

RTI Usage Guide/Information

Home screen menu

- LED Order - Enters the menu used to run the LEDs on the dome in a pattern.
- LED Single - Used to run LEDs on the dome individually.
- Settings - Change settings or restart the device (more settings are made available by connecting to the device from the USB serial connection offered by the Arduino.
- Profiles
 - Write to the on-board timing profiles which can be used while running LEDs in either single mode or pattern mode
- Test LEDs
 - Performs an automatic test on the LEDs.
- Positions
 - Allows the user to save custom LED configurations on the dome, which are used to skip non-populated LEDs when using a pattern.

LED Order

From this page, the desired LED Pattern Type must be selected. The options are as follows:

- Column Scan: Runs LEDs column by column, going from top to bottom. (This order follows the designed numeric order of the LEDs).
- Ring Scan: Runs LEDs ring by ring, starting at the top ring and going down.
- Single Column: Runs an individual column, beginning at the top of the column and running - down it. (One column, as defined by this software, is actually two adjacent lines of LEDs. See diagrams below.)
- Single Ring: Runs an individual ring, starting at the lowest numbered LED in that ring and going around counter-clockwise.

After a Pattern Type is chosen, a page is shown with many different setting selectors. The boxes are divided into LED and Shutter settings. To change any setting, tap on it's box. These settings may have been pre-defined using the Profiles setup page; if this is the case, tap the boxes labeled 'Profile:' and choose the correct profile from the dropdown box.

To change a setting manually, tap on its box and either choose the desired option from the dropdown or type the setting on the number pad which appears in the space to the right.

LED Setting Definitions:

- Profile - use a predefined profile to automatically set up the settings.
- Color - change the color which the system should use for the pattern.
- On Time - The amount of time the LED will remain on.
- Off Time - The delay between turning off the last LED and turning on the next one.
- Increment - This is used to reduce the time the entire process will take, at the cost of a lower image count. The pattern will be run by running each n^{th} LED (an increment of two uses every second LED, making it take half the images, while an increment of eight will run every eighth LED, taking an eighth the images.)

Shutter Setting Definitions:

- Profile - use a predefined profile to automatically set up the settings.
- On Time - This will be the maximum amount of time the shutter is left on. (it is initially set up as the minimum time since the user will be warned if the shutter cannot stay on this long)
- Trigger w/ - Select the logical level at which the camera triggering system is activated. (some cameras may take an image while the signal is 'high,' or on, while others will activate when the signal is 'low,' or off.)
- **NOT VISIBLE:** Starting Delay - The amount of time the shutter waits before turning on after the LED has been activated. This is preset in the shutter profile. If none is set, it will default to .1 seconds.

The LED On Time should be enough to accommodate the Shutter On Delay and the Shutter On Time, otherwise the display will show an error (though the pattern can still be run if it's just for a test).

If no error appears, there will be a list of the numbers of the LEDs which will run. This list can be copied directly from the USB Serial connection on the Arduino in a comma-separated-value format. (In a Column Scan without any change in the Increment value, the LEDs will light in numeric order.)

The timing of the LEDs and the camera shutter depends upon the values set for the LED On Time, the Shutter Wait Time, and the Shutter On Time (and are offset by the LED Off Time, if used.) The shutter will be turned on once the LED has been turned for the duration of the Shutter Wait Time. The shutter will then turn off after the amount of time set in the Shutter On Time has passed. Regardless of the Shutter On Time, the shutter will always be turned off when the LED is off.



An overall time estimate is given below the list on the display. This is only an estimate, and maybe slightly inaccurate at larger numbers, but should not be off by more than a few seconds.

When the Start button is pressed, a box will appear with information about the current LED pattern being run. There are two numbers used to identify LEDs: the LED Number and the Dome LED Number. The LED Number is a zero-inclusive value representing the logical position in the program's array, and the Dome LED Number is a zero-exclusive value representing the physical position of the LED on the dome. This can be compared to the Single LED selector but remember to subtract one from this value first to make it zero-inclusive.

LED Single

When opening this page, some instructions will appear, which can be passed by tapping the display.

Once the page is shown, there will be a few buttons to the left and an LED selector grid on the right.

