# FULHAM PRESENTS A COMPREHENSIVE **IGGUIDE**

A resource for past and present lighting innovations and lighting solutions



# LIFE CAN'T GRIND TO A HALT JUST BECAUSE THE SUN GOES DOWN

Wherever there is civilization, there is man-made light. When humanity tamed fire, we found many things to burn for cooking and for seeing in the dark. Sticks, fats, tar, oils, natural gas, you name it. From cavemen to Ancient Greeks to cowboys around campfires, people puzzled over the phenomena of lightning and magnetism, suspecting some sort of link. (Turns out they were right.) Mankind's natural curiosity led us to investigate further, but let's fast-forward to lighting as we know it today, touching on the main categories.

## INCANDESCENT

The incandescent lamp -- popularly called the "light bulb" -- came into widespread use roughly a century ago. Incandescence is produced by a heated, glowing filament sealed in a gas-filled (or vacuum) tube. Electricity surges in; a filament heats up; the bulb glows, produces light. (It also produces higher local temperatures and utility bills.)

## HALOGEN

Halogen lamps are souped-up incandescent bulbs with a tungsten filament. The filament is engulfed in inert gas, spiked with one of the halogen group of gases. When the tungsten heats up, its interaction with the gases triggers a chemical reaction appropriately labeled the halogen



cycle. During this cycle, tungsten atoms stream from the bulb's inside surface and back onto the tungsten filament. The lamp can therefore run safely at higher temperatures, can last longer, and has the added benefit of shining proportionately brighter per unit of electricity flowing through it.

## HID

High Intensity Discharge (HID) lamps fall into the gasdischarge lamp category. This means that their light output comes from electricity coursing between tungsten electrodes inside a tube filled with gas and metal salts. Sparking the arc

charges the salts into a "plasma" that glows intensely -- hence the word "intensity." But despite their brilliance, HID lamps consume less energy than incandescent or fluorescent lamps, delivering more lumens per watt. HIDs' internal



phosphor coating delivers a powerful and broad light spectrum, making them highly desirable for many uses in the home, in commerce and in industry.

# FLUORESCENT

Fluorescent lights are basically airtight tubes full of reactive gases that light up when electricity charges up their atoms, which then become



or Mercury Atom Visible Light

... fluorescent. Compact fluorescent lamps (CFLs) are often either self-ballasted, screw-in based lamps or pinbased replacement lamps that operate using fluorescent technology in various residential and commercial applications, based on their relatively small sizes.

Glass Tube

#### INDUCTION

Induction lighting is a hybridized form of fluorescent lighting, so it involves no electrodes. The "ignition system" isn't internal; it's not even electrical. The "spark plug" is a high frequency electromagnetic field,



usually generated outside the tube. Since there are no electrodes constantly heating up and cooling down, there are no electrodes to eventually burn out. This means longer, more efficient lamp life.

#### LED

Light Emitting Diode (LED) lamps operate by electroluminescence -- an optical phenomenon in which electrical current (in this case, flowing through a semiconductor) triggers light emission as it passes through certain materials. LED lamps use 30% less power compared with HID lighting, and generate



less heat. They're instant switching, with a superb brightness-to-size ratio and are far longerlasting than incandescent lamps. This makes them ideal for many lighting applications.

### PHOTOLUMINESCENT

Photoluminescence (PL) is a phenomenon that lets certain substances absorb and hold photons, then re-emit them after the photon source is gone. It's like a rebound of the light the substance was exposed to. This is how glow-in-the-dark toys and signs work. PL is non-toxic,

non-radioactive, and independent of electricity. It requires no batteries either, making it 100% dependable and highly cost effective. Super long-lasting PL can't experience power failure, because, as long as it is fully charged, it will "replay" that light when it's needed! This makes PL emergency lighting

-- easily visible even in smoke and darkness -- ideal for safety code compliance nationwide.

If I have seen further than other men, it is because I have stood upon the shoulders of giants. -- Sir Isaac Newton (1642 - 1727)

# fulham. ON THE SHOULDERS OF GIANTS

According to the ancient parable he was citing, even a dwarf can see further than a giant if he stands on the giant's shoulders. Sir Isaac -- indisputably an intellectual giant himself -- modestly credited the "shoulders of giants" for his success. The expression acknowledges the contribution of earlier workers for one's own achievements, since knowledge advances on the basis of previous knowledge.

But sometimes giants stand upon the shoulders of other giants. Consider the sequence of advances made by "giants" like Michael Faraday, James Maxwell, Nikola Tesla and Thomas Edison.

The solitary work of individual geniuses created a series of inspired lighting inventions. This established the foundation for a universe of practical applications, developed by later generations of scientists and technicians. The lonely eccentric's makeshift workshop has given way to extravagantly equipped lab complexes staffed with teams of trained researchers. Nowadays it is common to see close collaboration among colleagues half a world apart; speaking different languages; people from vastly divergent cultural backgrounds -- all working together in the common interest.

Technological and production advances will always be driven by inspired individual efforts. But in general, progress in our industry is the result of solid teamwork.

Nowhere is trans-national teamwork more evident than at Fulham. We are a worldwide company in manufacturing, marketing, sales and distribution. We also have world class R&D facilities in Asia and at the U.S. Headquarters, where we host an onsite UL testing facility. Our international research team includes some of the best brains in the industry, from many diverse backgrounds. All are united in Fulham's dedication to exceeding customer expectations. This commitment has grown us into a company that is truly trusted worldwide for cost-efficient lighting solutions.

# TABLE OF JORESCENT ELIABLE INDUSTRY STANDARD

| Commercial & Residential         | 12-30 |
|----------------------------------|-------|
| European Series Ballasts         | 12-13 |
| India Series Ballasts            | 14-15 |
| Middle Eastern Series Ballasts   | 16-17 |
| North America Series Ballasts    | 18-30 |
| Industrial & Specialty           | 31-33 |
| SineHorse Ballasts               | 31    |
| IceHorse Refrigeration Ballasts  | 32    |
| SunHorse UV and Tanning Ballasts | 33    |
| Lamps                            | 34-35 |
|                                  |       |

# LIGHTING SYSTEMS

# NDUCTION BRINGING NEW CLARITY TO BRILLIANCE

| 44-45 |
|-------|
| 44    |
| 44    |
| 45    |
| 45    |
| 48-50 |
| 48-50 |
| 51    |
| 52-53 |
|       |

# BREAKING NEW GROUND

| ThoroLED Drivers                                    | 60-63 |
|---|-------|
| Digital Addressable Drivers                         | 60-61 |
| Constant Current & Dimming Constant Current Drivers | 62-63 |
| Constant Voltage Drivers                            | 63    |
| ThoroLED Lamps                                      | 64-65 |
| PAR30 and PAR38 Lamps                               | 64    |
| MR16 Lamps  | 64    |
| Light Plugz/LED Light Engines                       | 65    |
| Light Engine Application Program (L.E.A.P)          | 66-67 |
| LED Modules   | 68-69 |
| Light Engine Solutions Guide                        | 70-73 |





6



HID AN ARC OF GENIUS



| Electronic HID Ballasts   | 80-82 |
|---|-------|
| Horticultural/Night Fishing Commercial Ballasts & Horticulture Hobby Ballasts         | 80    |
| Tanning Electronic MH Ballasts  | 81    |
| Industrial Electronic Ballasts  | 81    |
| European Series Electronic Ballasts   | 81    |
| Low Frequency Electronic MH Ballasts  | 82    |
| Magnetic HID Ballasts   | 83-85 |
| 5 Tap Metal Halide & High Pressure Sodium Core and Coil Ballasts                      | 83    |
| 5 Tap Metal Halide & High Pressure Sodium Core and Coil Lamp & Ballast Kits           | 83    |
| 4 Tap Metal Halide & High Pressure Sodium Core and Coil Ballasts                      | 84    |
| 4 Tap Metal Halide & High Pressure Sodium Core and Coil Lamp & Ballast Kits           | 85    |
| HID Lamps   | 86-89 |
| High Pressure Sodium & Standard Metal Halide Lamps                                    | 86    |
| Protected Metal Halide & Pulse Start Protected Metal Halide 2009 EISA Compliant Lamps | 87    |
| Ceramic Metal Halide Lamps  | 88-89 |
| Mercury Vapor Lamps   | 89    |
|   |       |

# EMERGENCY EXIT

CONTENTS

| LED Emergency Systems             | 94-97   |
|-----------------------------------|---------|
| HotSpot1                          | 94-95   |
| HotSpot2                          | 96-97   |
| Emergency Fluorescent Ballasts    | 98-100  |
| Emergency Exit Lighting & Signage | 101-105 |
| New York City Approved            | 102     |
| Chicago Approved                  | 103     |
| Exit Lighting                     | 103     |
| Exit Signage                      | 104     |
| Exit Combo Units                  | 105     |
| Accessories                       | 105     |
| FREELITE                          | 106     |

#### 글러크리 **ELECTRICITY REQUIRED**

| Exit Signs  | 110                             |
|---|---------------------------------|
| Custom Solutions                                      | 111                             |
| Lamp Compatibility Chart: WorkHorse, LongHorse & WHAM | 112-119                         |
| Wiring Diagrams: WorkHorse, LongHorse & WHAM          | 120-121                         |
| Custom Products                                       | 122                             |
| Warranty  | 123                             |
| Fulbam Co   | lpc www.fulbam.com 323-770-208( |

# FLUGRESCEN THE RELIABLE INDUSTRY STANDARD

Fluorescent light still accounts for a great deal of industrial, commercial, municipal and residential lighting. More sophisticated than incandescence, fluorescent light comes not from electrically "cooking" a filament inside the bulb, but from gases excited to brilliance by electricity flowing between two electrodes. That charge, triggered by a ballast, generates ultraviolet light, made visible by a phosphor coating inside the tube. A major benefit: it doesn't generate as much ambient heat as incandescence, burns up less electricity per unit of light and costs much less.



FUORESCEW

# Electromagnetism, Embryo

The ingenious English physicist and chemist Michael Faraday (1791-1867) was one of the most inspired experimental scientists in history. He proved the relationship between magnetism and electricity, which laid the foundation for electromagnetic theory.

His work with electromagnetic rotary devices led to the development of electric motors, the generator, and thus to the practical use of electrical power for home, industry and technology. It is Faraday who brought the terms electrode, cathode, anode, diode and others to the popular vocabulary. In a famous exchange between Queen Victoria (1819-1901) and Faraday, the monarch noted that his lab demonstrations were fascinating -- but of what practical use were they? Faraday is reputed to have replied, "Madam, of what use is a baby?"

Her Majesty was not amused.

Scottish-born James Maxwell (1831-1879) synthesized

research from several disciplines, including Farrady's initial work (magnetism, electricity, optics, classical physics), into the unified theory we now call Electromagnetism. This was his crowning achievement -- the one our industry is founded upon. Maxwell's breakthrough confirmed the suspected interrelationships among electricity, magnetism and light itself.

Michael Faraday

Maxwell's work is particularly important to daily life on Earth: his equations led to practical applications for the lighting industry. Maxwell's intuitive leap "connected the dots," producing the comprehensive theory of electromagnetism. Many believe that, without ideas advanced in Maxwell's Equations, Einstein's 1905 paper on relativity might not have been possible. (Einstein was born in 1879, the year Maxwell died. )



Fluorescence was a lighting technique first researched in 1857 by French physicist A.-E. Becquerel (1820 - 1891). He believed that light didn't necessarily have to come from heat, but also from chemical reactions. A respected experimenter with photo-voltaic processes, he coated tubes with various chemicals that could be excited to luminescence by

spraying electrons on them. This became full-fledged fluorescence when American engineer P.C. Hewitt (1861 - 1921) patented the mercury vapor lamp in 1901. Electrically charged vapors produce the glow inside the tube. It all seems so easy now: replacing nitrogen with mercury vapor creates a de facto filament, which, when electrified, produces invisible ultraviolet light, converted to visible light when it collides with the phosphorescent coating inside the lamp.

Edmund Germer (1901-1987) is credited by some historians as being the inventor of the first true fluorescent lamp. However, as we've seen, a great deal of work went into the development of fluorescent lamps prior to Germer. 22

# FLUORESCENT LIGHTING SYSTEMS

# OVER 800 MODELS COUNTLESS APPLICATIONS

# A Bit About Fluorescent Ballasts and Lamps

A ballast is an ignition device and regulator, which "fires up" a gas-filled lamp and regulates the current flowing through it. Ballasts are essential to the operation of fluorescent lighting and its offshoots (CFL, HID, etc.). They vary in complexity and function, but all limit and stabilize the flow of current in an electrical circuit.

#### THE LIGHT THAT CAME IN FROM THE COLD

Electric power in general is affected by heat and cold, and varies with ambient temperature. The same is true for lamps. If exposed to lower or higher than normal temperatures, their power decreases.

Fluorescent lamps dislike the cold, and they show it. Like people on a sub-zero day, they take longer to get going; longer to reach maximum performance. Their problem is the cold tube wall's unfriendly effect on the vapor inside the lamp, condensing it to lazy droplets. Only when the lamp warms can they become useful "lightable" vapor. As the temperature rises, so does illumination.

These charts track Lumen output for T8 and T5 lamps at ambient temperatures ranging from 5°C/41°F to 55°C/131°F.

The T8 performs more or less the same at both ends of the scale, with peak luminescence between 20°C/68°F and 30°C/86°F.

T5 is somewhat crankier in the cold, producing lower lumens for somewhat longer, reaching top output later, between 30°C/86°F and 40°C/104°F. This would seem to make T5s a better choice for tropical parking lots for example.

Fulham ballasts are engineered for optimal functioning of fluorescent lamps all across the use spectrum. Just two examples: IceHorse works T8 well in consistently low ambient temperatures like refrigerators, cold display cases and outdoor Siberian warehouses. SunHorse driving T12s is an excellent choice for germicidal purposes or your tanning salon. And so it goes.

# LIGHT OUTPUT VS TEMPERATURE



T5 LAMPS 110% 100% 90% 80% 70% LUMEN OUTPUT 60% **50%** 40% 30% 20% 10% 0% 5 10 25 55 15 20 30 35 40 45 50 **AMBIENT TEMPERATURE °C** 

8



# TYPICAL FLUORESCENT LAMP MORTALITY

#### **MEAN VS MEDIAN**

Here's what you can expect for fluorescent lamp lifespan, expressed as a "rated lifespan." Don't confuse that with either "average lifespan" or "mean lifespan," which is calculated by adding up the working hours of all lamps tested, then dividing by the total number of lamps.

Instead, rated life indicates the median lifespan, the point when 50% of all tested lamps expired and the other 50% were still going strong. Following the 50% mortality line across, we see that half of the lamps in the test sample were still alive and kicking at 100% rated life span.

# **DID YOU KNOW?** WHERE GLASS TUBES COME FROM

There are three basic techniques for shaping glass. The most ancient one -- seen in TV documentaries or old classroom films -- is blowing. The craftsman collects a blob of molten glass on the end of a long metal pipe, then gently blows through the pipe into the blob. He does not inhale. Bad idea. He shapes the glass by blowing while turning the pipe, occasionally re-heating his creation. When it reaches the desired form and thickness, it is cooled down and snapped from the pipe. Blowing can be done, more uniformly, by machine.

Glass can also be "pressed," dropping the molten discharge from the oven into a mold and pressing on it, like a waffle iron. This is the preferred way to make glass containers, ovenware and items like ash trays or platters. Fulhan Fulhan Fulhan Fulhan Fulhan Fulhan

The third method is "drawing." The glass is either flattened (windows, mirrors) or teased into tubes (fluorescent lamps, test tubes). For fluorescent tubes, molten glass is drawn in to coat the inside surface of a rotating cylinder. Air blows through it, forming a continuous tube as it exits the cylinder and cools. The tube is then cut into desired lengths.

