided, use the screw rings to secure the plugs. The box with the BLACK button is intended for the Centre Ref.
- Plug the controller into a USB port on the computer.
- Use the small inspection hole located at one end to confirm that the red LED inside is lit.

Open the browser and navigate to Ref Lights (either via the online link, or the ref-lights.html file that you downloaded). Bookmarking the location is handy!

The browser should now display a message indicating that a Ref Lights controller has been detected.

Immediately under that message you should see the prompt:

Press LEFT referee's WHITE button ...

If, instead, you see this message:

Ref Lights requires an up-to-date Chrome, Firefox or Microsoft Edge browser.

Referee lights controller not found

either you're using an incompatible browser, or the PC isn't communicating properly with the lights controller. Check that you're using an up-to-date version of Chrome, Firefox or Edge, that the USB cable is plugged in firmly and then reload the page (**Ctrl+F5**). If these don't solve the problem, there may be a fault with the controller or the USB cable.

Configuring the Options

You must now tell Ref Lights in which position each of the ref boxes will be located.

At the prompt:

Press LEFT referee's WHITE button ...

Press the white button on the box to be used by the Left Ref for this session. You'll then see the prompt:

Press RIGHT referee's RED button

Press the red button on the Right Ref's box. The system now knows which box will be used in each position and displays the "Configuration Selection" screen, where you select the various configuration options you want to use for the session. The on-screen descriptions of each option are mostly self-explanatory, but note the following:

The black buttons on the ref boxes are the 'Clear' buttons. They're used to clear green spots or lights from the screen.

In addition to the clear function, you can select an option that allows the Centre Ref's black button to also function as the start button for a 1-minute lift countdown. With this option selected, priority is given to the button's "clear" function when one or more spots, or the lights, are showing on the screen.

Saving configuration selections as your favourite is covered in a later section.

Assuming you're not going to save a favourite configuration at this point, click on the "Use this configuration" button. The screen will then clear and the browser will switch to full-screen mode, ready for you to start using the lights.

Lights Operation (HTML File Version 4.5.0)

Once you've clicked "Use this configuration" and the browser is in full-screen mode, operating the lights is simple:

- Each ref presses a button to signal their decision on a lift (WHITE, RED, BLUE or YELLOW when configured for IPF mode, otherwise WHITE or RED). As each ref makes their decision a green spot will appear on screen in the corresponding position. Once all three refs have signalled their decisions, any time showing on the lift countdown clock (see later) will automatically clear and the lights will show. You can also choose to have a short delay before the lights appear.
- Right up until when the lights appear, any ref can press another button to change their decision.
- A *Side Ref's* BLACK button (if present on the box) clears a spot showing for that ref only. (Effectively cancelling their decision or clearing an accidental key press.)
- The *Centre Ref's* BLACK button is used to clear *all spots, lights or lift clock* on the screen. They can also be cleared from the keyboard.

Keyboard

A large countdown clock in the centre of the screen can be used to indicate the time within which the current lifter must commence their lift, or to time a session break. Countdowns can be set in 1-minute increments.

Keys used to control the countdown clock:

- **Numeric keys:** These start a countdown for the corresponding number of minutes. So, pressing **1** starts a 1-min countdown. A *Lift* countdown can be set for between 1 and 5 mins. *Lift* countdowns are automatically cleared from the screen once all three refs have pressed a decision button.

Countdowns of 10 to 60 minutes can be set for timing longer periods, such as *session breaks*. For example, press **2** immediately followed by **0** to start a 20-minute countdown. Unlike a shorter *lift* countdown, the *session break* countdown clock is unaffected by pressing buttons on the ref boxes.

- **Zero:** Pressing the zero key cancels the current *lift* or *session* countdown – unless it was immediately preceded by a **1, 2, 3, 4, 5** or **6** key press to start a 10, 20, 30, 40, 50 or 60 minute *session* countdown.
- **Spacebar:** This pauses/resumes a *lift* countdown. The clock display turns grey when paused. In typical operation, the timekeeper would pause the clock when a lifter commences their lift, leaving the time at which the lift commenced visible for the referees and timekeeper until the lights appear. You can't pause a *session break* clock – it continues until it times out or until **0** is pressed.
- **+ and – keys:** These keys add or subtract a minute on the fly while a *lift* countdown is in progress. They're primarily intended for quickly correcting errors made by the timekeeper.

