

This presentation contains confidential and proprietary information belonging exclusively to Universal Instruments Corporation. Any use, dissemination, distribution, or copying of this presentation is strictly prohibited without prior written authorization from Universal.



LED Application: Best Practice

Revision F – 04-2014

LED Application Best Practices

Table of Contents:

1. LED Process Challenges
2. Universal LED Application
3. LED Procedures & Machine Settings
4. Frequently Asked Questions
5. Additional Resources

LED Process Challenges:

The advancement of LED technology has brought forth process issues that include...

- LED's sticking to carrier tape / tape pocket: This is caused by the "sticky" silicone encapsulant of the LED, which can cause it to get stuck in the bottom of the tape pocket or tipped on its side if the dome makes contact with the tape pocket side wall prior to pick.
- Sticking to the mylar after advancement of the feeder: Similar to the issues listed above, the silicone encapsulant can also cause issues with the LED sticking to the Mylar tape during "peel-back", which can cause the LED to flip on its side or upside down in the tape pocket.
- Sticking to the nozzle after placement: The same silicone stickiness issues, coupled with the vacuum pressure of a SMT nozzle, can cause significant placement issues due to an unwillingness of the LED to release from the nozzle during this process. Factors, such as nozzle material, vacuum pressure, placement speeds, PCB flex and even temperature, play a large role in the placement performance of your LED application.
- Negative effects of increased temperature: LED manufactures utilize special silicones, which become more malleable and tacky when subjected to higher temperatures. This improves the effectiveness, efficiency and lifespan of the LED during operation yet decreases pick and place performance.

Universal LED Application:

Universal has developed a complete LED application to handle these issues and ensure optimal performance. The next several pages will provide more information on each piece of the Universal LED application.

Dependent upon an LED's physical characteristics, one or several pieces of the application will be required.

For Universal application information specific to many popular LEDs, please go to:

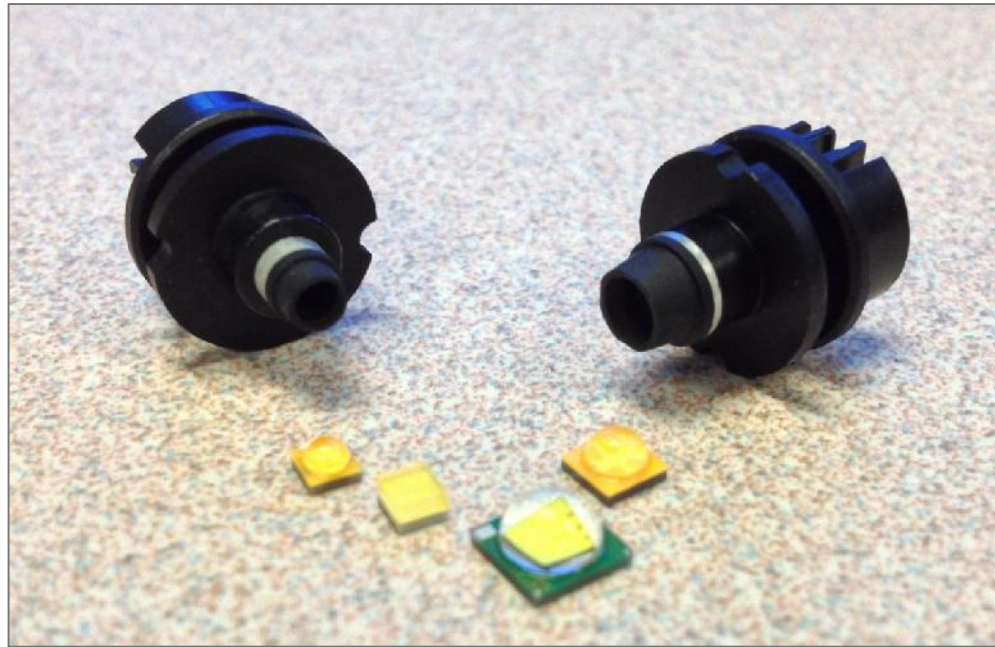
<http://parts.uic.com/complete-led-solution/>