All three methods require controlled reheating and cooling for molecular bonding to prevent shattering.



# FLUORESCENT LIGHTING SYSTEMS

- COMPLETE FLUORESCENT SYSTEMS WITH PREMIUM FULHAM LAMPS AND BALLASTS
- > OVER 800 SYSTEM MODELS
- > TRIED AND TRUE, RELIABLE TECHNOLOGY THAT WILL CONTINUE TO BE EMBRACED FOR MANY YEARS TO COME





# **COMMERCIAL & RESIDENTIAL BALLASTS**



**INDUSTRIAL** 

**& SPECIALTY** 

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COUNTLESS FLUORESCENT LAMP APPLICATIONS

REFRIGERATION, GERMICIDAL, TANNING, SIGNAGE









LAMPS

CFL, LINEAR



fulham. sugar cube.











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LAMPS

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# 230 50/60Hz

# Fulham. RACEHORSE FLUORESCENT ELECTRONIC BALLASTS

#### FEATURES

- ENEC / VDE / EMC certified
- Designed to CE requirements
- Programmed Preheat Lamp Start
- Cut-Off Technology
- End of Life Protection (EOL)
- High Power FactorActive Power Factor Control (APFC)
- Auto-Restart
- Standard distances between the mounting holes
- Solid Housing and Electronics
- 5 Year Warranty 50,000 hour life

#### COMMON SPECIFICATIONS

| APPLICATIONS                   | 5 |
|--------------------------------|---|
| <ul> <li>Decorative</li> </ul> |   |

- Architectural
- Industrial
- Commercial
- Wall Washing / Flood Lighting

| Input Voltage:                       | 220 - 240 VAC (±10%)        | Automatic Restart after lamp change: | Yes                             |
|--------------------------------------|-----------------------------|--------------------------------------|---------------------------------|
| Power Line Frequency:                | 50/60Hz                     | Cut-Off Technology:                  | Yes                             |
| Overvoltage Consistency (V AC, 1h):  | 320                         | End of Life Protection (EOL):        | Yes                             |
| Power Factor - APFC (λ):             | ≥ 0.96                      | Case Material:                       | CFL: Thermoplast - T5/T8: Metal |
| Line Current Harmonics:              | < 10%                       | Immunity:                            | EN 61547                        |
| Lamp Operating Frequency:            | > 42,000Hz                  | Harmonic Content:                    | EN 61000-3-2                    |
| Preheat Lamp Start (Seconds):        | ≤1.5                        | Radio Interference Suppression:      | EN 55015                        |
| Max. Case Hot Spot Temperature Tc:   | 70°C                        | ENEC, VDE, CE:                       | EN 60929:2006-03                |
| Ambient Temperature: CFL: -25°C to + | 60°C; T5/T8: -25°C to +50°C |                                      | EN 61347-1:2001+A1              |
| Expected Service Life at Ta max.:    | 50,000 hours                |                                      | EN 61347-2-3: +A1+A2            |
|                                      |                             |                                      |                                 |

CFL LAMP OPERATION Ballast Size 1 (L x W x H in mm): 103 x 67 x 31 - Ballast Size 2 (L x W x H in mm): 123 x 79 x 31

|                   | BALLAST |     | TC-DEI | (Quad) |     |     | TC  | -TEL (Tri | ple) |     | TC-L (Tw | vin Hi-Lumen) | TC-SEL | . (Twin) |
|-------------------|---------|-----|--------|--------|-----|-----|-----|-----------|------|-----|----------|---------------|--------|----------|
| BALLASTS          | SIZE    | 10W | 13W    | 18W    | 26W | 13W | 18W | 26W       | 32W  | 42W | 18W      | 21W           | 9W     | 11W      |
| RHS 230 113 C CFL | 1       | 1   | 1      |        |     | 1   |     |           |      |     |          |               | 1      | 1        |
| RHS 230 118 C CFL | 1       |     |        | 1      |     |     | 1   |           |      |     |          |               |        |          |
| RHS 230 142 C CFL | 1       |     |        |        | 1   |     |     | 1         | 1    | 1   | 1        | 1             |        |          |
| RHS 230 213 C CFL | 2       | 2   | 2      |        |     | 2   |     |           |      |     |          |               | 2      | 2        |
| RHS 230 218 C CFL | 2       |     |        | 2      |     |     | 2   |           |      |     |          |               |        |          |
| RHS 230 232 C CFL | 2       |     |        |        | 2   |     |     | 2         | 2    |     |          |               |        |          |
| RHS 230 242 C CFL | 2       |     |        |        |     | T   |     |           |      | 2   |          |               |        |          |

T5 LAMP OPERATION Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

BALLAST T16 (T5) TC-L (Twin Hi-Lumen) **BALLASTS** SIZE 14W 21W 28W 35W 49W 54W 80W 55W RHS 230 135 L T5 1 1 RHS 230 149 L T5 1 RHS 230 154 L T5 1 RHS 230 180 L T5 2 RHS 230 235 L T5 2 2 2 2 2 RHS 230 249 L T5 2 2 RHS 230 254 L T5 2 RHS 230 414 L T5 2 3/4

T8 LAMP OPERATION Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

|                  | BALLAST |     | <b>T26</b> (T8) |     | TC-L (Twin Hi-Lumen) |     |     |     |  |  |  |
|------------------|---------|-----|-----------------|-----|----------------------|-----|-----|-----|--|--|--|
| BALLASTS         | SIZE    | 18W | 36W             | 58W | 18W                  | 24W | 36W | 40W |  |  |  |
| RHS 230 118 L T8 | 1       | 1   |                 |     | 1                    |     |     |     |  |  |  |
| RHS 230 136 L T8 | 1       |     | 1               |     |                      | 1   | 1   | 1   |  |  |  |
| RHS 230 158 L T8 | 1       |     |                 | 1   |                      |     |     |     |  |  |  |
| RHS 230 218 L T8 | 1       | 2   |                 |     |                      |     |     |     |  |  |  |
| RHS 230 236 L T8 | 1       |     | 2               |     | 2                    |     | 2   |     |  |  |  |
| RHS 230 258 L T8 | 1       |     |                 | 2   |                      |     |     |     |  |  |  |
| RHS 230 418 L T8 | 2       | 3/4 |                 |     |                      |     |     |     |  |  |  |

## 230 50/60Hz

#### TUILIAM. PACEHORSE DIMMABLE FLUORESCENT ELECTRONIC BALLASTS

#### FEATURES

- Designed to CE requirements
- ENEC/VDE Certified
- Programmed Preheat Lamp Start
- Dimming 0-10V
- Cut-Off Technology
- End of Life Protection (EOL)
- High Power Factor
- Active Power Factor Control (APFC)
- Auto-Restart
- · Standard distances between the mounting holes
- Solid Housing and Electronics
- 5 Year Warranty 50,000 hour life

#### COMMON SPECIFICATIONS

| Input Voltage:                    | 220 - 240 VAC      | Automatic Restart after lamp change: | Yes                             |
|-----------------------------------|--------------------|--------------------------------------|---------------------------------|
| Power Line Frequency:             | 50/60Hz            | Cut-Off Technology:                  | Yes                             |
| Input Power Factor (PF) (λ):      | >0.98              | End of Life Protection (EOL):        | Yes                             |
| Line Current Harmonics (THD):     | <10%               | Case Material:                       | CFL: Thermoplast - T5/T8: Metal |
| Dimming Interface:                | 0 to 10V           | Immunity:                            | EN 61547                        |
| Lamp Operating Frequency:         | > 42,000Hz         | Harmonic Content:                    | EN 61000-3-2                    |
| Lamp Starting Type:               | Programmed Preheat | Radio Interference Suppression:      | EN 55015                        |
| Preheat Time [S]:                 | < 1,5              | ENEC, VDE, CE:                       | EN 60929:2006-03                |
| Overvoltage Protection [V, hr]:   | Yes                |                                      | EN 61347-1:2001+A1              |
| Undervoltage Protection [V]:      | Yes                |                                      | EN 61347-2-3: +A1+A2            |
| Expected Service Life at Ta max.: | 50,000 hours       | ]                                    |                                 |
|                                   |                    |                                      |                                 |

CFL LAMP OPERATION Ballast Size 1 (L/W/H in mm): 103 x 67 x 31 Ballast Size 2 (L/W/H in mm): 123 x 79 x 31

|                                | BALLAST | TC-DEL (Quad) |     |     |     |     | TC-TEI | T16R (T5 Circline) |     |     |     |
|--------------------------------|---------|---------------|-----|-----|-----|-----|--------|--------------------|-----|-----|-----|
| BALLASTS                       | SIZE    | 10W           | 13W | 18W | 26W | 13W | 18W    | 26W                | 32W | 22W | 40W |
| RHD 230 140 C CFL              | 1       |               |     |     |     |     |        |                    |     | 1   | 1   |
| RHD 230 213 C CFL <sup>†</sup> | 2       | 2             | 2   |     |     | 2   |        |                    |     |     |     |
| RHD 230 218 C CFL <sup>†</sup> | 2       |               |     | 2   |     |     | 2      |                    |     |     |     |
| RHD 230 232 C CFL <sup>†</sup> | 2       |               |     |     | 2   |     |        | 2                  | 2   |     |     |

T5 LAMP OPERATION Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

|                                       | BALLAST |     |     | T1  | <b>6</b> (T5) |     |     |
|---------------------------------------|---------|-----|-----|-----|---------------|-----|-----|
| BALLASTS                              | SIZE    | 14W | 21W | 28W | 35W           | 39W | 54W |
| RHD 230 135 L T5 <sup>†</sup>         | 1       | 1   | 1   | 1   | 1             |     |     |
| RHD 230 235 L T5 <sup>+</sup>         | 2       | 2   | 2   | 2   | 2             |     |     |
| RHD 230 139 L T5                      | 1       |     |     |     |               | 1   |     |
| RHD 230 239 L T5 <sup>†</sup>         | 2       |     |     |     |               | 2   |     |
| RHD 230 154 L T5                      | 1       |     |     |     |               |     | 1   |
| RHD 230 254 L T5 <sup>+</sup>         | 2       |     |     |     |               |     | 2   |
| RHD 230 414 L T5                      | 2       | 4   |     |     |               |     |     |
| RACEHORSE DIMMABLE AUTO-DIM           |         |     |     |     |               |     |     |
| RHDC 230 135 L T5                     | 1       | 1   | 1   | 1   | 1             |     |     |
| <b>RHDC 230 235 L T5</b> <sup>†</sup> | 2       | 2   | 2   | 2   | 2             |     |     |

T8 LAMP OPERATION Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

|                               | BALLAST | <b>T26</b> (T8) |     |     |
|-------------------------------|---------|-----------------|-----|-----|
| BALLASTS                      | SIZE    | 18W             | 36W | 58W |
| RHD 230 136 L T8 <sup>†</sup> | 1       |                 | 1   |     |
| RHD 230 236 L T8 <sup>†</sup> | 2       |                 | 2   |     |
| RHD 230 158 L T8 <sup>†</sup> | 1       |                 |     | 1   |
| RHD 230 258 L T8 <sup>†</sup> | 2       |                 |     | 2   |
| RHD 230 418 L T8              | 2       | 4               |     |     |

1



- Architectural
- Industrial
- Commercial
- Wall Washing / Flood Lighting

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6-00 B - 30 E

Dimmable



240 50/60Hz

. Fulh<u>am</u>.



**INDIA SERIES** 

#### COMMON SPECIFICATIONS

| Operating Voltage:     | 240VAC±10%            |  |  |
|------------------------|-----------------------|--|--|
| Frequency:             | 50/60Hz               |  |  |
| Starting Type:         | Rapid Start           |  |  |
| Starting Temperature:  | 0°C                   |  |  |
| Ballast Max Case Tempe | erature: 158ºF (70ºC) |  |  |
| Sound Rating:          | "A"                   |  |  |
| CCF:                   | < 1.7                 |  |  |
|                        |                       |  |  |
| High Power Factor:     | 9.<                   |  |  |



**T5/T8 FLUORESCENT ELECTRONIC BALLASTS** 

#### MASTER MODEL NUMBER REFERENCE (Example)



- $\label{eq:HSC} \text{HSC} = \text{Passive Power Factor Correction} + \text{Rapid Start}$
- NSC = Normal Power Factor + Rapid Start (Economic)

INDIA SERIES 240 50/60Hz

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# Model Number Description HSC 240 111 YCF 0AA 1X11W<35% THD CFL D/E 4 PIN</td> HSC 240 118 YCF 0AA 1X18W<35% THD CFL D/E 4 PIN</td> HSC 240 136 HT8 0AA 1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)</td> HSC 240 136 XT8 0AA 1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)</td> HSC 240 136 XT8 0AA 1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)</td>

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Туре

Economic

Economic

Termination

Connector

Connector

| HSC 240 136 HT8 0AA | 1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)  | Economic     | Wire      |
|---------------------|--|--------------|-----------|
| HSC 240 136 XT8 0AA | 1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)  | Economic     | Wire      |
| HSC 240 118 XT8 0AA | 1X18W<35% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)  | Economic     | Wire      |
| HSC 240 118 HT8 0AA | 1X18W<35% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)  | Economic     | Wire      |
| HSC 240 136 XT8 OAE | 1X36W<30% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)  | Economic     | Wire      |
| HSC 240 218 HT8 OAB | 2X18W<30% THD FTL T8 (Also for 2X20W T12 and 2X18W PLL "L" lamps)  | Economic     | Wire      |
| HSC 240 136 UT8 OAB | 1X36W<30% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)  | Economic     | Wire      |
| HSC 240 114 UT5 OAB | 1X14W<30% THD FTL T5   | Economic     | Wire      |
| HSC 240 124 UT5 0AB | 1X24W<30% THD FTL T5   | Economic     | Wire      |
| HSC 240 128 UT5 0AB | 1X28W<30% THD FTL T5   | Economic     | Wire      |
| HSC 240 136 HT8 OAB | 1X36W<30% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)  | Commercial   | Wire      |
| HSC 240 118 HT8 OAB | 1X18W<30% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)  | Commercial   | Wire      |
| HSC 240 114 HT5 0AB | 1X14W<30% THD FTL T5   | Commercial   | Wire      |
| HSC 240 124 HT5 0AB | 1X24W<30% THD FTL T5   | Commercial   | Wire      |
| HSC 240 128 HT5 0AB | 1X28W<30% THD FTL T5   | Commercial   | Wire      |
| HPY 240 236 IT8 0AB | 2X36W< 30% THD FTL T8 (Also for 2X40W T12 and 2X36W PLL "L" lamps) | Standard     | Connector |
| HPY 240 218 IT8 0AB | 2X18W< 30% THD FTL T8 (Also for 2X20W T12 and 2X18W PLL "L" lamps) | Standard     | Connector |
| HPY 240 214 IT5 0AB | 2X14W< 30% THD FTL T5  | Standard     | Connector |
| HPY 240 224 IT5 0AB | 2X24W< 30% THD FTL T5  | Standard     | Connector |
| HPY 240 228 IT5 0AB | 2X28W< 30% THD FTL T5  | Standard     | Connector |
| HPY 240 111 CCF 0AB | 1X11W< 30% THD CFL D/E 4 PIN                                       | Standard     | Connector |
| HPY 240 211 CCF 0AB | 2X11W< 30% THD CFL D/E 4 PIN                                       | Standard     | Connector |
| HPY 240 118 CCF 0AB | 1X18W< 30% THD CFL D/E 4 PIN                                       | Standard     | Connector |
| HPY 240 218 CCF 0AB | 2X18W< 30% THD CFL D/E 4 PIN                                       | Standard     | Connector |
| HPY 240 126 CCF 0AB | 1X26W< 30% THD CFL D/E 4 PIN                                       | Standard     | Connector |
| HPY 240 226 CCF 0AB | 2X26W< 30% THD CFL D/E 4 PIN                                       | Standard     | Connector |
| HPY 240 136 IT8 OAE | 1X36W<20% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)  | Professional | Connector |
| HPY 240 236 IT8 0AE | 2X36W<20% THD FTL T8 (Also for 2X40W T12 and 2X36W PLL "L" lamps)  | Professional | Connector |
| HPY 240 118 IT8 OAE | 1X18W<20% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)  | Professional | Connector |
| HPY 240 218 IT8 OAE | 2X18W<20% THD FTL T8 (Also for 2X20W T12 and 2X18W PLL "L" lamps)  | Professional | Connector |
| HPY 240 114 IT5 OAE | 1X14W<20% THD FTL T5   | Professional | Connector |
| HPY 240 214 IT5 OAE | 2X14W<20% THD FTL T5   | Professional | Connector |
| HPY 240 128 IT5 0AE | 1X28W<20% THD FTL T5   | Professional | Connector |
| HPY 240 228 IT5 0AE | 2X28W<20% THD FTL T5   | Professional | Connector |
| HPY 240 124 IT5 OAE | 1X24W<20% THD FTL T5   | Professional | Connector |
| HPY 240 224 IT5 OAE | 2X24W<20% THD FTL T5   | Professional | Connector |