Keys used for other functions:

- **Delete:** (Clear key) Pressing this key allows the timekeeper to clear all spots or lights from the screen in the same manner as the BLACK button on the Centre Referee's box.
- **B and Shift+B:** (Banners) These toggle the display of a banner image (for example, to show a club logo before a competition or during session breaks).

A banner can only be displayed in full-screen mode and with no *lift* countdown in progress. The banner is dimmed if a *session break* timer is running to make the countdown easier to read.

To use your own banner, replace the sample banner file with a JPG file with the name **banner.jpg**. The image will fill the full height of the screen, regardless of its width. Press **B** to display this banner.

You can use a second banner, with the file name **shift-banner.jpg**. Press **Shift+B** to display this banner.

Only one banner can be displayed at a time! Pressing either **B** or **Shift+B** hides whichever banner is currently being displayed.

- **H:** (History) This shows a summary of the 15 most recent decisions made since Ref Lights was last started. You can toggle the history on and off only in full-screen mode while no spots or lights are showing. The details displayed for each decision are: Date and time of decision, colours of left, centre and right lights/cards and the time remaining on the lift countdown clock when the lights appeared.

While the history is being displayed, any banner or clock running is temporarily hidden and the buttons on the referee boxes are disabled.

- **Esc:** The escape key exits full-screen mode and returns to the configuration menu.

Additional Notes

- Unlike some referee lights systems, Ref Lights will accept lift decisions at any time while the browser is in full-screen mode, and the lights are not already showing. There is no action required to signal when the system should start recognizing referee button presses.
- **'Ref decisions pending':** This message appears on the screen if all three refs fail to signal a decision within 8 seconds of each other or if, say, a ref box malfunctions, and the system can't record that referee's decision. The message will clear once the controller box has received a decision from all three refs.

If the message arises from a referee accidentally pressing a button at some random time, either that ref or the Centre Ref should clear it with their BLACK button, or the timekeeper can do so using the **Delete** key.

It's important to clear this message from the screen well before the next lift commences. This avoids any decisions that may still be held in the system from the previous lift from being counted for the next lift! This is a consequence of using a system that will accept ref button presses at any time throughout a session.

- **Lift countdown warnings:** At a time specified in the options, the *lift* countdown clock turns orange, and a buzzer sounds to warn that time is running out. The clock turns red, and another buzzer sounds when time expires. If not cleared beforehand, the clock automatically clears shortly after timing out.
- **Light shape:** Round or square lights can be selected in the options. It's also possible to use up to three different image files to customise the shape of the lights or cause a silhouette or 'watermark' to appear in them. This feature was incorporated following a request from a user! Instructions for creating and using custom files are in a separate pdf on the web site. The zip file package also contains a sample custom image file.
- **Centre Ref starts lift countdown:** This option allows the Centre Referee to use their BLACK Clear button to also start a *lift* countdown after calling 'Bar loaded.'

When this option is enabled, the BLACK button functions as usual to clear any spots, lights or lift clock but, if none of these is showing, it starts a **1-minute lift** countdown clock. For *lift* countdowns longer than a minute, or for corrections to the time, the keyboard must be used. Pressing the BLACK button again once the timer is running will cancel the 1-minute clock.

- **Lift submission countdowns:** An option allows **1-minute** timers to be displayed at the bottom of the screen to show the time remaining for lifters to submit their next attempt to the desk. When enabled, the timers run automatically: As soon as the decision lights appear for a lift, a 1-minute submission countdown clock appears at bottom-centre screen. On expiry, the clock display turns red and clears from the screen shortly afterwards. If a lifter completes their lift before the previous lifter's submission timer has cleared, the first clock display shifts to the right and a new one starts in the centre for the current lifter. Up to three timers can display concurrently - corresponding to the three most recent lifts.