LED Application Components:

- Pick & Place Nozzle
- LED Feeder
- PCB Board Support
- LED Special Software

Universal LED Application:

- LED Nozzle



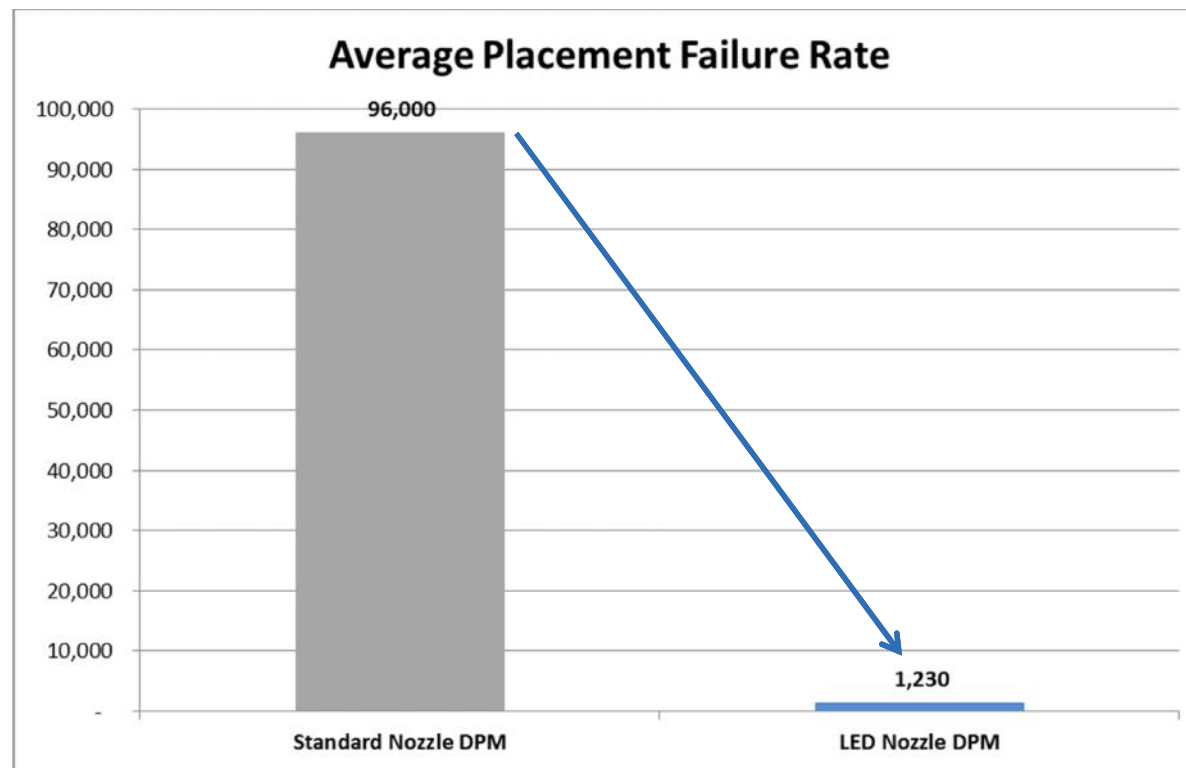
Universal offers a full array of LED nozzles for 30-, 7- and 4-spindle heads. Whether you're picking and placing a silicone-domed, flat-type, or other LED variant, the optimally designed nozzle is available. Each nozzle utilizes the best possible material and tip geometry to handle the unique characteristics of a given LED.