**MIDDLE EASTERN SERIES** 

#### 127 • 220 • 120-240 50/60Hz



#### FEATURES

- Rapid Start
- High Power Factor (HPF)
- End of Life (EOL) Protection
- Multiple Lamp Operation
- Suitable for T8 and T12 Operation
- Solid Housing and Compact Case

#### **APPLICATIONS**

- Decorative Lighting
- Indoor Architectural Lighting
- Outdoor Architectural Lighting
- Commercial and Industrial Lighting



#### COMMON SPECIFICATIONS 127 & 220V

| Input Voltage:        | 127V ± 10%, 50/60Hz<br>220V ± 10%, 50/60Hz |
|-----------------------|--|
| Power Factor:         | > 0.98                                     |
| Efficacy Factor:      | > 88%                                      |
| THD:                  | < 10%                                      |
| Current Crest Factor: | < 1.7                                      |
| EMI/RFI Compliance:   | FCC PART 18<br>non-consumer                |
| Sound Rating:         | "A"  |
| Ballast Type:         | Rapid Start                                |
| Voltage Transients:   | ANSI 62.41                                 |
| Min. Operating Temp.: | 10ºC (14ºF)                                |
| Max. Case Temp.:      | 75⁰C (167⁰F)                               |
| Approvals/Class:      | UL Listed, Class P<br>1 Outdoor            |

#### LAMP OPERATION 127 & 220V

| Model Number  | # of Lamps      | Lamp Туре                      |  |  |
|---|-----------------|--------------------------------|--|--|
| WHSG5 127 T12 $RS^{\dagger}$  | 1 x, 2 x        | F36T8, F40T12                  |  |  |
| WHSG6 127 T12 RS <sup>†</sup>   | 1 x, 2 x        | F18T8, F20T12                  |  |  |
| WHSG9 127 T12 RS  | 2 x<br>3 x, 4 x | F36T8, F40T12<br>F18T8, F20T12 |  |  |
| WHSG5 220 T12 $RS^{\dagger}$  | 1 x, 2 x        | F36T8, F40T12                  |  |  |
| WHSG6 220 T12 RS <sup>†</sup>   | 1 x, 2 x        | F18T8, F20T12                  |  |  |
| WHSG9 220 T12 RS  | 2 x<br>3 x, 4 x | F36T8, F40T12<br>F18T8, F20T12 |  |  |
| $\label{eq:WHCG5-127/220-Ballast Size (mm): 235 L x 40 W x 25.4 H \\ WHCG6-127/220 - Ballast Size (mm): 235 L x 40 W x 25.4 H \\ WHCG9-127/220 - Ballast Size (mm): 255 L x 40 W x 25.4 H \\ \end{aligned}$ |                 |                                |  |  |

#### COMMON SPECIFICATIONS 120-240V

| Input Voltage:        | 120V-240V ± 10%, 50/60Hz        |
|-----------------------|---------------------------------|
| Power Factor:         | > 0.98                          |
| Efficacy Factor:      | > 88%                           |
| THD:                  | < 10%                           |
| Current Crest Factor: | <1.7                            |
| EMI/RFI Compliance:   | FCC PART 18<br>non-consumer     |
| Sound Rating:         | "A"                             |
| Ballast Type:         | Rapid Start                     |
| Voltage Transients:   | ANSI 62.41                      |
| Min. Operating Temp.: | 10°C (14°F)                     |
| Max. Case Temp.:      | 75°C (167°F)                    |
| Approvals/Class:      | UL Listed, Class P<br>1 Outdoor |

#### LAMP OPERATION MLT 120-240V

| Model Number                  | # of Lamps      | Lamp Type                                     |
|-------------------------------|-----------------|---|
| WHSG5 MLT T12 RS <sup>†</sup> | 1 x, 2 x        | F36T8, F40T12                                 |
| WHSG6 MLT T12 RS <sup>†</sup> | 1 x<br>2 x      | F18T8, F36T8, F20T12, F40T12<br>F18T8, F20T12 |
| WHSG9 MLT T12 RS <sup>†</sup> | 2 x<br>3 x, 4 x | F36T8, F40T12<br>F18T8, F20T12                |

WHCG5-MLT - Ballast Size (mm): 235 L x 40 W x 25.4 H WHCG6-MLT - Ballast Size (mm): 235 L x 40 W x 25.4 H WHCG9-MLT - Ballast Size (mm): 255 L x 40 W x 25.4 H



† These products have previously been tested as per SASO guidelines and comply with the SASO standards. If you are interested in your shipment being accompanied by a SASO conformity certificate, this can be arranged at cost for the testing. Please contact the Middle East regional office for details.

#### MIDDLE EASTERN SERIES

#### 127 • 220 50/60Hz



#### **FEATURES**

- Rapid Start
- High Power Factor (HPF)
- End of Life (EOL) Protection
- Multiple Lamp Operation
- Suitable for T8 and T12 Operation
- Solid Housing and Compact Case

#### COMMON SPECIFICATIONS

| 127V ± 10%, 50/60Hz<br>220V ± 10%, 50/60Hz |  |  |
|--|--|--|
| > 0.98                                     |  |  |
| > 88%                                      |  |  |
| < 25%                                      |  |  |
| < 1.7                                      |  |  |
| "A"  |  |  |
| Rapid Start                                |  |  |
| ANSI 62.41                                 |  |  |
| 10ºC (14ºF)                                |  |  |
| 75⁰C (167⁰F)                               |  |  |
|  |  |  |

#### BALLAST SIZES (mm)

| WHCG5 127 T12 RS   | H 25.4, W 43.7, L 240.5 |
|--------------------|-------------------------|
| WHCG5 127 T12 RS L | H 25.4, W 43.8, L 240.5 |
| WHCG6 127 T12 RS   | H 25.4, W 43.7, L 240.5 |
| WHCG6 127 T12 RS L | H 25.4, W 43.8, L 240.5 |
| WHCG9 127 T12 RS   | H 25.4, W 40, L 255     |
| WHCG5 220 T12 RS   | H 25.4, W 40, L 235     |
| WHCG5 220 T12 RS L | H 25.4, W 43.8, L 240.5 |
| WHCG6 220 T12 RS   | H 25.4, W 43.7, L 240.5 |
| WHCG6 220 T12 RS L | H 25.4, W 43.8, L 240.5 |
| WHCG9 220 T12 RS   | H 25.4, W 40, L 255     |
|                    |                         |

#### **APPLICATIONS**

- Decorative Lighting
- Indoor Architectural Lighting
- Outdoor Architectural Lighting
- Commercial and Industrial Lighting



#### LAMP OPERATION

**ON GRADE** 

**.UORESCENT** 

| Model Number                                 | # of Lamps      | Lamp Type / Designation                       |  |
|--|-----------------|---|--|
| WHCG5 127 T12 RS<br>WHCG5 127 T12 RS L*†     | 1 x, 2 x        | F36T8, F40T12                                 |  |
| WHCG6 127 T12 RS<br>WHCG6 127 T12 RS L*†     | 1 x<br>2 x      | F18T8, F20T12, F36T8, F40T12<br>F18T8, F20T12 |  |
| WHCG9 127 T12 RS                             | 2 x<br>3 x, 4 x | F36T8, F40T12<br>F18T8, F20T12                |  |
| WHCG5 220 T12 RS<br>WHCG5 220 T12 RS L*†     | 1 x, 2 x        | F36T8, F40T12                                 |  |
| WHCG6 220 T12 RS<br>WHCG6 220 T12 RS L*†     | 1 x, 2 x        | F18T8, F20T12                                 |  |
| WHCG9 220 T12 RS                             | 2 x<br>3 x, 4 x | F36T8, F40T12<br>F18T8, F20T12                |  |
| *Ballasts with lead wire lengths as follows: |                 |   |  |

| Black  | 630mm   |
|--------|---------|
| White  | 630mm   |
| Rod    | 730mm   |
| Rluo   | 710mm   |
| Vallow | 1010mm  |
| renow  | 1210000 |



† These products have previously been tested as per SASO guidelines and comply with the SASO standards. If you are interested in your shipment being accompanied by a SASO conformity certificate, this can be arranged at cost for the testing. Please contact the Middle East regional office for details.

#### 120 · 230 · 277 50/60Hz



#### FEATURES

Versatile

- Energy Saving
- High Power Factor
- Lightweight
- Small Case Size
- Solid-State Electronics

# 10 BALLASTS OPERATE 132 LAMPS IN 860 COMBINATIONS

#### COMMON SPECIFICATIONS

| Operating Voltage:                             | 120VAC ± 10%                                 | Protection/Output:                        | Open/Shorted Lamp         |  |
|--|--|---|---------------------------|--|
|  | 230VAC ± 10%<br>277VAC ± 10%                 | Regulatory Approvals:                     | UL Listed Type1 or Type 2 |  |
| Frequency:                                     | 50/60Hz                                      | High Power Factor:                        | > .90                     |  |
| ATHD:  | Meets ANSI C82.11-1993 Open Circuit Voltage: |   | 600V RMS Max.             |  |
| Protection/Input:                              |  | Ballast Min. Operating Temp.:             | -20°F (-30°C)             |  |
| Over Current:                                  | Fuse   | Ballast Maximum Case Temp.:               | 158⁰F (70⁰C)              |  |
| Transient Protection: C62.41 Class A 7 strikes |  | Ballast Lamp Starting Mode: Instant Start |                           |  |
| EMI: FCC CFR Title 47 Part 18 non-consumer     |  | Inherent Thermal Protection               | Class P                   |  |
|  |  | Sound Rating                              | "A"                       |  |

NOTE: Frequently switched, short duration ON/OFF cycles with any Instant Start ballast will reduce lamp life. Please contact your lamp manufacturer for details.

(VL

|                     | WORKHORSE 1  | WORKHORSE 2  | WORKHORSE 22   | WORKHORSE 3   | WORKHORSE 33  |
|---------------------|--|--|--|---|---|
| Model No. 120V      | WH1-120-L  | WH2-120-L<br>WH2-120-C (BLS)   | WH22-120-L<br>WH22-120-C (BLS)   | WH3-120-L<br>WH3-120-C (BLS)  | WH33-120-L<br>WH33-120-C (BLS)                      |
| Max. Current 120VAC | .20 AMP  | .33 AMP  | .32 AMP  | .56 AMP   | .53 AMP   |
| Model No. 230V      | N/A  | WH2-230-L  | N/A  | WH3-230-L   | N/A   |
| Max. Current 230VAC |  | .26 AMP  |  | .29 AMP   |   |
| Model No. 277V      | WH1-277-L  | WH2-277-L<br>WH2-277-C (BLS)   | WH22-277-L<br>WH22-277-C (BLS)   | WH3-277-L<br>WH3-277-C (BLS)  | N/A   |
| Max. Current 277VAC | .11 AMP  | .15 AMP  | .15 AMP  | .24 AMP   |   |
| Max. Power          | 28W  | 35W  | 35W  | 64W   | 64W   |
| Black/White Wires   | 12"  | L-18" C-12"  | L-18" C-12"  | L-18" C-12"   | L-18" C-12"   |
| Red/Yellow Wires    | 24"  | L-36" C-12"  | L-36" C-12"  | L-36" C-12"   | L-36" C-12"   |
| Ballast Sizes       | 120L: H .75", W 1", L 6"<br>277L: H .75", W 1", L 7.5" | L: H 1", W 1", L 5.5"<br>120C: H 1", W 1.75", L 3.3"<br>277C: H 1", W 2.3", L 3.3" | L: H 1", W 1", L 5.5"<br>120C: H 1", W 1.75", L 3.3"<br>277C: H 1", W 2.3", L 3.3" | L: H 1", W 1.5", L 6.5"<br>120C: H 1", W 2.5", L 3.8"<br>277C: H 1", W 3.1", L 3.8" | L: H 1", W 1.5", L 6.5"<br>C: H 1", W 3.1", L 3.82" |
| Weight              | 4.5 oz.  | 7 oz.  | 7 oz.  | 10 oz.  | 10 oz.  |
| Case Qty/Wgt        | 50 pcs. 15 lbs.  | 50 pcs. 22 lbs.  | 50 pcs. 22 lbs.  | 50 pcs. 32 lbs.   | 50 pcs. 32 lbs.                                     |

Refer to pages 112-119 for lamp compatibility. Refer to pages 120 and 121 for wiring diagrams.





|                         | WORKHORSE 4             | WORKHORSE 5  | WORKHORSE 6   | WORKHORSE 7   | WORKHORSE 8                |
|-------------------------|-------------------------|--|---|---|----------------------------|
| Model No. 120V          | WH4-120-L               | WH5-120-L  | WH6-120-L   | WH7-120-L<br>WH7-120-H                                      | WH8-120-L                  |
| Max. Current 120VAC     | .56 AMP                 | 1.15 AMP   | 1.04 AMP  | 1.82 AMP  | 1.8 AMP                    |
| Model No. 230V          | N/A                     | WH5-230-L  | N/A   | WH7-230-L   | WH8-230-L                  |
| Max. Current 230VAC     |                         | 0.57 AMP   |   | 1.10 AMP  | 1.1 AMP                    |
| Model No. 277V          | WH4-277-L               | WH5-277-L  | WH6-277-L   | WH7-277-L   | WH8-277-L                  |
| Max. Current 277VAC     | .21 AMP                 | 0.48 AMP   | 0.50 AMP  | .85 AMP   | .74 AMP                    |
| Max. Power              | 70W                     | 128W   | 140W  | 220W  | 220W                       |
| Black/White Wires       | 18"                     | 18"  | 18"   | 18"   | 18"                        |
| <b>Red/Yellow Wires</b> | 36"                     | 36"  | 36"   | 36"   | 36"                        |
| Ballast Sizes           | L: H 1", W 1.5", L 6.5" | 120L: H 1", W 1.72", L 8.5"<br>277L: H 1", W 1.72", L 9.5" | L: H 1", W 1.72", L 8.5"<br>277L: H 1", W 1.72", L 9.5" | L: H 1", W 1.72", L 19.25"<br>H: H 1.25", W 3.25", L 11.75" | L: H 1", W 1.72", L 19.25" |
| Weinht                  |                         |  |   | 00.0  | 04                         |
| weight                  | 10 oz.                  | 14 oz.   | 15 0Z.  | 32.8 0Z.  | 34 0Z.                     |

## CANADIAN UL LISTED WORKHORSE BALLASTS 💐



| Model No.     | Description                         |
|---------------|-------------------------------------|
| CWH3-277-L    | WH3, 277V, Long Case                |
| CWH33-120-BLS | WH33,120V, Cube Case, BLS           |
| CWH33-120-C   | WH33,120V, Cube Case                |
| CWH33-120-L   | WH33,120V, Long Case                |
| CWH4-120-L    | WH4,120V, Long Case                 |
| CWH5-120-L    | WH5,120V, Long Case                 |
| CWH5-120-LR   | WH5,120V, Long Case, RoHS Compliant |
| CWH6-120-L    | WH6,120V, Long Case                 |
| CWH7-120-H    | WH7,120V, H CAN                     |
| CWH7-120-L    | WH7,120V, Long Case                 |
| CWH8-120-L    | WH8,120V, Long Case                 |

NOTE: For Canadian WorkHorse Ballasts, refer to pages 116-119 for compatibility with lamp sizes T6 and larger.