Changing Options During a Session

Press the **Esc** key to exit full-screen mode and return to the configuration screens. Any countdown clocks will continue to run, but lights will be cleared when exiting full-screen mode.

Saving a Favourite Configuration

If you run Ref Lights *offline* you can save your favourite configuration in a file. With a favourite configuration file in place, the next time you load/reload the Ref Lights HTML file, you'll get the choice of using your favourite configuration or selecting a new one. The file must have the name **ref-lights.config** and must be in the same location as all your other Ref Lights files.

Here's how to create the file:

1. On the "Configuration Selection" screen, select the options you want to save as your favourites.
2. *There's a note at the bottom of the screen reminding you of the location and name the file must have.*
3. Click the "Save as favourite" button and, depending on your browser's Download settings, you'll either be able to choose a location and file name in a 'Save As' dialogue box, or the file may just be written directly to your browser's Download location.
4. If a 'Save As' dialogue box opens, make sure you select the correct location and file name before you save it.
If no dialogue box appears, you'll have to look for the file in your browser's Download folder and move it to the correct location.

It's the same procedure if you're replacing an existing favourite configuration, except that Windows will remind you that you're about to replace a file.

The favourite configuration feature is not available when you run Ref Lights *online*. However, if your browser has cookies enabled, it stores your *online* configuration in a cookie. If the cookie is there next time you run Ref Lights *online* with the same browser and machine, the "Configuration Selection" screen will show with your last-used options already selected.

Summary of Referee Button Functions

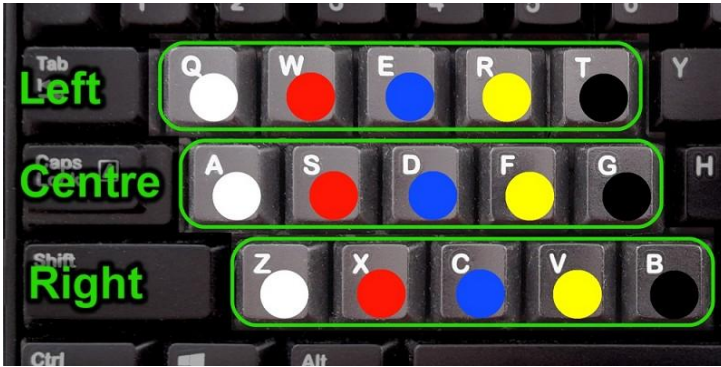
Button Colour	Function
White	Signals a Good Lift.
Red	Signals 'No Lift'. In IPF mode: Signals 'No Lift' due to a red-carded infraction of IPF rules.
Blue	In IPF mode only: Signals 'No Lift' due to a blue-carded infraction of IPF rules.
Yellow	In IPF mode only: Signals 'No Lift' due to a yellow-carded infraction of IPF rules.
Black (Centre Ref)	Immediately clears the lights or any placeholder green spots showing on the screen. (Same function as the Delete key on the keyboard.) With option selected: The button can also start a 1-minute lift countdown clock. (No lights or green spots must be showing on the screen when using this function.)
Black (Side Ref)	Clears only that referee's placeholder green spot from the screen.

Summary of Keyboard Functions

Key(s)	Function – General
S	Starts simulation when HTML page is first loaded or reloaded in the browser. There must be no Ref Lights controller plugged into the computer.
Esc	Exits full-screen mode, returning user to the Configuration screen.
1, 2, 3, 4, 5	Starts the lift countdown clock for the corresponding number of minutes.
0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Start a session break countdown of 10 to 30min when pressed straight after 1, 2 or 3 .
0	Clears a currently running countdown clock.
+	Adds 1 minute to a lift countdown clock while it's running, to a maximum of 4:59s.
-	Subtracts 1 minute from a lift countdown clock while running, to a minimum of 1s.
spacebar	Pauses a running lift countdown clock. Resumes a paused lift countdown clock.
Delete	Clears any green spots or lights that are showing on the screen.
H	Toggles display of the 15 most recent lift decisions on or off.
B	Turns on display of the banner.jpg file. Turns off display of either banner file.
Shift+B	Turns on display of the shift-banner.jpg file. Turns off display of either banner file.