The LED selector grid is a visual way to choose which LED should be turned on. The LEDs also have numbers written over them, which are also displayed at the bottom left of the window when an LED is on (labeled Dome LED number). Both numbers in the counters are zero-inclusive. The graphic has a white circle to one side, which indicates the hole drilled in the side of the dome (when it is viewed from the top).

Before choosing an LED, make sure the correct color is selected from the right. The color-filled buttons to the left can be used to change the LED color. The top-most white-filled button is used to select a pre-created shutter profile to use when LEDs are enabled, and the bottom-most button is used to change the shutter's "Trigger With" setting.

Settings

The Settings page only contains three settings, which are all toggle buttons.

- The first button, Diagnostics, is used to enable drawing and writing circles and general running information to the display. More information can be found in the header of the program file 'main.cpp'
- The second button is a restart button, which just restarts the device. Useful for troubleshooting and programming.
- The calibrate display button begins the display touch location calibration, which only requires that the user touches two locations on the display. If the display is not usable due to an issue with the calibration, this must be done through the USB Serial connection.
- The button labeled Combine Shutters is used to control all three camera color shutter outputs in unison, regardless of the color being used. Since there are three colors, all three camera control shutters can be used separately if preferred, though this can be an issue if a camera is not connected to the correct shutter.

Profiles

To add or modify a profile for a pattern, follow these steps:

1. Tap on the pattern name on the screen. To add a profile to all patterns, tap "All Patterns".
2. Choose which profile you would like to write to. Patterns have three profiles each. The profiles can be overwritten if needed.
 - a. If you are modifying all pattern profiles at once, the profile number will be the same within all profiles (if profile #2 is selected, the second profile will be written to in all pattern profiles, and will overwrite any settings previously saved there.)
3. Enter the name of the profile.
4. After the name is set, a new screen will appear, with instructions on the left and a keypad on the right. Enter the settings you wish to apply to the profile.
5. Once complete, the keypad will disappear and you can return home. The profile is automatically saved.

To modify a profile for the camera shutter settings, follow these steps:

1. Tap the “Shutters” option.
2. Choose which profile you would like to write to. Eight shutter profiles can be saved. Profiles can be overwritten if needed.
3. Enter the name of the profile.
4. After the name is set, a new screen will appear, with instructions on the left and a keypad on the right. Enter the settings you wish to apply to the profile.
5. Once complete, the keypad will disappear and you can return home. The profile is automatically saved.

Test LEDs

Not yet implemented; this will test all LEDs automatically, using a photoresistor or photovoltaic sensor.

Positions

It may be necessary to limit one of the color arrays to only use certain LED positions, since some array positions may not be populated. To modify, enable, or disable one of these custom LED arrays, open the “Positions” menu option and select which channel/color you would like to limit.

Once you have chosen the color, a selector grid will come up, identical to the one used on the Single LED page. The graphic has a white circle to one side, which indicates the hole drilled in the side of the dome (when it is viewed from the top). The LED numbers are also shown on top of the circles they are represented by.

To set an LED to usable or unusable, tap on the LED’s circle so that it turns green or red, respectively. While setting the LEDs, all can be set to usable or unusable to speed up the process, using the “All On” or “All Off”.

Once the custom array is set up, press “Save”. The array will not be stored anywhere if it isn’t pressed. If desired, the custom array can be ignored but still saved using the “USE ARRAY?” toggle button.

NOTE: LEDs that are set to unusable will not be used when using the LED Order page to activate LEDs, but the position can still be powered when using the LED Single page.

Touch Calibration

The touch calibration screen can be activated by entering the Settings page and tapping the “Recalibrate Touch” button, holding the calibration reset button on the case, or by entering the device’s serial control interface. If the touch calibration is slightly off, the device will still be largely usable but will be especially difficult when using the individual LED selector.

When tapping the red target circles while calibrating, it is important to be as accurate as possible. Quickly tap and release using something with a small end or corner, being careful not to accidentally lay a finger or palm on the rest of the display. The backside of a pen, the corner of a USB connector, or the tip of a headphone wire’s connector (3.5mm barrel connector) work well. Using a finger won’t be as accurate, but it will still work.