Refer to pages 112-119 for lamp compatibility. Refer to pages 120 and 121 for wiring diagrams. c(VL)US

#### 120 50/60Hz



#### FEATURES

- All of the features of the WorkHorse in a slim case
- Designed for Thin Undercabinet Applications
- $\bullet$  3/4" x 1" Cross Section Allows the WHAM to Easily Fit Extrusions
- See the WorkHorse 1 for another 3/4" x 1" Case for T2 & T5 Lamps

#### COMMON SPECIFICATIONS

| Operating Voltage:               | 120VAC ± 10%               |
|----------------------------------|----------------------------|
| Frequency:                       | 50/60Hz                    |
| ATHD:                            | Meets ANSI C82.11-1993     |
| Protection/Input:                |                            |
| Over Current:                    | Fuse                       |
| Transient Protection:            | C62.41 Class A 7 strikes   |
| EMI: FCC CFR Title 47 Part 18 no | n-consumer                 |
| Open/Shorted Lamp:               |                            |
| Regulatory Approvals:            | UL Listed Type 1 or Type 2 |
| High Power Factor:               | > .90                      |
| Open Circuit Voltage:            | 600 V RMS Max.             |
| Ballast Min. Operating Temp.:    | -20°F (-30°C)              |
| Ballast Maximum Case Temp.:      | 158ºF (70ºC)               |
| Ballast Lamp Starting Mode:      | Instant Start              |
| Class P Inherent Thermal Protect | ion                        |
| Sound Rating                     | "A"                        |

#### 2 BALLASTS OPERATE 41 LAMPS IN 70 COMBINATIONS

| WHAM 1               | WHAM 2  |
|----------------------|---|
| WHAM1-120-135-L      | WHAM2-120-213-L   |
| .33 AMP              | .22 AMP   |
| 35W                  | 28W   |
| 18"                  | 18"   |
| 24"                  | 24"   |
| H .75", W 1", L 7.5" | H .75", W 1", L 7.5"  |
| 5 oz.                | 5 oz.   |
| 50 pcs. 22 lbs.      | 50 pcs. 22 lbs.   |
|                      | WHAM 1<br>WHAM1-120-135-L<br>.33 AMP<br>35W<br>18"<br>24"<br>H .75", W 1", L 7.5"<br>5 oz.<br>50 pcs. 22 lbs. |

Refer to pages 112-119 for lamp compatibility. Refer to pages 120 and 121 for wiring diagrams.

#### 120 • 277 50/60Hz



- Operates up to 20 ft. from Lamp
- Versatile
- High Power Factor
- Energy Saving
- Lightweight
- Solid-State Electronics

#### COMMON SPECIFICATIONS

| Operating Voltage:                         | 120VAC ± 10%<br>277VAC ± 10% | Regulatory Approvals:         | UL Listed Type 1 or Type 2 |
|--|------------------------------|-------------------------------|----------------------------|
| Frequency:                                 | 50/60Hz                      | High Power Factor:            | > .90                      |
| ATHD:                                      | Meets ANSI C82.11-1993       | Open Circuit Voltage:         | 600 V RMS Max.             |
| Protection/Output:                         | Open Lamp and Shorted Lamp   | Ballast Min. Operating Temp.: | -20°F (-30°C)              |
| Protection/Input:                          |                              | Ballast Maximum Case Temp.:   | 158⁰F (70⁰C)               |
| Over Current:                              | Fuse                         | Ballast Lamp Starting Mode:   | Instant Start              |
| Transient Protection:                      | C62.41 Class A 7 strikes     | Inherent Thermal Protection   | Class P                    |
| EMI: FCC CFR Title 47 Part 18 non-consumer |                              | Sound Rating                  | "A"                        |

6 BALLASTS OPERATE 124 LAMPS

IN 628 COMBINATIONS

NOTE: Frequently switched, short duration ON/OFF cycles with any Instant Start ballast will reduce lamp life. Please contact your lamp manufacturer for details.

|                         | LONGHORSE 1             | LONGHORSE 2               | LONGHORSE 3              | LONGHORSE 4              | LONGHORSE 5  | LONGHORSE 6  |
|-------------------------|-------------------------|---------------------------|--------------------------|--------------------------|--|--|
| Model No. 120V          | LH1-120-L               | LH2-120-L                 | LH3-120-L                | LH4-120-L                | LH5-120-L  | LH6-120-L  |
| Max. Current 120VAC     | 0.26 AMP                | 0.36 AMP                  | 0.61 AMP                 | 0.65 AMP                 | 1.25 AMP   | 1.25 AMP   |
| Model No. 277V          | LH1-277-L               | LH2-277-L                 | LH3-277-L                | LH4-277-L                | LH5-277-L  | LH6-277-L  |
| Max. Current 277VAC     | 0.10 AMP                | 0.15 AMP                  | 0.25 AMP                 | 0.22 AMP                 | 0.48 AMP   | 0.50 AMP   |
| Max. Power              | 28W                     | 35W                       | 64W                      | 70W                      | 128W   | 140W   |
| Black/White Wires       | 18"                     | 18"                       | 18"                      | 18"                      | 18"  | 18"  |
| <b>Red/Yellow Wires</b> | 36"                     | 36"                       | 36"                      | 36"                      | 36"  | 36"  |
| Ballast Sizes           | H 1", W 1.5",<br>L 6.5" | H 1", W 1.72 ",<br>L 9.5" | H 1", W 1.72",<br>L 9.5" | H 1", W 1.72",<br>L 9.5" | 120: H 1", W 1.72",<br>L 13.3"<br>277: H 1", W 1.72",<br>L 16" | 120: H 1", W 1.72",<br>L 13.3"<br>277: H 1", W 1.72",<br>L 16" |
| Weight                  | 7 oz.                   | 14 oz.                    | 14 oz.                   | 14 oz.                   | 120: 24 oz.<br>277: 26.4 oz.                                   | 120: 22.4 oz.<br>277: 27.2 oz.                                 |
| Case Qty/Wgt            | 50 pcs. 15 lbs.         | 50 pcs. 44 lbs.           | 50 pcs. 44 lbs.          | 50 pcs. 44 lbs.          | 25 pcs. 29 lbs.  | 25 pcs. 29 lbs.  |

## CANADIAN UL LISTED LONGHORSE BALLASTS

| Model No.  | Description             |
|------------|-------------------------|
| CLH1-120-L | WH1 for Remote Mounting |
| CLH2-120-L | WH2 for Remote Mounting |
| CLH3-120-L | WH3 for Remote Mounting |
| CLH4-120-L | WH4 for Remote Mounting |
| CLH5-120-L | WH5 for Remote Mounting |
| CLH6-120-L | WH6 for Remote Mounting |

NOTE: For Canadian LongHorse Ballasts, refer to pages 116-119 for compatibility with lamp sizes T6 and larger.

Refer to pages 112-119 for lamp compatibility.

Refer to pages 120 and 121 for wiring diagrams.

US

#### 120-277 · 120 50/60Hz





# **APPLICATIONS**

- Offices • Retirement Complexes
- Schools Industrial
- Hotels Retail Stores
- Apartments



#### COMMON SPECIFICATIONS

• Drop In Replacement for Magnetic Ballasts

**FEATURES** 

• Parallel Lamp Operation

• Specifier Grade = < 10% THD

• High Ballast Factor (1.18) Available

• Low Ballast Factor (0.78) Available

#### LAMP OPERATION

| Power Factor:           | 98.5 % Min.                             | Мо  |
|-------------------------|---|-----|
| ATHD:                   | Less than 10%                           | Uni |
| EMI: FCC CFR Title 47 F | Part 18 non-consumer                    | ωн  |
| Ballast Factor::        | >.87                                    |     |
| Lamp CF:                | < 1.7                                   |     |
| Starting Method:        | T8: Instant Start                       | WH  |
|                         | T12HO: Modified Rapid Start             |     |
| Regulatory Approvals:   | UL & cULus Listed Type1 or              |     |
|                         | Туре 2                                  | WH  |
| Min. Starting Temp. :   | 0°F (-18°C)                             |     |
| Inherent Thermal        | Class P                                 | WH  |
| Protection:             | ••••••••••••••••••••••••••••••••••••••• |     |
| Transient Protection:   | C62.41 Class A 7 strikes                | WH  |
| Ballast Sizes:          | T8: H 1.2", W 1.7", L 9.5"              |     |
|                         | (H 30mm, W 43mm, L 240mm)               | Dec |
|                         | T12H0: H 1.5", W 3", L 11.75"           |     |
|                         | (H 38mm, W 76mm, L 268mm)               | WH  |
| Weights:                | T8: 1.5 lbs. (700g)                     |     |
|                         | T12H0: 4.0 lbs. (1.8 kg)                |     |
|                         |   |     |

| Model Number  | # of Lamps | Lamp Type / Designation  |  |  |  |
|---|------------|--|--|--|--|
| Universal Voltage for T8 - (Instant Start) <10% THD   |            |  |  |  |  |
| WHSG1-UNV-T8-IS                                       | 1 x        | F17T8, F25T8, F32T8, F40T8, FB031T8,<br>F32T8/30, F32T8/28, F32T8/25 |  |  |  |
|   | 1 x        | F17T8, F25T8, F32T8, F40T8, FB031T8,<br>F32T8/30, F32T8/28, F32T8/25 |  |  |  |
| WH3G2-UNV-18-15                                       | 2 x        | F17T8, F25T8, F32T8, FB031T8,<br>F32T8/30, F32T8/28, F32T8/25        |  |  |  |
| WHSC3_UNV_T8_IS                                       | 2 x        | F25T8, F32T8, F40T8  |  |  |  |
| WI1303-0IW-10-13                                      | 3 x        | F17T8, F25T8, F32T8  |  |  |  |
|   | 3 x        | F25T8, F32T8, F40T8  |  |  |  |
| WH504-0IW-10-15                                       | 4 x        | F17T8, F25T8, F32T8  |  |  |  |
|   | 1 x        | F96T8, F96T8H0,  |  |  |  |
| WIDG0-UNV-10 SL                                       | 2 x        | F96T8  |  |  |  |
| Dedicated Voltage for T12HO - (Rapid Start) <10% ATHD |            |  |  |  |  |
|   | 1 x        | F96T12H0, F96T12/ESH0  |  |  |  |
| WHSG7-120-T12 H0                                      | 2 x        | F96T12H0, F72T12H0, F60T12H0,<br>F48T12H0, F96T12/ES/H0              |  |  |  |

| WHSG UNV 1           | WHSG UNV 2   | WHSG UNV 3  | WHSG UNV 4   | WHSG 120 7   | WHSG UNV 8   |
|----------------------|--|---|--|--|--|
| WHSG1-UNV-T8-IS      | WHSG2-UNV-T8-IS  | WHSG3-UNV-T8-IS   | WHSG4-UNV-T8-IS  | WHSG7-120-T12 H0   | WHSG8-UNV-T8 SL  |
| 120V-277V<br>50/60Hz | 120V-277V<br>50/60Hz   | 120V-277V<br>50/60Hz  | 120V-277V<br>50/60Hz   | 120V<br>50/60Hz  | 120V-277V<br>50/60Hz   |
| 33W                  | 59W  | 85W   | 112W   | 200W   | 109W   |
| .28 AMP              | .50 AMP  | .71 AMP   | .93 AMP  | 1.65 AMP   | .92 AMP  |
| 24"                  | 24"  | 24"   | 28"  | 22"  | 25"  |
| 46"                  | 46"  | 46"   | 30"  | 46"  | 79"  |
| 32"                  | 32"  | 32"   | 30"  | 46"  | 46"  |
| N/A                  | N/A  | N/A   | 46"  | 70"  | N/A  |
| 25 pcs.              | 25 pcs.  | 25 pcs.   | 25 pcs.  | 10 pcs.  | 25 pcs.  |
|                      |  | J   | 1  |  |  |
|                      |  | v   | v  |  |  |
|                      | WHSG UNV 1           WHSG1-UNV-T8-IS           120V-277V           50/60Hz           33W           .28 AMP           24"           46"           32"           N/A           25 pcs. | WHSG UNV 1         WHSG UNV 2           WHSG1-UNV-T8-IS         WHSG2-UNV-T8-IS           120V-277V         120V-277V           50/60Hz         50/60Hz           33W         59W           .28 AMP         .50 AMP           24"         24"           46"         32"           N/A         N/A           25 pcs.         25 pcs. | WHSG UNV 1         WHSG UNV 2         WHSG UNV 3           WHSG1-UNV-T8-IS         WHSG2-UNV-T8-IS         WHSG3-UNV-T8-IS           120V-277V         120V-277V         50/60Hz           50/60Hz         50/60Hz         50/60Hz           33W         59W         85W           .28 AMP         .50 AMP         .71 AMP           24"         24"         24"           46"         32"         32"           N/A         N/A         N/A           25 pcs.         25 pcs.         25 pcs. | WHSG UNV 1WHSG UNV 2WHSG UNV 3WHSG UNV 4WHSG1-UNV-T8-ISWHSG2-UNV-T8-ISWHSG3-UNV-T8-ISWHSG4-UNV-T8-IS $120V-277V$ $120V-277V$ $50/60Hz$ $120V-277V$ $50/60Hz$ $50/60Hz$ $50/60Hz$ $112W$ .28 AMP.50 AMP.71 AMP.93 AMP.24"24"24"28"46"46"30".32".32".30"N/AN/AN/A46".25 pcs25 pcs25 pcs25 pcs. | WHSG UNV 1         WHSG UNV 2         WHSG UNV 3         WHSG UNV 4         WHSG 120 7           WHSG1-UNV-T8-IS         WHSG2-UNV-T8-IS         WHSG3-UNV-T8-IS         WHSG4-UNV-T8-IS         WHSG7-120-T12 H0           120V-277V         120V-277V         120V-277V         120V-277V         50/60Hz         50/60Hz           33W         59W         85W         112W         200W           .28 AMP         .50 AMP         .71 AMP         .93 AMP         1.65 AMP           24"         24"         28"         22"           46"         46"         30"         46"           32"         32"         32"         30"         46"           N/A         N/A         46"         70"         25 pcs.         10 pcs. |

NEMA Premium / CEE Lamp Ballast Combinations: These ballasts meet new, high efficiency standards in combination with T8 four foot lamps. Please contact Fulham Customer Service for details.

