

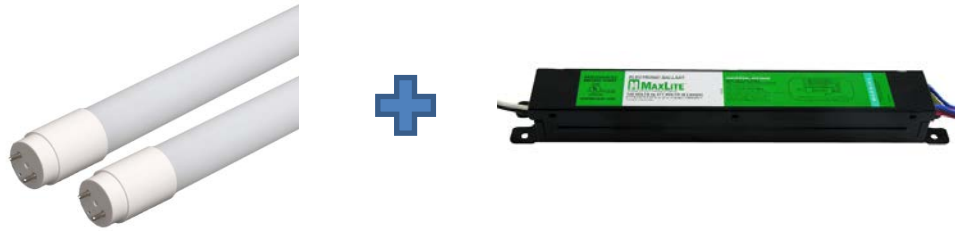
THE RISE OF TLEDs: WHAT HAVE WE LEARNED?

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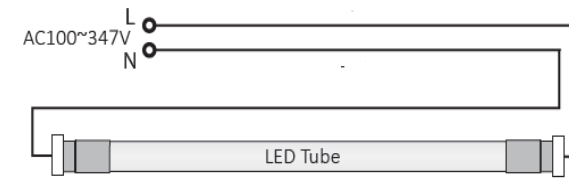
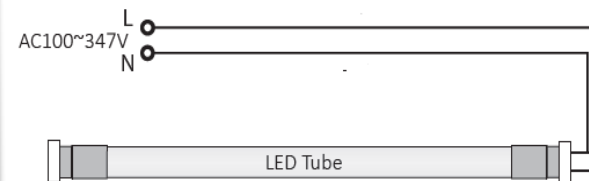
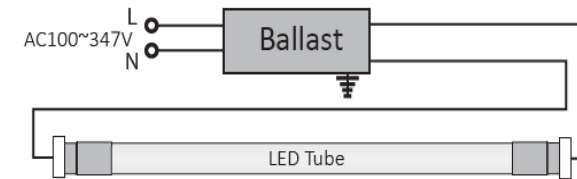
Plug & Play (ballast compatible):
UL Type-A



Integrated Driver (ballast bypass):
UL Type-B



External Driver: **UL Type-C**



Hybrid: **UL Type-A & UL Type-B**



Not all ballast compatible TLEDs are created equal

Ballast Compatibility

- Ballast types: instant-start, programmed-start, programmed-start dimmable, emergency battery backup
- Ballast changes from batch to batch
- Discontinued ballasts

UL TYPE-A: OPERATION

Do all plug and play products operate similarly? Do they all change wattage and light output?

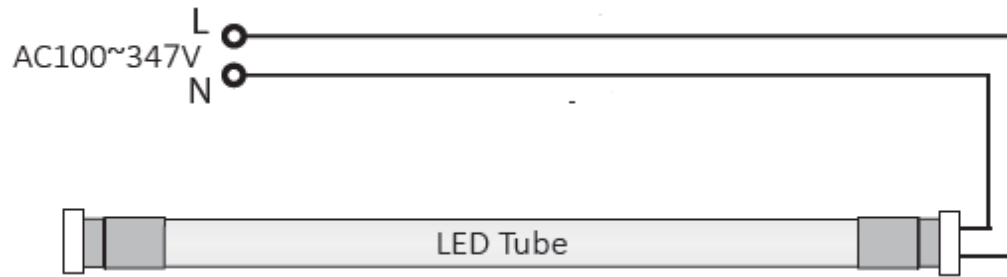
	Average System Watts (W)			Initial Lumens		
Bare Lamp Watts (W)	Low Ballast Factor (0.78)	Normal Ballast Factor (0.88)	High Ballast Factor (1.18)	Low Ballast Factor (0.78)	Normal Ballast Factor (0.88)	High Ballast Factor (1.18)
15	16	18	25	1600	1800	2500

Using Type-A TLEDs (under-loading a ballast) reduces the ballast case temperature and extends ballast life. True or False?

- Electrolytic capacitor = “weakest” component of the ballast
- Life of electrolytic capacitor is either doubled or halved for every 10°C change in operating temperature
- Type-A TLEDs are consuming less power = less strain on the ballast = cooler operating temp = longer ballast life?