Universal LED Application:



Application Analysis Results: Placement Performance

- Popular silicone-encapsulated LED
- Highlights LED nozzle's ability to release sticky silicone LED at placement



Universal LED Application:

- LED Feeder



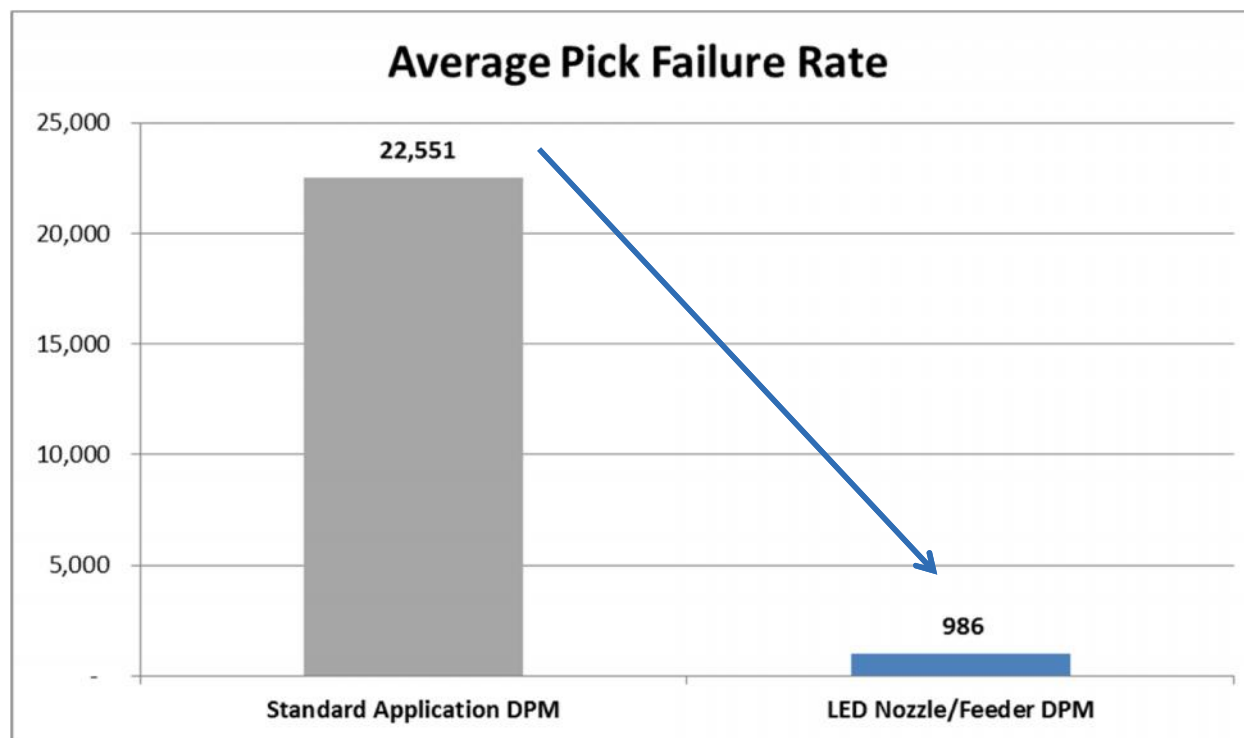
Silicone-encapsulated LEDs can present issues during the pick process with a tendency to stick to both the tape pocket and the Mylar tape cover. Universal offers specialized LED feeders and feeder retrofits, which ensure proper LED positioning and eliminate Mylar-related failures for superior pick performance.

Universal LED Application:



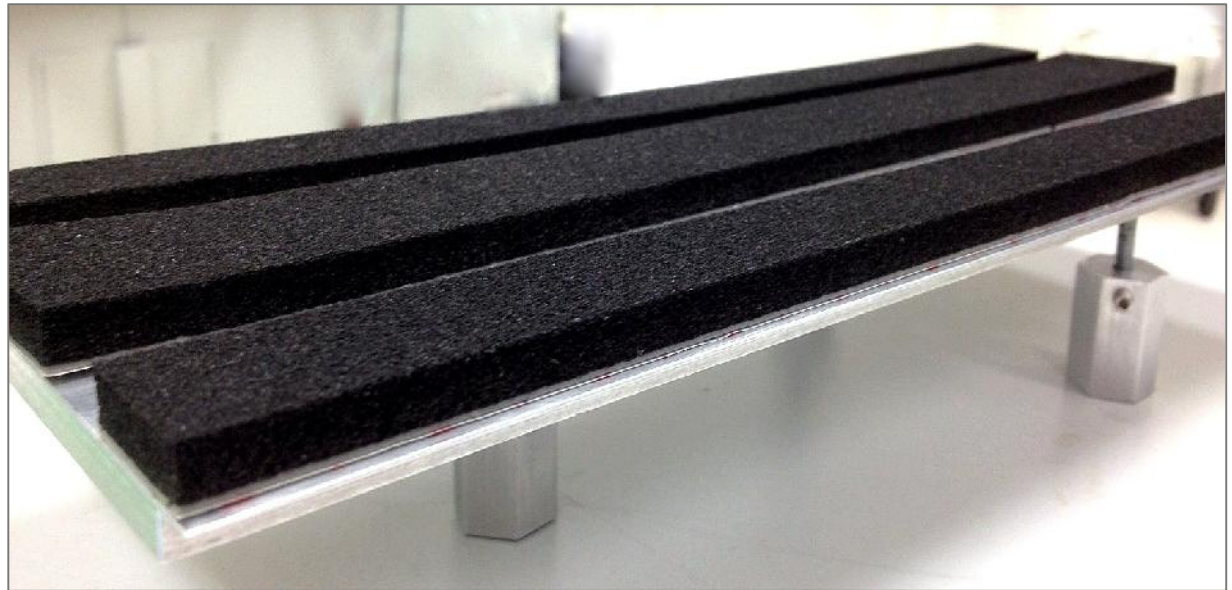
Application Analysis Results: Pick Performance

- Demonstrates importance & effectiveness of Universal's LED nozzle & feeder technology
- LED Feeder drastically reduced Mylar & packaging related errors.
- Nozzle designed to handle packaging clearance & maintain optimal component pick position



Universal LED Application:

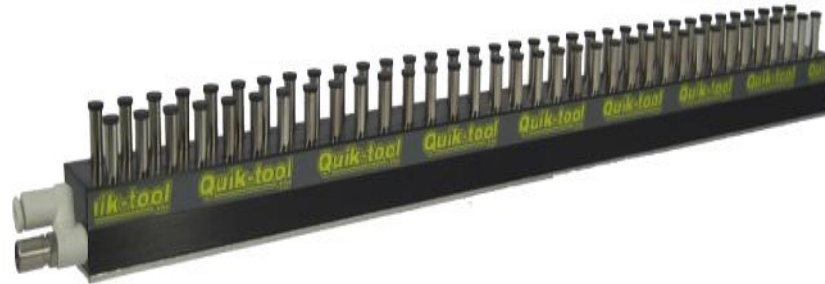
- LED Board Supports



Many LED printed circuit boards require additional board support to guarantee peak performance during placement of LEDs.

Universal has several board support options to fit varying application demands, including the Adjustable Board Support Plate with Memory Foam.

Universal LED Application:



Also available is the Universal Quik-tool Automatic SMT board supports.

Standard Supports may be used depending on board characteristics.

Please contact the Universal application team to ensure you have the proper board support in your Universal Placement Machines.

Set proper Board support height per applicable documentation.

Universal LED Application:

- LED Software Special



For exceptional LED performance on 30-spindle placement heads, Universal's LED software upgrade incorporates specialized machine parameters to enhance placement performance. The LED software upgrade leverages a combination of special timing, air kiss and variable placement speeds to handle the latest-generation LEDs.

- Software Level of UPS+ 8.5.0.7 needed for Genesis/Advantis machines.
- Fuzion Software Levels 1.1.0.2, 1.1.0.3 or 1.1.1.0 for Fuzion machines.
- Verify Lightning Firmware updated to Daughterboard DSP1 + DSP2 FBGA Part # 50322010.