#### 120-277 50/60Hz



#### lham ER GRADE T8 FLUORESCENT LOW BALLAST FACTOR SPECI HIGH & **FRONIC BALLASTS** SPECIFIER GRADE

#### **FEATURES**

- Drop In Replacement for Magnetic Ballasts
- Parallel Lamp Operation
- Specifier Grade = < 10% THD
- High Ballast Factor (1.18) Available
- Low Ballast Factor (0.78) Available

#### **APPLICATIONS**

- Offices • Retirement Complexes Industrial
- Schools
- Hotels Retail Stores
- Apartments



#### COMMON SPECIFICATIONS

| Power Factor:           | 98.5% Min.                |
|-------------------------|---------------------------|
| ATHD:                   | Less than 10%             |
| EMI: FCC CFR Title 47 P | art 18 non-consumer       |
| Ballast Factor:         | >.87                      |
| Lamp CF:                | < 1.7                     |
| Starting Method:        | T8: Instant Start         |
| Regulatory Approvals:   | UL & cULus Listed Type 1  |
|                         | or Type 2                 |
| Min. Starting Temp.:    | 0°F (-18°C)               |
| Inherent Thermal        | Class P                   |
| Protection:             |                           |
| Transient Protection:   | C62.41 Class A 7 strikes  |
| Ballast Size:           | H 1.2", W 1.7", L 9.5"    |
|                         | (H 30mm, W 43mm, L 240mm) |
| Weight:                 | 1.5 lbs. (700g)           |

#### LAMP OPERATION

| Model Number                   | # of Lamps  | Lamp Type / Designation  |  |  |  |
|--------------------------------|---|--|--|--|--|
| Universal Voltage for High and | Universal Voltage for High and Low Ballast Factor T8 Applications |  |  |  |  |
|                                | 1 x   | F25T8, F32T8, F40T8, FB031T8,<br>F32T8/30, F32T8/28, F32T8/25  |  |  |  |
|                                | 2 x   | F17T8, F25T8, F32T8, FB031T8,<br>F32T8/30, F32T8/28, F32T8/25  |  |  |  |
| WHSG2-UNV-T8-HB                | 1 x   | F32T8, F40T8, FB031T8, F32T8/30,<br>F32T8/28, F32T8/25         |  |  |  |
|                                | 2 x   | F32T8, FB031T8, F32T8/30, F32T8/28,<br>F32T8/25                |  |  |  |
|                                | 2 x   | F32T8, F40T8   |  |  |  |
| WII303-UNV-TO-LD               | 3 x   | F17T8, F25T8, F32T8  |  |  |  |
|                                | 2 x   | F25T8, F32T8, F40T8  |  |  |  |
| WH303-0IVV-10-HD               | 3 x   | F17T8, F25T8, F32T8  |  |  |  |
| WHSG4-UNV-T8-LB                | 3 x   | F25T8, F32T8, F40T8  |  |  |  |
|                                | 3 x   | F25T8, F32T8, F32T8/ES/25, F32T8/<br>ES/28, F32T8/ES/30, F40T8 |  |  |  |
| WIDU4-UNV-18-HB                | 4 x   | F25T8, F32T8, F32T8/ES/25, F32T8/<br>ES/28, F32T8/ES/30        |  |  |  |

|                   | WHSG UNV LB 2        | WHSG UNV HB 2        | WHSG UNV LB 3        | WHSG UNV HB 3        | WHSG UNV LB 4        | WHSG UNV HB 4        |
|-------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Model No.         | WHSG2-UNV-T8-LB      | WHSG2-UNV-T8-HB      | WHSG3-UNV-T8-LB      | WHSG3-UNV-T8-HB      | WHSG4-UNV-T8-LB      | WHSG4-UNV-T8-HB      |
| Input Voltage     | 120V-277V<br>50/60Hz | 120V-277V<br>50/60Hz | 120V-277V<br>50/60Hz | 120V-277V<br>50/60Hz | 120V-277V<br>50/60Hz | 120V-277V<br>50/60Hz |
| Input Power       | 52W                  | 74W                  | 76W                  | 104W                 | 98W                  | 146W                 |
| Max. Current      | .44 AMP              | .62 AMP              | .64 AMP              | .91 AMP              | .82 AMP              | 1.24 AMP             |
| Black/White Wires | 24"                  | 24"                  | 24"                  | 24"                  | 24"                  | 24"                  |
| Red Wires         | 46"                  | 46"                  | 46"                  | 46"                  | 46"                  | 30"                  |
| Blue Wires        | 32"                  | 32"                  | 32"                  | 32"                  | 32"                  | 30"                  |
| Yellow Wires      |                      |                      |                      |                      |                      | 46"                  |
| Case Qty          | 25 pcs.              |
|                   |                      | ✓                    | ✓                    | ✓                    | ✓                    |                      |

NEMA Premium / CEE Lamp Ballast Combinations: These ballasts meet new, high efficiency standards in combination with T8 four foot lamps. Please contact Fulham Customer Service for details.

#### 120-277 50/60Hz



# HIGH EFFICIENCY & PROGRAM START HIGH EFFICIENCY & PROGRAM START ELECTRONIC BALLASTS

#### FEATURES

- WHHE: Instant Start
- WHPS: Program Start for Long Lamp Life
- High Efficiency
- Multiple Lamp Operation
- WHHE: CEE Qualified

#### **APPLICATIONS**

- Decorative Lighting
- Indoor Architectural Lighting
- Outdoor Architectural Lighting
- Commercial and Industrial Lighting



#### COMMON SPECIFICATIONS

| Operating Voltage:      | WHHE: 120-277VAC       | Ballast Maximum Case Temp.:     | WHHE: 194°F (90°C)                   |
|-------------------------|------------------------|---------------------------------|--------------------------------------|
|                         | WHPS: 120-277VAC ± 10% |                                 | WHPS: 158ºF (70ºC)                   |
| Frequency:              | 50/60Hz                | Ballast Lamp Starting Mode:     | WHHE: Instant Start                  |
|                         |                        |                                 | WHPS: Program Start                  |
| Power Factor::          | WHHE: 98%              | Min. Operating Temp.:           | 0°F (-18°C)                          |
|                         | WHPS: 98.6% Min.       |                                 |                                      |
| ATHD:                   | <u>≤</u> 10%           | Inherent Thermal Protection:    | Class P                              |
| EMI: FCC CFR Title 47 F | Part 18 non-consumer   | Ballast Size:                   | H 1.05", W 1.32", L 8.91"            |
|                         |                        |                                 | (H 26.7mm, W 33.5mm, L 226.3mm)      |
| Ballast Factor:         | >.93                   | Sound Rating                    | "A"                                  |
| Lamp CF:                | < 1.7                  | Regulatory Approvals: UL & cULu | s Listed Type1 or Type 2 Type HL, CC |

|                 | WHHE 2         | WHPS 1          | WHPS 2          | WHPS 3          |
|-----------------|----------------|-----------------|-----------------|-----------------|
| Model No.       | WHHE-UNV-T8-IS | WHPS1-UNV-T8-PS | WHPS2-UNV-T8-PS | WHPS3-UNV-T8-PS |
| Starting Method | Instant Start  | Program Start   | Program Start   | Program Start   |
| Max. Load       | 59W            | 30W             | 57W             | 87W             |
| Max. Current    | 0.46 AMP       | 0.25 AMP        | 0.48 AMP        | 0.72 AMP        |
| Case Quantity   | 25 pcs.        | 25 pcs.         | 25 pcs.         | 25 pcs.         |
| NEMA<br>Premium | ./             | ./              | ./              | ./              |
| CEE             | v              | v               | v               | v               |

NEMA Premium / CEE Lamp Ballast Combinations: These ballasts meet new, high efficiency standards in combination with T8 four foot lamps. Please contact Fulham Customer Service for details.

#### LAMP OPERATION

| Model Number    | # of Lamps | Lamp Type / Designation  |
|-----------------|------------|--|
|                 | 1 x        | F40T8  |
| WHHEZ-UNV-10-13 | 1 or 2     | F32 / FB32 / FB31 / FB28 / F25 / F17 T8; F32T8/ES/30; F32T8/ES/28; F32T8/ES/25 |
| WHPS1-UNV-T8-PS | 1 x        | F32T8, FB32T8, FB31T8, FB28T8, F32T8/ES/30, F32T8/ES/28, F32/ES/25             |
| WHPS2-UNV-T8-PS | 2 x        | F32T8, FB32T8, FB31T8, FB28T8, F32T8/ES/30, F32T8/ES/28, F32/ES/25             |
| WHPS3-UNV-T8-PS | 3 x        | F32T8, FB32T8, FB31T8, FB28T8, F32T8/ES/30, F32T8/ES/28, F32/ES/25             |

COMMERCIAL GRADE T8/T12 FLUORESCENT

#### 120 • 277 50/60Hz



#### **APPLICATIONS**

- OfficesSchools
- Retirement Complexes
  Industrial
- Retail Stores
- HotelsApartments
  - ts



#### COMMON SPECIFICATIONS

| 97.5% Min.  |
|---|
| Less than 20%                                       |
| rt 18 non-consumer                                  |
| >.87  |
| < 1.7   |
| WHCG1-4: Instant Start<br>WHCG5 & 6: Rapid Start    |
| UL & cULus Listed Type 1 or<br>Type 2               |
| 0°F (-18°C)   |
| Class P   |
| H 1.2", W 1.7", L 9.5"<br>(H 30mm, W 43mm, L 240mm) |
| 1.7 lb. (760g)                                      |
|   |

#### LAMP OPERATION

| Model Number  | # of Lamps                              | Lamp Type / Designation   |  |  |  |
|---|---|---|--|--|--|
| Dedicated Voltage (120V) for T8 - (Instant Start) <20% ATHD |   |   |  |  |  |
| WHCG1-120-T8-IS   | NHCG1-120-T8-IS 1 x F17T8, F25T8, F32T8 |   |  |  |  |
|   | 1 x                                     | F25T8, F32T8, F40T8,<br>FB031T8   |  |  |  |
| WHCG2-120-18-IS   | 2 x                                     | F17T8, F25T8, F32T8,<br>FB031T8   |  |  |  |
| WU000 100 TO IC   | 2 x                                     | F25T8, F32T8, F40T8   |  |  |  |
| WH663-120-18-15   | 3 x                                     | F17T8, F25T8, F32T8   |  |  |  |
|   | 2 x                                     | F40T8   |  |  |  |
| WHCG4-120-T8-IS   | 3 x                                     | F17T8, F25T8, F32T8,<br>F40T8, FB031T8, F32T8/30,<br>F32T8/28, F32T8/25 |  |  |  |
|   | 4 x                                     | F17T8, F25T8, F32T8,<br>FB031T8, F32T8/30,<br>F32T8/28, F32T8/25        |  |  |  |
| Dedicated Voltage for T12 - (F                              | apid Start) <2                          | 20% ATHD  |  |  |  |
|   | 1 x                                     | F36T8, F34T12, F40T12   |  |  |  |
| WHCG5-120-T12 RS  | 2 x                                     | F18T8, F36T8, F40T8,<br>F20T12, F34T12, F40T12                          |  |  |  |
| WHCG6-120-T12 BS  | 1 x                                     | F18T8, F36T8, F20T12,<br>F34T12, F40T12                                 |  |  |  |
|   | 2 x                                     | F18T8, F20T12   |  |  |  |

IS: Instant Start - RS: Rapid Start

|                   | WHCG 1                    | WHCG 2                    | WHCG 3                    | WHCG 4                     | WHCG 5                     | WHCG 6                     |
|-------------------|---------------------------|---------------------------|---------------------------|----------------------------|----------------------------|----------------------------|
| Model No.         | WHCG1-120-T8-IS           | WHCG2-120-T8-IS           | WHCG3-120-T8-IS           | WHCG4-120-T8-IS            | WHCG5-120-T12 RS           | WHCG6-120-T12 RS           |
| Input Voltage     | 120V 60Hz<br>(108V-132V)  | 120V 60Hz<br>(108V-132V)  | 120V 60Hz<br>(108V-132V)  | 120V 60Hz<br>(108V-132V)   | 120V 60Hz<br>(108V-132V)   | 120V 60Hz<br>(108V-132V)   |
| Input Power       | 30W<br>(with T8 32W lamp) | 58W<br>(with T8 32W lamp) | 85W<br>(with T8 32W lamp) | 112W<br>(with T8 32W lamp) | 74W<br>(with T12 40W lamp) | 36W<br>(with T12 20W lamp) |
| Max. Current      | .26 AMP                   | .50 AMP                   | .71 AMP                   | .93 AMP                    | .62 AMP                    | .31 AMP                    |
| Black/White Wires | 24"                       | 24"                       | 24"                       | 28"                        | 24"                        | 24"                        |
| Red Wires         | 48"                       | 48"                       | 48"                       | 30"                        | 32"                        | 32"                        |
| Blue Wires        | 32"                       | 32"                       | 32"                       | 30"                        | 32"                        | 32"                        |
| Yellow Wires      | N/A                       | N/A                       | N/A                       | 46"                        | 48"                        | 48"                        |
| Case Qty          | 25 pcs.                   | 25 pcs.                   | 25 pcs.                   | 25 pcs.                    | 25 pcs.                    | 25 pcs.                    |
|                   |                           |                           |                           | ✓                          |                            |                            |

Promium

NOTE: WorkHorse Commercial Grade 277V available for models 1-5 while supplies last. Contact Customer Service for details.

US

#### 120 · 230 50/60Hz

LINEAR, COMPACT & CIRCLE LAMP ELECTRONIC BALLASTS



COMMON SPECIFICATIONS

**∖fulh**am

| Operating Voltage:    | 120VAC±10% or         | Regulatory Approvals:   | UL & cULus Listed    |
|-----------------------|-----------------------|-------------------------|----------------------|
|                       | 230VAC±10%            |                         | Type 1 or Type 2     |
| Frequency:            | 50/60Hz               | EMI: FCC CFR Title 47 F | Part 18 non-consumer |
| Starting Type:        | Rapid Start           | Sound Rating:           | "A"                  |
| Starting Temperature: | 14ºF (-10°C)          | CCF:                    | < 1.7                |
| Ballast Max Case Temp | erature: 158ºF (70ºC) | Normal Power Factor:    | > .5                 |
| Transient Protection: | C62.41 Class A 7      |                         |                      |
|                       |                       |                         |                      |

fulham. sugar

#### strikes

#### LAMP OPERATION

#### SUGARCUBES FOR T5, T8, T12

| Model Number                           | Operates Lamps                          |
|--|---|
| SC-120-115-CT8                         | 1 x F14T8, F15T8, F17T8, F14T12, F15T12 |
| SC-120-120-CT12                        | 1 x F20T12                              |
| Ballast Size: H 1", W 1.45", L 3.09"   |   |
| SC-120-108-LT5*                        | 1 x F6T5, F8T5                          |
| SC-120-113-LT5*                        | 1 x F13T5, F14T5                        |
| SC-120-120-LT12                        | 1 x F20T12                              |
| Ballast Size: H .76", W 1.05", L 4.76  | n                                       |
| SC-120-128-LT5*                        | 1 x F21T5, F28T5                        |
| Ballast Size: H 1.04", W 1.09", L 5.9  | 1"                                      |
| SC-120-115-T8XL                        | 1 x F14T8, F15T8, F14T12, F15T12        |
| SC-120-125-T8XL                        | 1 x F17T8, F25T8                        |
| Ballast Size: H .73", W .95", L 6.30"  |   |
| SC-120-117-LT8                         | 1 x F15T8, F17T8                        |
| SC-120-132-T8XL                        | 1 x F15T8, F17T8, F25T8, F32T8          |
| Ballast Size: H 1.01", W 1.08", L 6.3  | 0"                                      |
| SC-120-125-LT8                         | 1 x F17T8, F25T8                        |
| Ballast Size: H .73", W .95", L 4.76"  |   |
| SC-120-208-LT5*                        | 1 x F13T5, F14T5, F6T5+F8T5             |
|  | 2 x F6T5, F8T5                          |
| SC-120-213-LT5                         | 1 x F21T5, F8T5+F13T5                   |
| ••••••                                 | 2 x F13T5, F14T5                        |
| Ballast Size: H 1.01", W 1.27", L 5.53 | 11                                      |