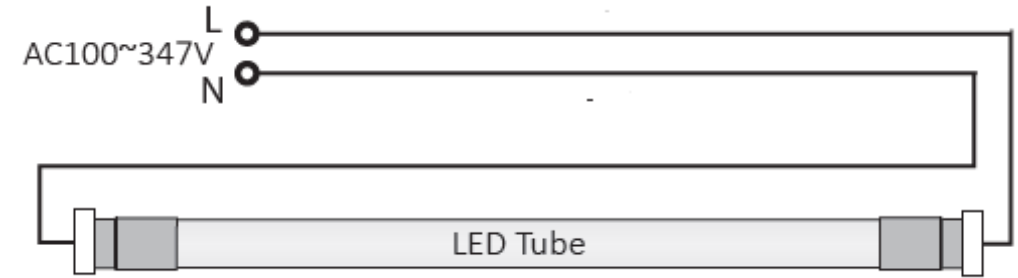
How do Type-A TLEDs perform with dimming ballast?

- Limited ballast compatibility
- Limited dimming range
- Limited test data



Single-ended power

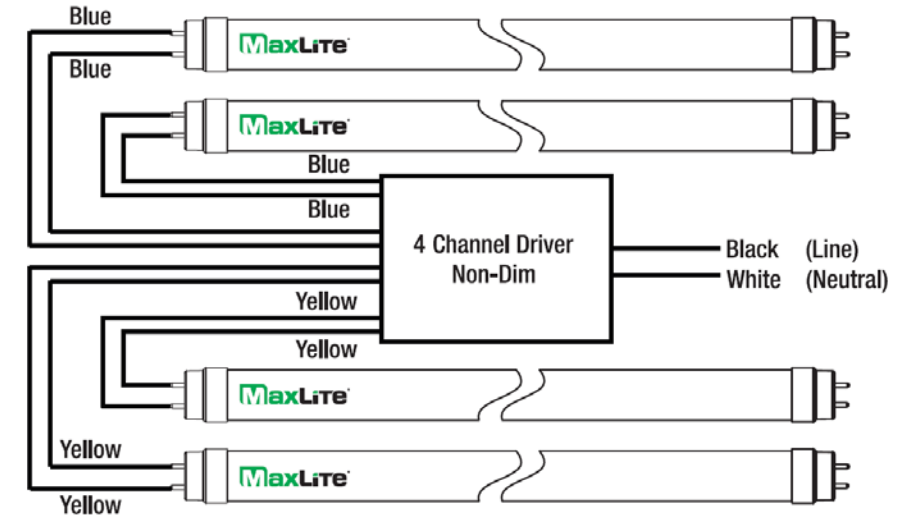
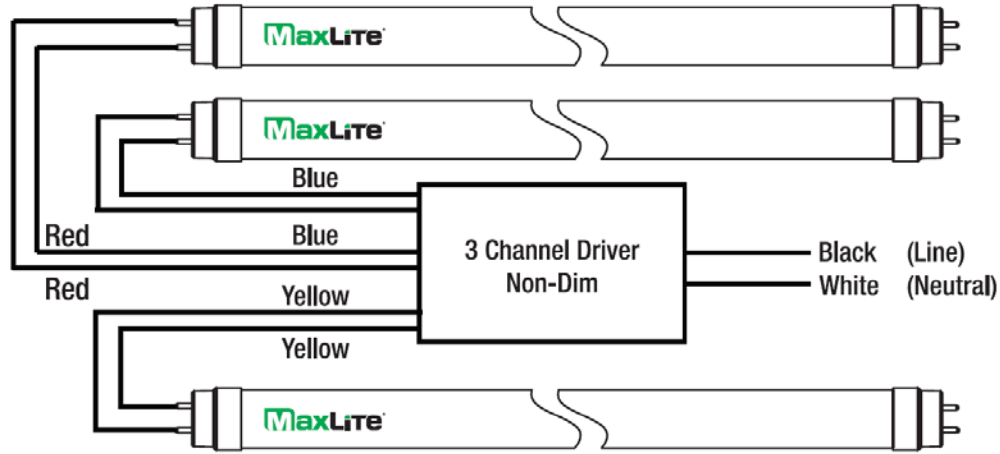
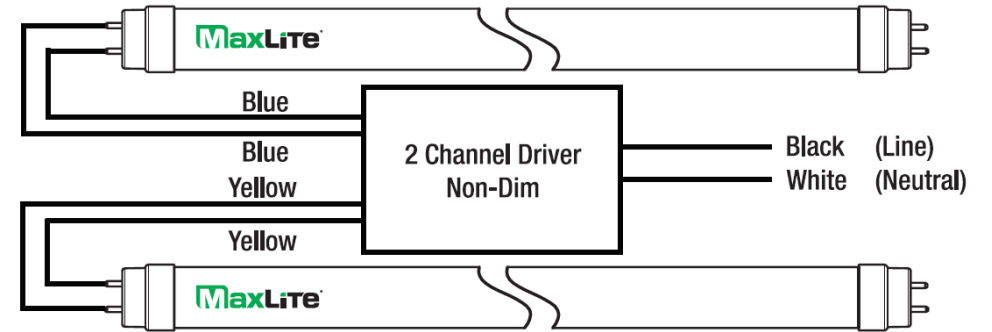
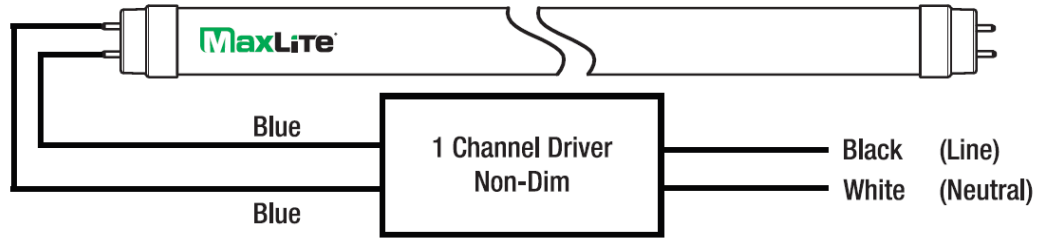
- Bypass existing fluorescent ballast
- Require at least (1) non-shunted lamp holder per lamp
- Direct line voltage to one end