LED Procedures & Machine Settings:

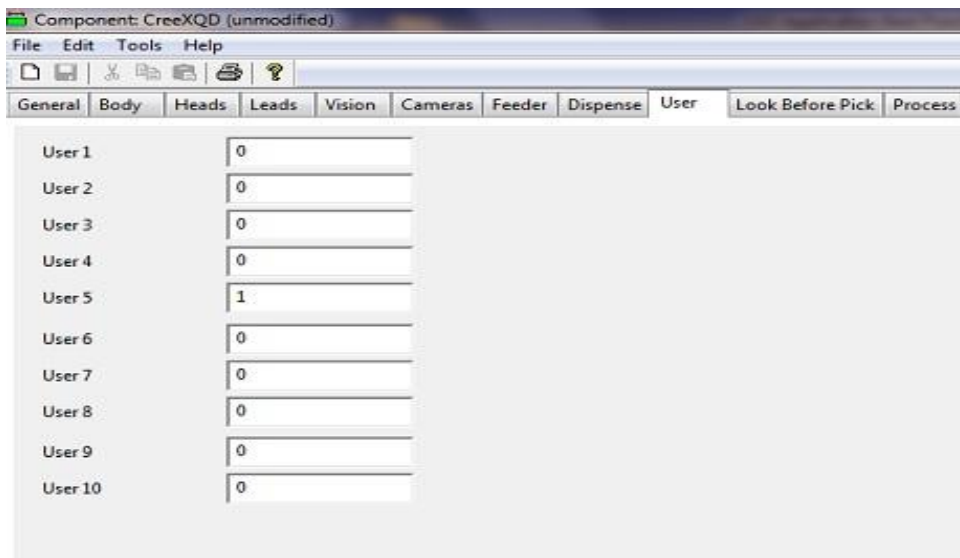
- Component Database Settings

Head	Head	Nozzle 1	Nozzle 2	Pressure	Place Delay	Accuracy	Placement Slew	Drive to TD	PreOrient	APU	Part Sense	Pick	Motion	Center	Place
1	HSC	H144		150	0.000	Standard	Reduced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Fast	Fast	Fast	Fast
>				150	0.000	Standard	Normal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>				

- Set Placement Slew to reduced. Reduced slew will reduce the velocity of the Z-axis at place.
- Set Head Settings, Pick, Motion, Center and Place, to Fast. Fast setting keeps the time the LED is on the spindle to a minimum. LED software makes appropriate changes to placement.
- Keep APU off, or unchecked. With APU off, Pick location will remain as it was originally taught. Universal machine will not update pick.

LED Procedures & Machine Settings:

- Component Database Settings

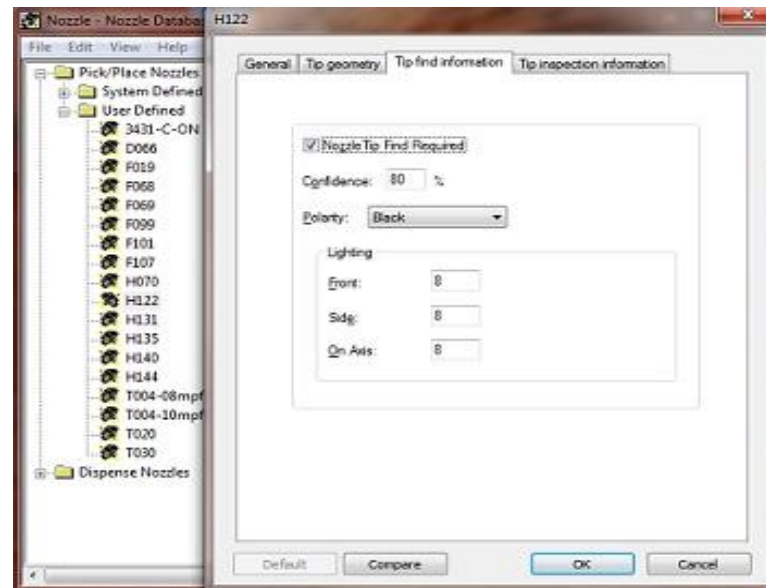


User	Value
User 1	0
User 2	0
User 3	0
User 4	0
User 5	1
User 6	0
User 7	0
User 8	0
User 9	0
User 10	0

- Only applicable to machines with Universal's 30-spindle LED special software.
- Set User Field 5 from 0 to 1. When set, it will activate LED software changes for that component. LED software is component specific. This prevents non-LED components from being slowed down.