#### SUGARCUBES FOR UV LAMPS

| Model Number                          | Operates Lamps                |
|---------------------------------------|-------------------------------|
| SC-120-287-CUV*                       | 1 x 180mm T5 UV, 287mm T5 UV  |
| SC-230-287-CUV*                       |                               |
| Ballast Size: H 1", W 1.46", L 3.07"  |                               |
| SUGARCUBES FOR 230V                   | LAMPS                         |
| SC-230-113-LT5                        | 1 x F8T5, F13T5               |
| Ballast Size: H .73", W .95", L 4.76" |                               |
| SC-230-115-LT8                        | 1 x F15T8                     |
| SC-230-120-LT12                       | 1 x F20T12                    |
| SC-230-125-LT8                        | 1 x F25T8                     |
| Ballast Size: L 121mm, W 24mm, H 1    | 9mm                           |
| SC-230-118-CFL*                       | 1 x 18CFQ/E, 18CFTR/E         |
| Ballast Size: L 78.3mm, W 37mm, H 2   | 25.4mm                        |
| SC-230-213-LT5                        | 2 x F8T5, F13T5               |
|                                       | 1 x F8T5 + F13T5              |
| Ballast Size: L 140mm, W 32mm, H 2    | 5.4mm                         |
| SC-230-118-LT8                        | 1 x F18T8                     |
| Ballast Size: H .73", W .95", L 4.76" |                               |
| SC-230-113-CFL                        | 1 x QUAD (CFQ/E), 4 PIN 13W   |
|                                       | 1 x TRIPLE(CFTR/E), 4 PIN 13W |
| Ballast Size: H 1", W 1.45", L 3.09"  |                               |

#### **SUGARCUBES FOR CFL, CIRCLE & T8**

| SC-120-113-CTW                       | 1 x 13CFT/E                           |
|--------------------------------------|---------------------------------------|
| SC-120-113-CFL*                      | 1 x 13CFQ/E, F15T8, F17T8, 13W Spiral |
| SC-120-118-CFL                       | 1 x 18CFQ/E, 18CFTR/E                 |
| SC-120-118-CTW                       | 1 x 18CFT/E                           |
| Ballast Size: H 1", W 1.45", L 3.09" |                                       |

# c ULus \*Also cULus listed.

26

## 120 • 230 50/60Hz





#### LAMP OPERATION

#### **PONY FOR CFL**

| Model Number             | Operates Lamps   |
|--------------------------|--|
| NPY-120-113-CFL          | 1 x 7CFT/E, 9CFT/E, 11CFT/E, 13CFQ/E, 13CFTR/E               |
| NPY-120-118-CFL*         | 1 x 13CFT/E, 18CFQ/E, 18CFTR/E                               |
| Ballast Size: H 1.03", V | V 1.76", L 3.36"   |
| NPY-120-113-BL           | 1 x 7CFT/E, 9CFT/E, 11CFT/E, 13CFQ/E, 13CFTR/E               |
| NPY-120-118-BL*          | 1 x 13CFT/E, 18CFQ/E, 18CFTR/E                               |
| Ballast Size: H 1", W 1. | 77", L 3.34"   |
| NPY-120-126-CFL*         | 1 x 18CFT/E, 24/27CFT/E, 26CFQ/E, 26CFTR/E, 32CFTR/E, 22CRT9 |
| NPY-120-126-BLS*         | 1 x 18CFT/E, 24/27CFT/E, 26CFQ/E, 26CFTR/E, 32CFTR/E, 22CRT9 |
| NPY-120-132-CFL          | 1 x 36/39CFT/E, 32CFTR/E, 32CRT9, 24/27CFT/E                 |
| Ballast Size: H 1.02", V | V 2.39", L 3.36"   |
| NPY-120-213-CFL*         | 2 x 7CFT/E, 9CFT/E, 13CFQ/E, 13CFTR/E                        |
| NPY-120-218-CFL*         | 2 x 13CFT/E, 18CFQ/E, 18CFTR/E                               |
| Ballast Size: H 1.02", V | V 2.39", L 3.36"   |
| NPY-120-226-CFL*         | 2 x 18CFT/E, 24/27CFT/E, 26CFQ/E, 26CFTR/E, FC22T9           |
| NPY-120-232-CFL*         | 2 x 36/39CFT/E, 32CFTR/E, 32CRT9                             |
| Ballast Size: H 1.02", V | V 2.39", L 3.36"   |
|                          |  |

#### **PONY FOR CIRCLE**

| NPY-120-240-CR           | 1 x FC22T9 + FC32T9, |
|--------------------------|----------------------|
|                          | 1 x FC32T9 + FC40T9, |
| Ballast Size: H 1.04", V | V 3.11", L 3.84"     |
| NPY-120-126-CR           | 1 x FC8T9-22W        |
| NPY-120-132-CR           | 1 x FC12T9-32W       |
| Ballast Size: H 1.02", V | V 2.39", L 3.36"     |

#### **PONY ULTRASLIM FOR T5**

| Model Number            | Operates Lamps   |
|-------------------------|------------------|
| NPY-120-108-T5US        | 1 x F8T5         |
| NPY-120-113-T5US        | 1 x F14T5, F13T5 |
| Ballast Size: H .69", W | .67", L 6.81"    |

#### **PONY T5**

| NPY-120-214-LT5*         | 1 or 2 x F14T5 |   |
|--------------------------|----------------|---|
| NPY-120-221-LT5          | 1 or 2 x F21T5 |   |
| NPY-120-228-LT5*         | 1 or 2 x F28T5 |   |
| Ballast Size: H 1.01", V | 1.01", L 11.5" |   |
| NPY-120-139-T5           | 1 x F39T5H0    |   |
| NPY-120-154-T5           | 1 x F54T5H0    | Ĵ |
| Ballast Size: H .91", W  | .23", L 9.06"  | Ì |

#### **PONY T8**

Ballast Size: H 1.02", W 1.74", L 9.49"

| NPY-120-232-LT8          | 1 or 2 x F32T8  |
|--------------------------|---|
|                          | 2 x F25T8, F40 / F34 / F30 / F25 T12                  |
|                          | 1 x F32T8 + F25T8,                                    |
|                          | 1 x F32T8 + F17T8                                     |
| NPY-120-217-LT8          | 2 x F17T8 or F20T12                                   |
| Ballast Size: H .83", W  | '.96", L 12.01"                                       |
| NPY-120-232-T8IS         | 1 or 2 x F32T8, FB031T8, F25T8, FB024T8, F17T8,       |
|                          | FB016T8, F32T8 (30/28W), F20T12, F25T12, F30T12,      |
|                          | F34T12, F40T12  |
| Ballast Size: H 1", W 1  | .41", L 6.5"  |
| NPY-120-432 T8IS         | 2 x F40T8   |
|                          | 3 x F17T8, F25T8, F32T8, F40T8, F32T8 (30W/28W/25W),  |
|                          | FB031T8, FB024, FB016, F20T12, F25T12, F30T12,        |
|                          | F34T12, F40T12  |
|                          | 4 x F17T8, F25T8, F32T8, F32T8 (30W), FB031T8, FB024, |
|                          | FB016, F20T12, F25T12, F30T12, F34T12, F40T12         |
| Ballast Size: H 1.06", \ | N 1.32", L 9.45"                                      |
| PONY FOR T8,             | T12   |
| NPY-120-130-T8           | 1 x F30T8, F30T12                                     |
| Ballast Size: H .96", W  | '.90", L 6.72"  |
| NPY-120-140-T8           | 1 x F32T8, F40T8, F40T12                              |
| Ballast Size: H .96", W  | 1.85", L 6.72"  |
| NPY-120-230-T8           | 2 x F30T8, F30T12                                     |
| NPY-120-240-T8           | 2 x F32T8, F40T8, F40T12                              |





## 120-277 50/60Hz

# RACEHORSE CFL FLUORESCENT ELECTRONIC BALLASTS

#### FEATURES

- 120V-277V
- < 10% ATHD
- High Power Factor
- End of Life (EOL) Protection
- Operate 1 or 2 Lamps
- Twin, Triple, Quad, Double Quad 9-70W
- UL, cULus
- 90°C Max. Operating Temp.
- -30°C Min. Start Temp.

#### APPLICATIONS

- Retail & Industrial Medium & High Bay
- Canopy Lighting
- Flood Lighting
- Parking Garages
- Gymnasiums
- Indirect Wall Washing
- Downlighting
- Outdoor Architectural
- Post Tops
- Wall Sconces
- Ceiling Surface Mount
- Air Handling Spaces (BLS Models)

**RaceHorse Kits** 

(VL)<sub>US</sub>

#### COMMON SPECIFICATIONS

| Operating Voltage:             | 120V-277V (Universal Voltage)        | Lamp Starting Temp.:           | See Lamp Specifications        |
|--------------------------------|--------------------------------------|--------------------------------|--------------------------------|
| Frequency:                     | 50/60Hz                              | Ballast Maximum Case Temp.:    | 167°F (75°C) - 5 Year Warranty |
| ATHD:                          | < 10% Meets ANSI C82.11-1993         | Ballast Maximum Case Temp.:    | 194°F (90°C) - 3 Year Warranty |
| Protection/Output:             | Open Lamp, Shorted Lamp, End of Life | Ballast Lamp Starting Mode:    | Programmed Start               |
| Input Over Current Protection: | Fuse                                 | Inherent Thermal Protection    | Class P                        |
| Transient Protection:          | C62.41 Class A 7 strikes             | Sound Rating                   | "A"                            |
| Regulatory Approvals:          | UL & cULus Listed Type 1 Outdoor     | Remote Mounting                | 18' Maximum at -18℃            |
| High Power Factor:             | > .98                                | Anti-Arcing Protection         | UL Type CC                     |
| Open Circuit Voltage:          | < 300V RMS Max.                      | RHA-EMI: FCC CFR Title 47 Part | t 18 non-consumer              |
| Ballast Min. Operating Temp.:  | -22°F (-30°C)                        | (RH-EMI: FCC CFR Title 47 Part | 18 consumer & non-consumer)    |
| ••••••                         |                                      | BLS models are approved for a  | ir handling spaces             |

|                | RACEHORSE 1                                    | RACEHORSE 2 <sup>†</sup>                       | RACEHORSE 3 <sup>†</sup>                     | RACEHORSE 4 <sup>†</sup>                     |
|----------------|--|--|--|--|
| Model No.      | RHA-UNV-213-BLS/C/K<br>(RH1-UNV-213-BLS/C/K)** | RHA-UNV-218-BLS/C/K<br>(RH2-UNV-218-BLS/C/K)** | RHA-UNV-226-BLS/C/K<br>(RH3-UNV-226-BLS/C/K) | RHA-UNV-242-BLS/C/K<br>(RH4-UNV-242-BLS/C/K) |
| Max Load       | 26W  | 36W  | 57W  | 84W  |
| Max. Current   | .27 AMP  | .36 AMP  | .47 AMP                                      | .72 AMP                                      |
| Ballast Size   | H 1", W 2.4",<br>L 5.0", L1 4.2"               | H 1", W 2.4",<br>L 5.0", L1 4.2"               | H 1", W 2.4",<br>L 5.0", L1 4.2"             | H 1.3", W 3",<br>L 5.0", L1 4.2"             |
| Ballast Weight | 5.2 oz.  | 5.2 oz.  | 5.2 oz.                                      | 7 oz.  |
| Case Quantity  | 50 pcs.  | 50 pcs.  | 50 pcs.                                      | 50 pcs.                                      |

• BLS = Compact Case with mounting studs (8/32" studs on bottom plate, 2" on center)

• **C** = Compact Case; No studs on bottom plate

• K = Contractor Kit with stud adapter plate, lead wire set and wire removal tool

#### LAMP OPERATION

| Model Number           | # of Lamps | Lamp Type / Designation  |  |  |  |
|------------------------|------------|--|--|--|--|
| RHA-UNV-213-BLS/C/K    | 1 x        | 7CFT*, 9CFT*, 13CFQ, 13CFTR, 2D10W*, 2D16W   |  |  |  |
| (RH1-UNV-213-BLS/C/K)  | 2 x        | _7CFT, 9CFT, 13CFQ, 13CFTR, 2D10W  |  |  |  |
| RHA-UNV-218-BLS/C/K    | 1 x        | 18CFQ, 18CFTR, 2D21W   |  |  |  |
| (RH2-UNV-218-BLS/C/K)  | 2 x        | 18CFQ, 18CFTR, 2D16W, 2D21W  |  |  |  |
|                        | 1 x        | 13CFT, 26CFQ, 26CFTR, 32CFTR, 42CFTR, 2D21W, 2D28W, 2D38W, T5CR22, FT18W, FT36W, T5CR40, |  |  |  |
|                        |            | FT24/27, 57CFM   |  |  |  |
| (nno-0100-220-6Lo/6/K) | 2 x        | 13CFT, FT18W, 26CFQ, 26CFTR, FT24/27, 2D21W, F24T5H0                                     |  |  |  |
|                        | 1 x        | CFM57, CFM70, 42CFTR, 24/27CFT, 36CFT, 40CFT, 2D28W, 2D38W, T5CR40, 36TUV, GPH793T5L     |  |  |  |
| RH4-UNV-242-BL3/6/K    | 2 v        | 26CFQ, 26CFTR, 32CFTR, 42CFTR, 24/27CFT, 36CFT, 40CFT, 2D28W, 2D38W, T5CR22W, T5CR40W,   |  |  |  |
| (1017 0107272020/0/N)  | ۷ ۲        | 36TUV, GPH793T5L   |  |  |  |

\*RHA model does not operate these lamps.

\*\*NOTE: RH1 & RH2 are not cULus listed. All other models are UL & cULus listed.



† These products have previously been tested as per SASO guidelines and comply with the SASO standards. If you are interested in your shipment being accompanied by a SASO conformity certificate, this can be arranged at cost for the testing. Please contact the Middle East regional office for details.