Touch calibration accuracy can be checked by enabling the “Diagnostics” setting in the Settings page and seeing how closely the circles appear to each tap. These circles are drawn wherever a touch is thought to have occurred. If no circles appear, the circles will likely be placed in one of the four corners due to bad calibration values.

Joining Shutters

There are three camera triggering outputs, called shutters. These can be used separately or can be joined so that all three outputs will trigger any connected camera when any LED channel is turned on. When shutters are joined, all three outputs will use the same shutter profile. This can be toggled in either the serial control interface or the settings control page.

Joining shutters can also be used in case a shutter output is somehow broken, as was the case in our version.

Serial Interface

This device has a USB serial connection available through the Arduino library package. The default baud rate is 115200. The baud rate can only be changed through the serial connection. Disable newlines in the console if necessary - the interface will be buggy if you don't.

The serial connection can be used to change settings not available in the display interface, change internal names, and run LED tests without the display. It can also be used to diagnose problems. When in the serial interface, you can press 'h' to show a help menu to help navigate the system.

Settings/troubleshooting options available through the serial connection:

- Reset serial baud rate (sets to 115200)
- Reset display touch calibration
- Reset channel/color names
- Change the serial baud rate
- Change channel/color names
- Toggling the verbose serial output
- Show free RAM
- Turn on patterns of LEDs or manually activate individual LEDs, one at a time.
- Resetting some settings saved in EEPROM. Resets serial baud rate, shutter joining, touch calibration values, display diagnostics mode, usage of custom arrays (which stops using arrays, but does not erase them,) and verbose serial.
- Resetting all data saved in EEPROM. This will erase profiles, all settings, display calibration values, and custom arrays, and will reset channel names and the serial baud rate. Only perform the clean erase if it is absolutely necessary.

Troubleshooting

Display Troubleshooting

No Image:

- Reseat cable.
- See if the 'Pin 13' LED on the Arduino Mega board is toggling when tapping
 - If not, then there may be an issue with the connection/cable.
- Try a more powerful power supply for the mainboard
 - It is possible that there is too much of a voltage drop from the power supply to the display. (This actually has more to do with the wires of the power supply, but a more powerful one will likely have thicker wires.)
- Test backlight
 - Use a bright light on the display and see if any image is barely visible. Point light at the top left/right corners and see if the blue border at the top of the display is there.
 - See if the black screen changes at all in tone or color on power-up, indicating that there is power, but no image sent to the device.
- Check connector for continuity

The screen has light, but no clear image:

- Reseat cable.
- Check cable.

No touch control:

- Reseat cable.
- Try re-calibrating through the serial

LED Troubleshooting

Single LED not lighting:

- Run a baseline test (like a ring or column scan) with a skip of '1' and see if the problem persists.
- Test LED using the Single LED function.
 - If it lights, check the Positions menu to make sure the LED is not disabled.
- Reseat 8-pin LED connectors.
- Turn current to the minimum amount, test LEDs again, or unplug the potentiometers and see if the LED lights very dimly.
 - If this works, the power supply may not be sufficient.
- Check connections on current adjustment potentiometers
 - If the connection is intermittent, try reseating. If still intermittent, new parts may be needed.
 - Shorting all four connectors together will also work, which will run the LEDs at full power.
- Make sure the power indicator LEDs are steadily lit when trying to light power LEDs.
 - If the LEDs flicker, the power supply is not sufficient.
- Pinch/move around the blue inline splices on the dome, see if the connection is intermittent.
- Try moving the LEDs to a different channel. Be careful when changing channels: some LED colors may require a lower maximum current! If you aren't sure, set all channels to minimum current while running device.

- Check voltage/current to LEDs manually.

LED Ring/Column is not lighting:

- Try activating LEDs in Single LEDs function. Check that the LEDs are not disabled in the positions menu.
- Reseat 8-pin connectors.
- Pinch/move around any blue connectors for the ring/column and see if the connection is intermittent.

Known Issues

- When controlling single LEDs, setting a shutter profile may switch to the last channel. Channel can be changed back after it is accidentally set.