Double-ended power

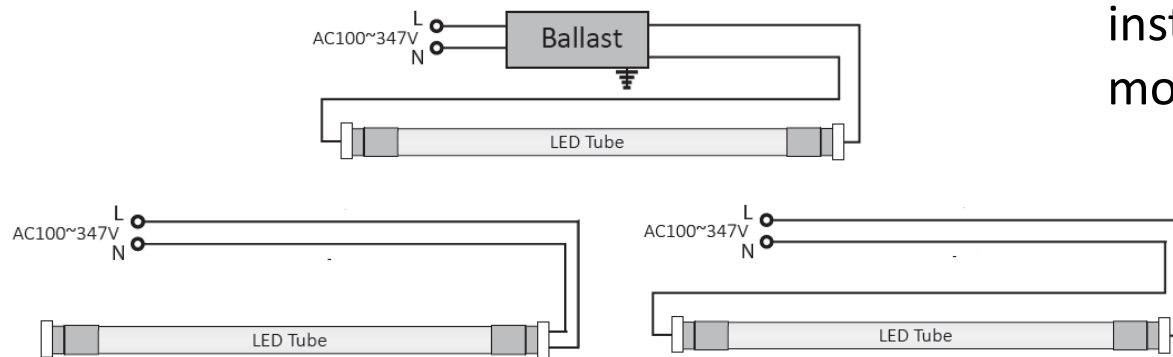
- Bypass existing fluorescent ballast
- Can use existing shunted lamp holders found in fluorescent luminaires with instant-start ballasts
- May require a safety switch to meet UL safety certification

EXTERNAL DRIVER: UL TYPE-C



- Can be used to operate with existing compatible fluorescent ballasts
- Can be used with direct line voltage and bypass existing fluorescent ballasts (rewiring necessary)

- Issues/Concerns
 - Hybrid products labeling
 - Some hybrid products are marked only “Type-A” or “Type-B”
 - Field installation when switching from Type-A to Type-B
 - Type-B (ballast bypass) installation requires warning labels intended to be installed in the fixture after it has been modified



MAXLITE SALES % BASED ON TECHNOLOGY



	T8	T5
Plug & Play (Type-A)	34%	100%
Line Voltage (Type-B)	66%	n/a
External Driver (Type-C)	n/a	n/a
Hybrid (A & B)	n/a	n/a

Note: The percentage shown above does not reflect the actual industry distribution.

- Built-in sensors
- Connected lighting - wireless control
- White tunable, color tunable, grow light
- Built-in battery backup
- DC powered - PoE (Power over Ethernet)



Thank You!

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