Simulation Mode

Starting from version 4.0 of the HTML file, you can simulate the operation of Ref Lights without needing the referee boxes and controller – a handy feature for learning how to use Ref Lights. Keys take the place of the buttons on the three ref boxes as indicated in the photo.



To run Ref Lights in Simulation mode:

- Make sure no controller is plugged in.
- Open the HTML file in your browser.
- When **Referee lights controller not found** appears, press the **S** key.

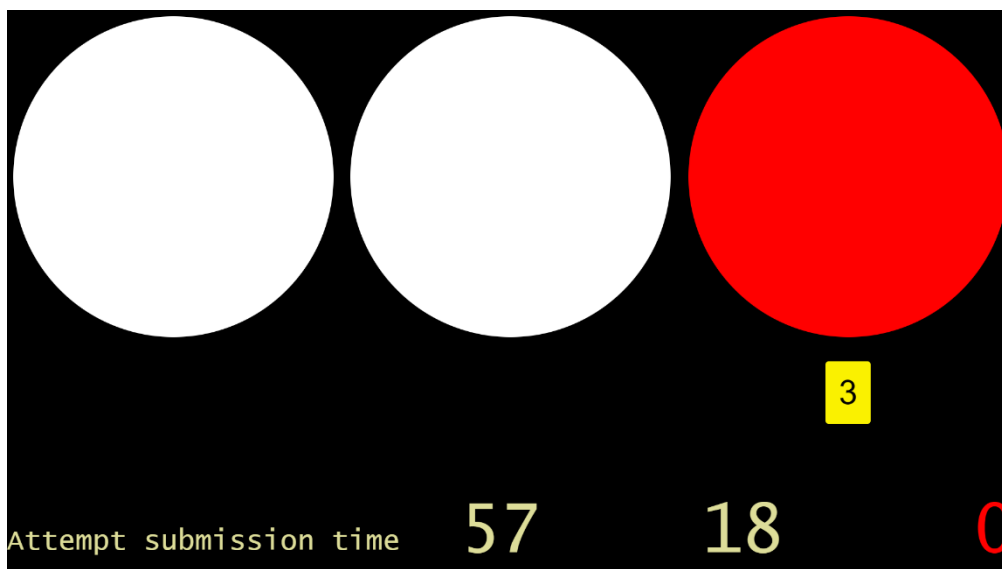
You'll see on-screen prompts to remind you which key represents each ref's pushbutton.

In all other respects Ref Lights will behave exactly as when using ref boxes and a controller.

Ref Lights remains in Simulation mode until you exit from or reload the HTML file.

Keys	Function in Simulation Mode
Q, W, E, R, T	Act, respectively, as the Left Ref's White, Red, Blue, Yellow and Black buttons.
A, S, D, F, G	Act, respectively, as the Centre Ref's White, Red, Blue, Yellow and Black buttons.
Z, X, C, V, B	Act, respectively, as the Right Ref's White, Red, Blue, Yellow and Black buttons.