LED Procedures & Machine Settings:

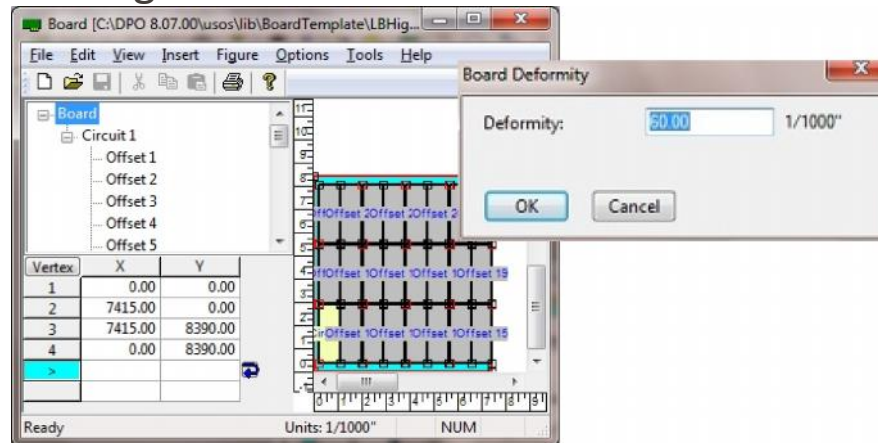
- Nozzle Database Settings



- Only applicable to 30-spindle placement heads.
- Turn Nozzle Centering and Nozzle Contamination ON.
- Verifies machine is finding the center of the nozzle to ensure proper pick of LED.
- Verifies Nozzle is not contaminated and causing miss-picks.

LED Procedures & Machine Settings:

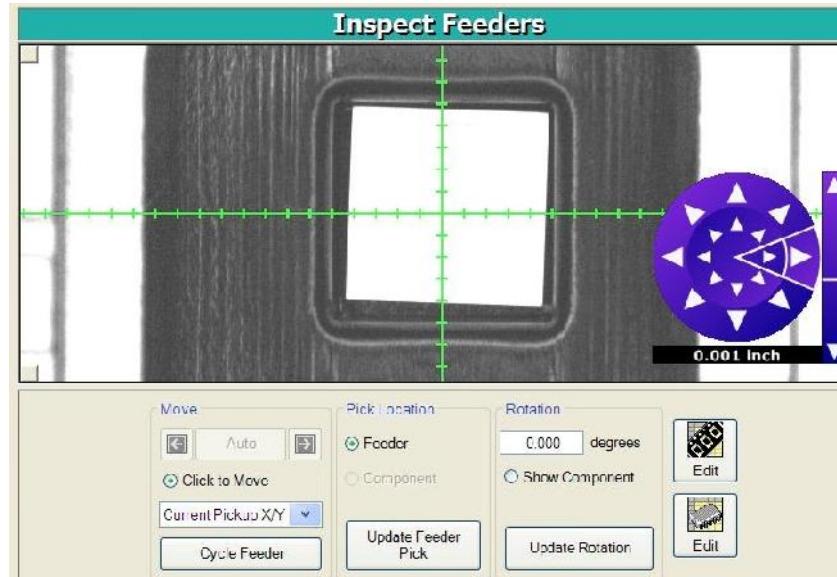
- Software and Hardware Settings



- In board template, go to tools and set Board Deformity equal to or greater than 1.5mm/.060".
- Board Deformity can compensate for inconsistent board flatness from board to board during production.
- Set Nozzle Pre-Pick Mode to either "When Board is Available" or "Off". Do not set to Immediate. Immediate will leave LED's on the nozzle longer and will increase the possibility of LED's sticking to the nozzle.
- Set Vision Diagnostics Level to 1.
- Set Head Regulators to 70 PSI and all Vacuum valves on per Voyager.