**APPLICATIONS** 

Indirect Wall Washing

Outdoor Architectural

• Canopy Lighting

Flood LightingParking Garages

Gymnasiums

• Downlighting

Post Tops

#### 120-277 50/60Hz

-

Fulham. RACEHORSE T5HO & T5HE FLUORESCENT ELECTRONIC BALLASTS

#### FEATURES

- 120V-277V
- < 10% ATHD
- High Power Factor
   Find of Life (FOL) Pr
- End of Life (EOL) Protection
  Operate 1x, 2x, 3x & 4x Lamps
- TW, CR, T5HO, T5HE
- UL, cULus
- Programmed Preheat Start

#### COMMON SPECIFICATION

| COMMON SPECIFICATIONS                      |                                  |                               |                                |  |  |
|--|----------------------------------|-------------------------------|--------------------------------|--|--|
| Operating Voltage:                         | 120V-277V (Universal Voltage)    | High Power Factor:            | > .98                          |  |  |
| Frequency:                                 | 50/60Hz                          | Open Circuit Voltage:         | 600 V RMS Max.                 |  |  |
| ATHD:                                      | < 10%                            | Ballast Min. Operating Temp.: | -18°C (0°F)                    |  |  |
| Protection/Output:<br>Protection/Input:    | End of Life (EOL)                | Ballast Maximum Case Temp.:   | 167ºF (75ºC) - 5 Year Warranty |  |  |
| Over Current:                              | Fuse                             | Ballast Maximum Case Temp.:   | 194°F (90°C) - 3 Year Warranty |  |  |
| Transient Protection:                      | C62.41 Class A 7 strikes         | Ballast Lamp Starting Mode:   | Programmed Preheat Start       |  |  |
| EMI: FCC CFR Title 47 Part 18 non-consumer |                                  | Inherent Thermal Protection   | Class P                        |  |  |
| Regulatory Approvals:                      | UL & cULus Listed Type 1 Outdoor | Sound Rating                  | "A"                            |  |  |

• Retail and Industrial Medium and High Bay

|                | RACEHORSE 21 HO         | RHA21 HO              | RACEHORSE 22 HO         | RHA22 HO               |
|----------------|-------------------------|-----------------------|-------------------------|------------------------|
| Model No.      | RH21-UNV-224 LT5        | RHA-UNV-224-LT5       | RH22-UNV-239 LT5        | RHA-UNV-239-LT5        |
| Max. Load      | 24W                     | 24W                   | 39W                     | 39W                    |
| Max. Current   | 0.44 AMP                | 0.20 AMP              | 0.58 AMP                | 0.57 AMP               |
| Ballast Size   | H 1", W 1.18", L 16.34" | W 1.25", H 1", L 9.0" | H 1", W 1.18", L 16.34" | W 1.25", H 1", L 9.0", |
| Connector Type | No Leads                | Leads                 | No Leads                | Leads                  |
| Case Quantity  | 20 pcs.                 | 20 pcs.               | 20 pcs.                 | 20 pcs.                |

|                | RACEHORSE 23 HO         | RACEHORSE 28 HO         | RACEHORSE 13 HE         | RHA13 HE                  | RACEHORSE 14 HE         |
|----------------|-------------------------|-------------------------|-------------------------|---------------------------|-------------------------|
| Model No.      | RH23-UNV-254 LT5        | RH28-UNV-454 LT5        | RH13-UNV-228 LT5        | RHA-UNV-228-LT5           | RH14-UNV-235 LT5        |
| Max. Load      | 120W                    | 235W                    | 28W                     | 28W                       | 35W                     |
| Max. Current   | 1.04 AMP                | 1.95 AMP                | 0.28 AMP                | 0.25 AMP                  | 0.29 AMP                |
| Ballast Size   | H 1", W 1.23", L 16.88" | H 1", W 2.29", L 16.88" | H 1", W 1.18", L 16.34" | H 1.06", W 1.35", L 8.96" | H 1", W 1.18", L 16.34" |
| Connector Type | Push-in                 | Leads                   | No Leads                | Leads                     | No Leads                |
| Case Quantity  | 30 pcs.                 | 15 pcs.                 | 20 pcs.                 | 20 pcs.                   | 20 pcs.                 |

#### LAMP OPERATION

| Model Number                          | # of Lamps | Lamp Type / Designation                                 |
|---------------------------------------|------------|---|
| RH21-UNV-224 LT5                      | 1 x        | F24T5H0, F39T5H0, FT24W, T5CR22W, T5CR40W, FT40W, FT36W |
| RHA-UNV-224-LT5                       | 2 x        | F24T5H0, FT24W, T5CR22W                                 |
|                                       | 1 x        | F39T5H0, F24T5H0, T5CR40W, T5CR22W, FT36W, FT24W, FT40W |
| ΠΠ22-UNV-239 LI 3<br>RHA_UNV-230_I T5 | 2 x        | F39T5H0, F24T5H0, T5CR40W, T5CR22W, FT36W, FT24W        |
|                                       | 1 each     | T5CR22W + T5CR40W                                       |
| RH23_UNV_254 LT5                      | 1 x        | F54T5H0, FT55W, FT50W, FT36W, FC12T5 55W                |
| 11123-011V-234 LIJ                    | 2 x        | F54T5H0, FT55W, FT50W, FT36W, FC12T5 55W                |
| BH28-UNV-454 LT5                      | 3 x        | F54T5H0, FT55W, FT50W, FT36W, FC12T5 55W                |
|                                       | 4 x        | F54T5H0, FT55W, FT50W, FT36W, FC12T5 55W                |
| RH13-UNV-228 LT5                      | 1 x        | F28T5/HE, F21T5/HE, F14T5/HE                            |
| RHA-UNV-228-LT5                       | 2 x        | F28T5/HE, F21T5/HE, F14T5/HE                            |
|                                       | 1 x        | F35T5/HE, F28T5/HE, F21T5/HE                            |
| n1114-0111-200 LID                    | 2 x        | F35T5/HE, F28T5/HE, F21T5/HE, F14T5/HE                  |

#### 120-277 50/60Hz



#### **FEATURES**

**fulham**.

- Programmed Preheat Start for extended lamp life in frequent switching applications
- End of Life (EOL) Protection to safely remove power from the lamp as it nears end of life
- Cold Starting to ensure proper functionality even in low temperature applications (-18°C)
- Improved Reliability due to precision control flicker-free operation
- Auto-Restart which eliminates the need to reset the power mains after lamp replacement



#### COMMON SPECIFICATIONS

| Operating Voltage:                 | 120V-277V (Universal Voltage)    | Type HL Approval:             | Approved for Hazardous Location  |
|------------------------------------|----------------------------------|-------------------------------|----------------------------------|
| Frequency:                         | 50/60Hz                          | High Power Factor:            | > .98                            |
| ATHD:                              | < 10%                            | Open Circuit Voltage:         | 600 V RMS Max.                   |
| Protection/Output:                 | End of Life (EOL)                | Ballast Min. Operating Temp.: | -18°C (0°F)                      |
| Protection/Input:                  |                                  | Ballast Maximum Case Temp.:   | (158°F) (70°C) - 5 Year Warranty |
| Over Current:                      | Fuse                             | Ballast Maximum Case Temp.:   | (194°F) (90°C) - 3 Year Warranty |
| Transient Protection:              | C62.41 Class A 7 strikes         | Ballast Lamp Starting Mode:   | Programmed Preheat Start         |
| EMI: FCC CFR Title 47 Part 18 non- | consumer                         | Inherent Thermal Protection   | Class P                          |
| Regulatory Approvals:              | UL & cULus Listed Type 1 Outdoor | Sound Rating:                 | "A"                              |

|                | RACEHORSE A2              | RACEHORSE A4               |
|----------------|---------------------------|----------------------------|
| Model No.      | RHA-UNV-254-LT5           | RHA-UNV-454-LT5            |
| Max. Load      | 120W                      | 240W                       |
| Max. Current   | 1.0 AMP                   | 2.0 AMP                    |
| Ballast Size   | H 1.05", W 1.32", L 9.53" | H 1.18", W 1.69", L 16.88" |
| Connector Type | Leads                     | Leads                      |
| Case Quantity  | 20 pcs.                   | 20 pcs.                    |

#### LAMP OPERATION

| Model Number      | # of Lamps | Lamp Type / Designation                  |
|-------------------|------------|--|
|                   | 1 x        | F54T5H0, FT55W, FT50W, FC12T5 55W        |
| NITA-UNV-204-LI 0 | 2 x        | F54T5H0, FT55W, FT50W, FT36W, FC12T5 55W |
|                   | 2 x        | F54T5H0, FT36W, FT55W                    |
| RHA-UNV-454-LT5   | 3 x        | F54T5H0, FT36W, FT55W                    |
|                   | 4 x        | F54T5H0, FT36W, FT55W                    |

INDUSTRIAL & SPECIALTY

#### 120-277 50/60Hz

cus SIRE HORSE TI2HO & T8HO FLUORESCENT ELECTRONIC BALLASTS

#### FEATURES

- Instant Start
- Energy Efficient / Green Responsible
- Reduced Installation and Maintenance Cost
- Reduced Weight and Profile for Signage
- Lower Inventory Carrying Cost with just 3 SKUs



| Operating Voltage:               | 120V - 277V                 | Input Protection        | Fuse                     |
|----------------------------------|-----------------------------|-------------------------|--------------------------|
| Frequency:                       | 50/60Hz                     | Lamp Current Regulation | ±5%                      |
| ATHD:                            | < 10%                       | Starting Temperature    | -29°C (-20°F)            |
| Power Factor                     | >90%                        | Operating Temperature   | 29°C - 50⁰C              |
| EMI: FCC 47 CFR Part 18 Consumer |                             | Max Case Temperature    | 70ºC                     |
| Min./Max. Lamp Length Per Output | 2' / 10'                    | RMS Open Circuit        | <1000V                   |
| Lamp Configuration               | Parallel                    | Sound Rating:           | "A"                      |
| Regulatory Approvals:            | cULus Listed Type 2 Outdoor | Transient Protection:   | C62.41 Class A 7 strikes |

| Model No.         | SN1-UNV-1324-IS               | SN2-UNV-2432-IS               | SN3-UNV-4650-IS               |
|-------------------|-------------------------------|-------------------------------|-------------------------------|
| Input Current     | 1.55A                         | 2.1A                          | 3.2A                          |
| Lamp Load Min/Max | 2ft-24ft with 1, 2 or 3 Lamps | 4ft-32ft with 2, 3 or 4 Lamps | 8ft-50ft with 4, 5 or 6 Lamps |
| Ballast Size      | 1.8" H, 2.8"W, 12" L          | 1.8" H, 2.8"W, 12" L          | 1.92" H, 2.83" W, 14.37" L    |

#### MODEL SELECTION CHART

|                        |                 | TOTAL LAMP FOOTAGE |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|------------------------|-----------------|--------------------|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| # LAMPS<br>PER BALLAST | 2               | 4                  | 6 | 8 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 |
| 1, 2 or 3              | SNS-UNV-1324-IS |                    |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 2, 3 or 4              |                 | SNS-UNV-2432-IS    |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| 4, 5 or 6              | SNS-UNV-4650-IS |                    |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

SineHorse electronic ballasts for signage applications in the United States of America are available exclusively under the "Be-Brite I powered by Fulham" brand for N. Glantz & Son.

### 120-277 50/60Hz



Fulham, FLUORESCENT LOW TEMPERATURE ELECTRONIC BALLASTS CORNERS AND **FEATURES APPLICATIONS** • A Dynamic Ballast that automatically • Refrigerator Cases synchs/adjusts in cold temperatures to • Freezer Cases provide optimal light output • Vending Machines • Coolers Universal Voltage 120V-277V • Consistently Cold • High Power Factor • Deactivated Lamp Protection **Outdoor Locations** • Fault Condition Protection **STANDARD** • Programmed Pre-Heat Start **MOLEX® CONNECTORS**  Minimum Starting Temperature -30°C/-22°F No PCBs

• Low THD < 10%

#### COMMON SPECIFICATIONS

| Input Voltage             | 120V-277V                   |
|---------------------------|-----------------------------|
| Input Voltage Range       | ± 10%                       |
| Power Line Frequency      | 50/60Hz                     |
| High Power Factor         | > 0.98                      |
| ATHD                      | < 10%                       |
| Re-Lamping Circuit        | Deactivated Lamp Protection |
| Current Protection        | Fuse                        |
| Lamp Operation Mode       | Programmed Start            |
| Lamp Connection           | Parallel                    |
| Ignition Method           | Programmed Pre-Heat Start   |
| Lamp Current Crest Factor | < 1.7                       |
| Transient Protection:     | C62.41 Class A 7 strikes    |
| Circuit to Ground         | < 600 VAC                   |
| UL / cULus Listed         | Type 1 Outdoor              |
| Type "CC" Rated           | Anti-Arc                    |
| Thermal Protection        | Class "P"                   |
| EMI/RFI Compliance        | FCC Part 18 non-consumer    |
| Sound Rating              | A                           |
| Minimum Operating         | -30°C (-22°F)               |
| Temperature               |                             |
| Maximum Case Temperature  | 70°C (158°F)                |
| Ballast Case Construction | Painted Steel               |
| Input/Output Connections  | Wire Leads + Connectors     |
| Potted                    | Yes                         |
| Warranty                  | 3 years                     |

|                        | ICEHORSE 1   | ICEHORSE 2     | ICEHORSE 3        |  |  |  |  |  |  |
|------------------------|--|----------------|-------------------|--|--|--|--|--|--|
| Model No.              | IH1-UNV-232-T8   | IH2-UNV-270-T8 | IH3-UNV 272 T12H0 |  |  |  |  |  |  |
| Max. Current           | .85 AMP  | 1.35 AMP       | 1.38 AMP          |  |  |  |  |  |  |
| Max. Power             | 100W   | 155W           | 150W              |  |  |  |  |  |  |
| Common<br>Ballast Size | H 1", W 1.7", L 12"<br>H 25.4mm, W 43.18mm, L 304.80mm |                |                   |  |  |  |  |  |  |
| Weight                 | 1.4 lbs 1.5 lbs  |                | 1.4 lbs           |  |  |  |  |  |  |
| Case Qty               | 25 pcs.  | 25 pcs.        | 25 pcs.           |  |  |  |  |  |  |

#### LAMP OPERATION

| Model Number      | # of Lamps | Lamp Type / Designation                                     |
|-------------------|------------|---|
| IH1-UNV-232-T8    | 1 or 2     | F25 / F32 / F40 T8  |
| IH2-UNV-270-T8    | 1 or 2     | F58 / F70 T8  |
| IH3-UNV 272 T12H0 | 1 or 2     | F48 / F60 T8H0<br>F48 / F60 T10VH0<br>F48 / F60 / F72 T12H0 |
|                   | 1          | F72T8H0, F72T10VH0, F96T12VH0                               |



#### 120 · 210 · 230 · 208-240 50/60Hz



#### COMMON SPECIFICATIONS

| Frequency            | 50/60Hz                  |
|----------------------|--------------------------|
| Protection Output    | Yes                      |
| Protection Input     | Fuse/MOV                 |
| Over Current         | Yes                      |
| Transient Protection | C62.41 Class A 7 strikes |
| EMI                  | FCC PART 18 non-consumer |
| Regulatory Approvals | UL/cULus                 |
| Class P Inherent     | Type 1 Outdoor           |
| Thermal Protection   |                          |
| Lamp Starting Mode   | Instant Start            |
| Sound Rating         | "A"                      |



#### **STANDARD MODELS**

|                          | FEP-120-600-L              | FEP-210-600-L             | FEP-230-600-L              | SHS4-120-C                | SHGS1 MID 2 200 L       | SHGS2 MID 4 100 L       |
|--------------------------|----------------------------|---------------------------|----------------------------|---------------------------|-------------------------|-------------------------|
| <b>Operating Voltage</b> | 120VAC                     | 210VAC                    | 230VAC                     | 120VAC                    | 208-240VAC +/- 10%      | 208-240VAC +/- 10%      |
| Max. Current             | 2.86                       | 1.52                      | 1.50 0.303                 |                           | 1.85                    | 1.88                    |
| Rated Max. Load          | 320W                       | 320W                      | 320W                       | 21W                       | 380W                    | 380W                    |
| Min. Operating Temp.     | -18ºC (0ºF)                | -18ºC (0ºF)               | -18ºC (0ºF)                | 0°C (32°F)                | 0°C (32°F)              | 0°C (32°F)              |
| Max Case Temp            | 70°C (158°F)               | 70°C (158°F)              | 70°C (158°F)               | 75⁰C (167⁰F)              | 75⁰C (167⁰F)            | 75⁰C (167⁰F)            |
| Ballast Dimensions       | H 1.25", W 3",<br>L 18.75" | H1.25", W 3",<br>L 18.75" | H 1.25", W 3",<br>L 18.75" | H 1", W 1.45",<br>L 3.09" | H 1.73", W 3.11", L 12" | H 1.73", W 3.11", L 12" |

### **DIMMABLE MODELS**

|                           | SHGS3 MID 6 100 L       | SHGD1 MID 2 200 L       | SHGD2 MID 4 100 L       | С  |
|---------------------------|-------------------------|-------------------------|-------------------------|----|
| <b>Operating Voltage</b>  | 208-240VAC +/- 10%      | 208-240VAC +/- 10%      | 208-240VAC +/- 10%      | In |
| Max. Current              | 2.42                    | 0.99                    | 1.32                    | fr |
| Rated Max. Load           | 600W                    | 200W                    | 100W                    |    |
| Min. Operating Temp.      | 0°C (32°F)              | 0ºC (32ºF)              | 0ºC (32ºF)              |    |
| Max Case Temp             | 75°C (167°F)            | 75ºC (167ºF)            | 75°C (167°F)            |    |
| <b>Ballast Dimensions</b> | H 1.77", W 3.11", L 16" | H 1.73", W 3.11", L 12" | H 1.73", W 3.11", L 12" |    |

#### DIMMING FEATURES

Instant Start with 0-10V dimming control and linear (smooth) dimming from 100-70%.