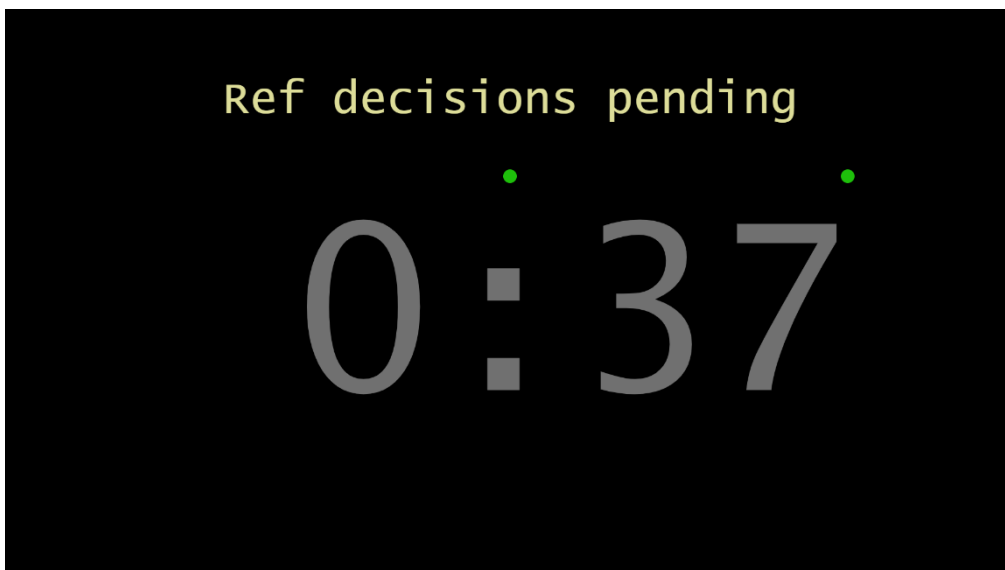
Sample Screenshots



This indicates a good lift (two-to-one majority). IPF cards are in use and the Right Ref gave the lift a yellow card. The lights appeared just 3s ago, so the lifter has 57s to submit their next attempt, the previous lifter has 18s to have submitted their next attempt and the attempt submission time for the lifter before that has expired.



The timekeeper paused the lift countdown (clock grey) at 44s when the current lifter commenced their lift. The Centre and Right Ref's have signalled decisions, but the clock won't clear and the lights won't show, until the Left Ref also signals a decision. The previous lifter has 18 seconds left to submit their next attempt to the desk.



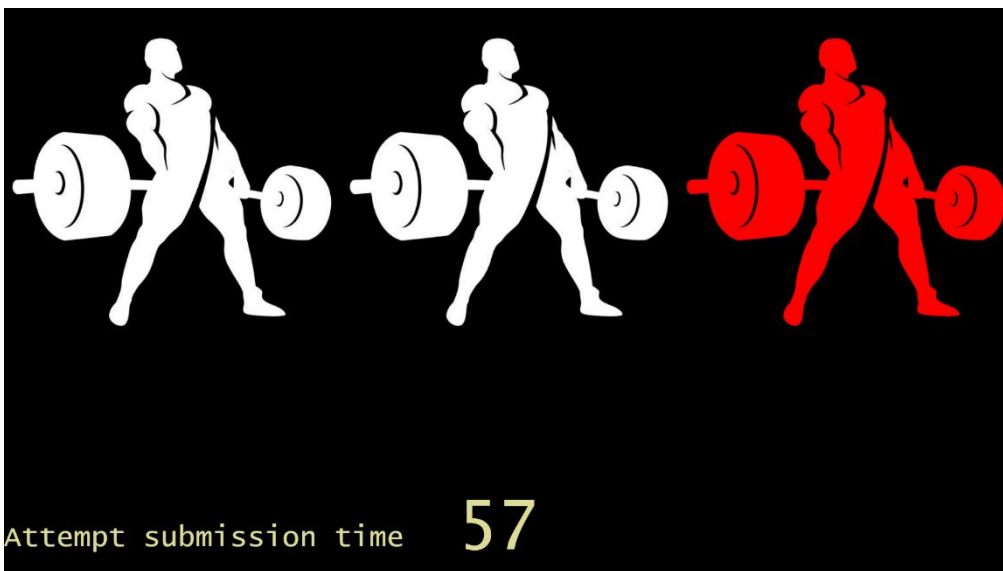
Two refs made decisions, but the Left Ref's box was turned off and the delay caused the warning to show. It's important to clear this before the next lift because, for example, if the Left Ref is first to signal a decision for that lift, the system will have decisions for all three positions and *the lights will show a mix of decisions for that and the previous lift.*



History has been toggled on to review the 15 most recent lifts.



A banner image has been toggled on. Because the session break countdown is also being displayed, the banner is dimmed to make the clock easier to read.



Here are two examples of a custom image file being used to change the lights' appearance.

On the left, the outline of the lights has been completely changed, while a watermark effect has been created in the lower example.



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