LED Procedures & Machine Settings:

- Process Parameters



- Feeder Teach Center of LED Pocket, which gives the most flexibility for the component to move in the pocket.
- Teach Center of LED Pocket in NPI before running 1st Board and after each reel change.
- Verify LED placements with NPI to ensure proper placement of LED onto corresponding pad site/solder paste deposit.
- Stencil thickness of .015mm/.006" and stencil apertures to manufacturer's recommendations.

Frequently Asked Questions:

Q. What is the advantage of buying LED nozzles from Universal?

A. Universal's Custom Tooling Group has tested many types of materials for LED nozzles; from metals, ceramics, woods, plastics/Teflon, and urethanes, along with many others to find the best material for the LED nozzles.

Our team of experts has run millions of LED components, under high-speed camera and different environmental conditions to design, test and validate the best performing LED nozzles in the market. Our nozzles have special features which limit vacuum pressure, thereby reducing the propensity of the LED to stick to the nozzle tip during placement. Unlike non-Universal made nozzles, ours are ESD safe and backed by our team of experts with a combined 90+ years of experience. The biggest LED lighting manufacturers in the world use only Universal LED nozzles because they understand the cost of each miss-pick, miss-placement and scrapped component.

Q. Can I use the same nozzle for multiple LEDs?

A. Not Typically. In some cases the LED's have the same or very similar body styles where they can use the same nozzle. In most cases, however, LEDs have unique physical characteristics and need a nozzle designed specifically for it to process properly.

Frequently Asked Questions:

Q. Why do I need a special feeder window?

A. Led Feeder Windows ensure proper Mylar peel-back point and keeps the LED from sticking to the Mylar tape during index. Additionally, these windows contain the component in the proper pick position during final index prior to pick.

Q. What feeders can be upgraded to use a special feeder window?

A. HP Gold and Gold Plus can be upgraded to use the LED feeder windows.

Q. What sizes of feeders can be upgraded?

A. 8 and 12MM Feeders can be upgraded, along with some other larger sizes. Please contact the Custom Tooling Group (see last page) to see if your feeders are upgradable and what your options are if they are not.

Q. Do ION Feeders need special feeder windows?

A. Universal has done extensive testing with the ION feeder and they perform very well with the LED advancement and pick process. Please contact Universal to verify your ION feeders will process the LEDs properly as standard, or if they will need an upgrade.

Frequently Asked Questions:

Q. What is the importance of board supports?

A. Proper board support is needed so the board does not move or flex when placing the LEDs. Any movement/flexing of the PCB during placement will prevent the LED from releasing from the nozzle tip properly.

Q. Why are there different board supports?

A. Universal has multiple board supports designed to support the variety of PCB styles. PCB characteristics such as overall size and thickness of the PCB, along with process steps the PCB goes through, such as Pin and Paste and others, will affect the board support needed.

Q. How do I know what board support to purchase?

A. Please contact the Custom Tooling Group (see last page) and we'll determine the proper board support for your PCBs and processes.

Q. What Head types can use the LED Special Software?

A. The LED special software was designed only for Universal's 30-spindle placement head. To this date, we have not seen a need on the 4 or 7 spindle heads.

Frequently Asked Questions:

Q. Why do I need special software for my Universal Placement Equipment?

A. Universal has designed and tested a software upgrade that will optimize the air flow (air kiss) and the Z-axis motion of the placement head to improve the placement performance of the LED and is designed to eliminate the LEDs from sticking to the nozzle after placement. Universal has tested over 1,000,000 components against the LED Software special to find the best machine parameters to include in this upgrade.

Q. Does every LED need this special software?

A. No. Each LED has size, shape and material characteristics that determine the placement challenges. So far, our testing has shown silicone domed or cubed LEDs will require the LED special software. Please contact the Custom Tooling Group (see last page) and we will recommend the necessary software configuration.

Q. What Level of software is needed for LED special?

A. Universal UPS+ 8.5.0.7 and multiple versions of Fuzion software are equipped with LED software. Please contact Universal to verify if your software is LED equipped.

Q. What if I do not have UPS+ 8.5.0.7 or Fuzion software?

A. Please contact Universal to see what options are available for a software upgrade.

Additional Resources:

For up-to-date Universal application information for many popular LEDs, go to:

<http://parts.uic.com/complete-led-solution/>

Or contact the Universal Custom Tooling Group at:

Richard Buchanan
Sr. Applications Technician

buchanan@uic.com

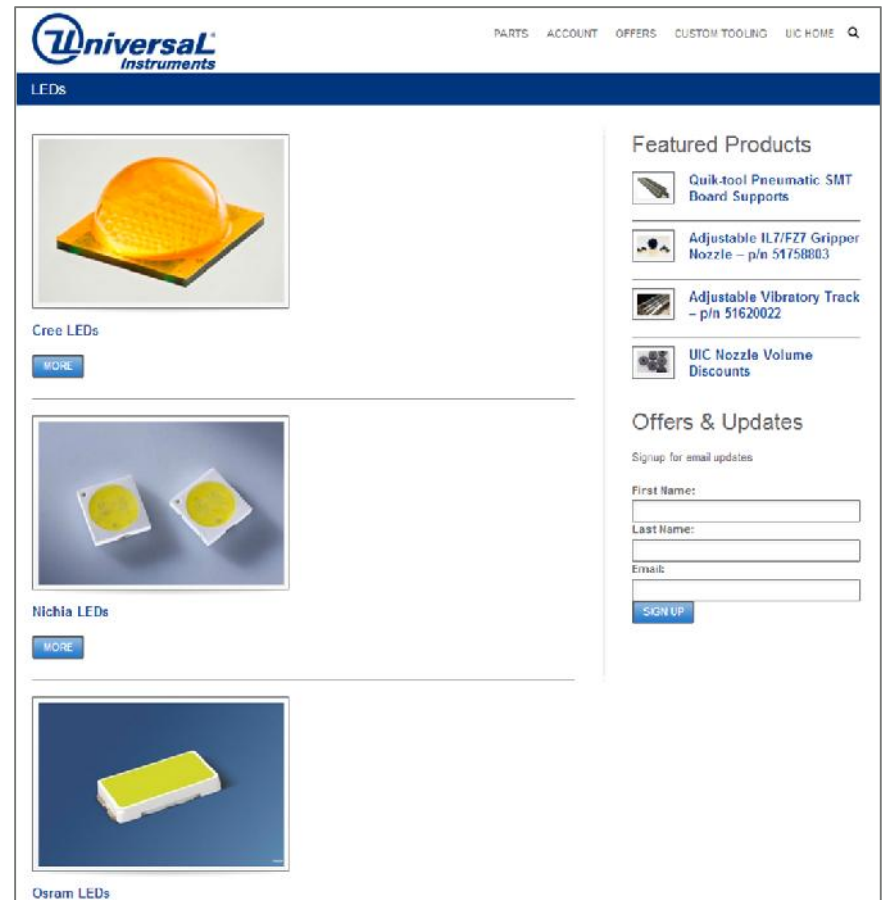
Ph: +1 607.779.5038

Justin Poet

General Manager, Production Tooling

justin.poet@uic.com

Ph: +1 607.779.7206



The screenshot displays the Universal Instruments website. At the top, the navigation menu includes 'PARTS', 'ACCOUNT', 'OFFERS', 'CUSTOM TOOLING', and 'UIC HOME'. The main content area is titled 'LEDs' and features three product categories: 'Cree LEDs' with a 'MORE' button, 'Nichia LEDs' with a 'MORE' button, and 'Osram LEDs' with a 'MORE' button. Each category includes a representative image of an LED component. On the right side, there are sections for 'Featured Products' listing items like 'Quik-tool Pneumatic SMT Board Supports', 'Adjustable IL7/FZ7 Gripper Nozzle - p/n 51758803', 'Adjustable Vibratory Track - p/n 51620022', and 'UIC Nozzle Volume Discounts'. Below this is an 'Offers & Updates' section with a 'Signup for email updates' form containing fields for 'First Name', 'Last Name', and 'Email', along with a 'SIGN UP' button.