#### LAMP OPERATION

| Model Number      | # of Lamps | Lamp Type / Designation   |
|-------------------|------------|---|
| FEP-120-600-L     | 1 or 2     | F72 / F79 T12H0   |
|                   | 3 x        | F24 / F30 / F36 / F48 / F59 / F60 / F64 / F72 / F84 T12H0   |
|                   | 4 x        | F24 / F30 / F36 / F48 / F59 / F60 / F64 / F72 T12H0   |
| FEP-210-600-L     | 1 or 2     | F59 / F72 / F79 T12H0   |
|                   | 3 or 4     | F59 / F72 T12H0   |
| FEP-230-600-L     | 2 x        | F72 / F79 T12H0   |
|                   | 4 x        | F59 / F72T12H0  |
| SHS4-120-C        | 1 x        | GPH500T5L   |
| SHGS1 MID 2 200 L | 1 or 2     | F59 / F60 / F71 / F72 / F73 / F74 / F79 (180W) / F79 (200W) T12VHO                                |
| SHGS2 MID 4 100 L | 3 or 4     | F59 / F71 / F72 / F73 T12H0   |
| SHGS3 MID 6 100 L | 5 or 6     | F59 / F71 / F72 / F73 T12H0   |
| SHGD1 MID 2 200 L | 1 or 2     | F59T12VH0, F60T12VH0, F71T12VH0, F72T12VH0, F73T12VH0, F74T12VH0, F79T12VH0, F79T12VH0, F79T12VH0 |
| SHGD2 MID 4 100 L | 3 or 4     | F59T12H0, F71T12H0, F72T12H0, F73T12H0  |

LAMPS CFL

|   | Watts | Item Number* | CCT (K)*<br>Color Temp | Initial<br>Lumens | Rated<br>Life <sup>1</sup> | Base    | MOL<br>(IN) | Case<br>Qty |  |  |  |
|---|-------|--------------|------------------------|-------------------|----------------------------|---------|-------------|-------------|--|--|--|
| TWIN  |       |              |                        |                   |                            |         |             |             |  |  |  |
|   | 5W    | FCFTE5W8     | 27, 35, 41             | 250               | 10K HRS                    | 2G7     | 3.6         | 100         |  |  |  |
|   | 7W    | FCFTE7W8     | 27, 35, 41             | 400               | 10K HRS                    | 2G7     | 4.7         | 100         |  |  |  |
|   | 9W    | FCFTE9W8     | 27, 35, 41             | 600               | 10K HRS                    | 2G7     | 5.9         | 100         |  |  |  |
|   | 13W   | FCFTE13W8    | 27, 35, 41, 50         | 900               | 10K HRS                    | 2GX7    | 6.4         | 100         |  |  |  |
| TWIN HI-LUMEN T5  |       |              |                        |                   |                            |         |             |             |  |  |  |
| 2611  | 18W   | FCFTE18W8    | 27, 30, 35, 41         | 1250              | 10K HRS                    | 2G11    | 8.9         | 50          |  |  |  |
|   | 24W   | FCFTE24W8    | 27, 30, 35, 41         | 1800              | 10K HRS                    | 2G11    | 12.8        | 50          |  |  |  |
|   | 36W   | FCFTE36W8    | 27, 30, 35, 41         | 2900              | 10K HRS                    | 2G11    | 16.4        | 50          |  |  |  |
|   | 40W   | FCFTE40W8    | 27, 30, 35, 41         | 3150              | 10K HRS                    | 2G11    | 22.5        | 50          |  |  |  |
|   | 55W   | FCFTE55W8    | 27, 30, 35, 41, 50     | 4800              | 10K HRS                    | 2G11    | 21.2        | 50          |  |  |  |
| QUAD T4   |       |              |                        |                   |                            |         |             |             |  |  |  |
| $M_{0}$ $M_{0}$ $M_{1.4}$ $M_{0}$ $M_{1.4}$ | 13W   | FCFQE13W8    | 27, 30, 35, 41         | 900               | 10K HRS                    | G24Q1   | 5.1         | 100         |  |  |  |
|   | 18W   | FCFQE18W8    | 27, 30, 35, 41         | 1250              | 10K HRS                    | G24Q2   | 5.8         | 100         |  |  |  |
|   | 26W   | FCFQE26W8    | 27, 30, 35, 41         | 1850              | 10K HRS                    | G24Q3   | 6.5         | 100         |  |  |  |
| TRIPLE  |       |              |                        |                   |                            |         |             |             |  |  |  |
| M<br>C<br>K fulham<br>GX24Q-4<br>GX24Q-4<br>GX24Q-2   | 13W   | FCFTRE13W8   | 27, 30, 35, 41, 50     | 900               | 10K HRS                    | GX24Q-1 | 4.1         | 100         |  |  |  |
|   | 18W   | FCFTRE18W8   | 27, 30, 35, 41         | 1250              | 10K HRS                    | GX24Q-2 | 4.5         | 100         |  |  |  |
|   | 26W   | FCFTRE26W8   | 27, 30, 35, 41, 50     | 1850              | 10K HRS                    | GX24Q-3 | 4.9         | 100         |  |  |  |
|   | 32W   | FCFTRE32W8   | 27, 30, 35, 41, 50     | 2400              | 10K HRS                    | GX24Q-3 | 5.5         | 100         |  |  |  |

\*ADD DESIRED COLOR TEMP CCT (K) TO END OF ITEM NUMBER WHEN ORDERING. EXAMPLE: FCFTE5W827

LAMP NOTES: (1) RATED LAMP LIFE BASED ON 3 HOURS PER START (MIN.). (2) CUSTOM COLORS (CCT) ARE AVAILABLE 27K THRU 64K, AS SPECIAL ORDER. CALL 323-599-5000. (3) ALL LAMPS CARRY A CRI RATING OF 80 TO 84 MIN. CRI. (4) DETAILED LAMP SPECIFICATIONS ARE AVAILABLE. CALL 323-599-5000 OR VISIT WWW.FULHAM.COM

FLUORESCENT

#### LAMPS

LINEAR



\*ADD DESIRED COLOR TEMP CCT (K) TO END OF ITEM NUMBER WHEN ORDERING. EXAMPLE: FCFTE5W827

LAMP NOTES: (1) RATED LAMP LIFE BASED ON 12 HOURS PER START (MIN.). (2) CUSTOM COLORS (CCT) ARE AVAILABLE 27K THRU 64K, AS SPECIAL ORDER. CALL 323-599-5000. (3) ALL LAMPS CARRY A CRI RATING OF 80 TO 84 MIN. CRI. (4) DETAILED LAMP SPECIFICATIONS ARE AVAILABLE. CALL 323-599-5000 OR VISIT WWW.FULHAM.COM Lamp color availability may vary by geographic region. Contact Customer Service for details.

# HALOGEN LIGHTING SYSTEMS

Think of halogen lighting as incandescence on steroids. It's bright, shows color well and is very affordable. Halogen is an excellent choice for track lighting, architectural design and displays.

In 1959 Elmer Fridrich and Emmett Wiley created the first workable (and patentable) tungsten halogen lamp. Only a year later, GE scientist Frederick Moby improved on Fridrich and Wiley's invention with the "A-Lamp" that anyone could screw into their ceiling sockets or bedside table lamps. In 1962 came "Multi-Vapor Metal Halide" technology. Since then, lighting companies have been refining the design and operation of halogen lamps.

The halogen cycle kicks in only at high temperatures (nearly 500 degrees F.), otherwise the gas won't vaporize enough to work its magic on the tungsten. So bulbs must be smaller and stronger than incandescent bulbs, and made of heat resistant materials. Thick walls enable it to be packed with gases at very high pressure. The gas density slows tungsten degeneration from the filament, so the bulb doesn't become as blackened as soon. And the lamp's useful lifespan is increased.



That's not all. Halogen produces brighter, whiterquality light while using less energy than ordinary incandescent bulbs of the same wattage. They are available in a variety of configurations, ranging from as low as 20 up to 2,000 watts.



# **DID YOU KNOW?** A MOST PRODUCTIVE MIND: THOMAS ALVA EDISON

Earlier we spoke of "the shoulders of giants" upon which scientific advances depend. Surely no Comprehensive Lighting Guide could be complete without mention of the giant called Thomas Edison (1847-1931) whose work in incandescence paved the way for halogen lighting. Edison's work is largely responsible for the "electrified" modern world: the phonograph, movies, municipal power grids and practical home lighting.

Few realize that Edison also possessed a first rate business mind. Establishing the nation's first major industrial rersearch laboratory, he pioneered the concepts of team research and mass production. Among history's most productive inventors, Edison held over 1,000 patents in the U.S. alone, and hundreds abroad.



He was mainly self-taught. A slow talker (he didn't speak until almost age 4), "Little Al" was considered dullwitted by his first teachers. So he rarely attended school, being tutored instead at home by his mother. At age 11 he began devouring the contents of the local library, increasing his knowledge by endlessly questioning adults on topics that interested him.

Unlike his rival, the lifelong celibate Nikola Tesla (see Induction), Edison was a family man. He married twice and fathered six children. Considering his exhaustive work schedule, where he found the time remains a mystery.






Dimmabl



#### FEATURES

- Operate Multiple MR16 & MR11 Lamps up to Stated Wattage
- Short Circuit, Overload & Thermal Protection
- cURus (UL recognized components)
- Solid State Electronics

#### COMMON SPECIFICATIONS

- Dimmer Capability: Leading Edge Or Trailing Edge
- Maximum Ambient Temperature: 50°C
- Auto Reset Electronic Short Circuit
- And Overload Protection
- High Power Factor, Low Total Harmonic Distortion
- Aluminum Case, Waterproof Potting
- Minimum Load Requirement: 20W

|                     | PONY ET 60W CLASS 2          | PONY ET 75W                  | PONY ET 150W                     | PONY ET 300W Linear             | PONY ET 300W Circular                                    |
|---------------------|------------------------------|------------------------------|----------------------------------|---------------------------------|--|
| Model No.           | PET-120-12-60                | PET-120-12-75                | PET-120-12 150W L                | PET-120-12 300W L               | PET-120-12 300W R  |
| Max. Load           | 60W                          | 75W                          | 150W                             | 300W                            | 300W   |
| Transformer<br>Size | H 0.78", W 1.29",<br>L 2.08" | H 0.78", W 1.29",<br>L 2.08" | H 1.0625", W 1.375",<br>L 3.375" | H 1.0625", W 1.5",<br>L 5.1875" | H 1.375",<br>Diameter 3.6875",<br>Inside Diameter 0.375" |
| Lead Wire           | 6"                           | 6"                           | 6"                               | 6"                              | 6"   |
| Case Qty            | 100 pcs.                     | 100 pcs.                     | 60 pcs.                          | 48 pcs.                         | 42 pcs.  |



#### COMMON SPECIFICATIONS

| Input Voltage:           | 220V~240V, 50/60Hz     | Temperature Protection | Yes                    |
|--------------------------|------------------------|------------------------|------------------------|
| Output Voltage           | 10.6~12V               | Approvals/Class        | TUV, ROHS              |
| EMI/RFI compliance       | EN55015                | Sound Rating           | "A"                    |
| Power Factor             | >0.99                  | Max. Case Temp         | 75°C (167°F)           |
| Dimmable                 | 100%~20% trailing edge | Max. Ambient Temp      | 40°C (104°F)           |
| Short Circuit Protection | Auto-Reset             | Hi-Pot                 | Input & Output 3750VAC |
| Over Load Protection     | Auto-Reset             | Warranty               | 2yrs                   |

| Model No.         | PET-230-12-060          | PET-230-12-105                     |
|-------------------|-------------------------|------------------------------------|
| Input Power       | 20~60W                  | 35~105W                            |
| Max. Line Current | 0.25A                   | 0.42A                              |
| THD               | <12% IEC 61000-3-2      | <8% IEC 61000-3-2                  |
| Over Load Range   | <150W                   | <250W                              |
| Lamp Watts/Type:  | 3x20W/1x50W/6x10W 12V   | 3x35W/2x50W/5x20W/1x75W/1x100W 12V |
| Transformer Size  | H 22mm, W 33mm, L 107mm | H 23mm, W 45mm, L 166mm            |







# **BRINGING NEW CLARITY TO BRILLIANCE**

Picture a fluorescent lamp with an electromagnet wrapped around it. The electromagnet fires up. This excites gas molecules inside the lamp, producing a powerful electrochemical reaction that results in a stream of photons generating ultraviolet light, then visible light – based on the phosphor coating on the inside of the glass tube.



DUCTION

# Here, Igor - Hold These Two Wires!

Enigmatic scientist and inventor Nikola Tesla (1856-1943) has been defined in many ways. Visionary. Pioneer. Seminal genius. Renaissance man. Polyglot. Prophet. Crackpot. An ethnic Serb born in what is now Croatia, he studied at several European universities in various languages before emigrating to America. An eccentric by most standards (vegetarian; lifelong celibate; clean-freak; claimed not to need sleep; photographic memory; devoted to pigeons, et al.), many aspects of his life remains opaque. To this day, many of his works are still studied, puzzled over, classified -- even suppressed (was he developing a Death Ray?). But our interest centers on his revolutionary work in electromagnetism and its applications, which match -- and often surpass -- those of his rival Edison. In the late 1800s (!), Tesla had already devised ways to transfer electrical energy into both fluorescent and incandescent lamps. In 1891, he patented a recognizable ancestor of the induction lamp. His diagrams for the U.S. Patent Office look very like designs for the electrode-less lamps we know today!

• An inventor's endeavor is essentially life saving. Whether he harnesses forces, improves devices, or provides new comforts and conveniences, he is adding to the safety of our existence.



# 

Popular wisdom holds that "the better the light, the better you can see." But not necessarily "the brighter the light." It's the quality of the light, not the wattage, that matters for visual acuity. Induction lighting produces breakthrough light quality because it was engineered according to the latest understanding of how our eyes process visual stimuli.

The human eye is built to perceive shapes, motion, colors, spatial orientation and other information from the environment (about 80% of human perception comes via eyesight). Induction lighting produces vision-friendly light. More clarity per watt.

Visual stimuli must transit the eye for processing in the brain. Efficient transit depends on the efficient functioning of cells in your retina called rods and cones. Rods are excellent for seeing at night ("scotopic vision") but don't "do" color. That's a job for the cones, which thrive at brighter levels ("photopic vision"). When the two work smoothly together they create optimal "seeing." The better the quality of the S/P balance ("mesopic"), the better the quality of that seeing.

Induction lighting assures the best possible interaction between rods and cones, thereby achieving superb mesopic balance.

#### **Color Temperature**

Degrees Kelvin is a temperature measurement as commonly understood. But in the context of "color temperature" it can be mislleading, since that expression refers to the spectral quality of the color emitted by the lamp -- not the bulb's hotness, chill or color saturation.

That quality of light, described in Kelvin (K), ranges from yellowish "soft white" at the low end (standard household bulbs); through "bright white" (big retail store lighting); to "daylight" at the upper (bluish-white) end. The lower the "K" (2700 - 3000) the "warmer" the light quality; the higher the "K" the "cooler" as it rises to the blue end of the spectrum (5000+K). Fulham induction lamps are offered in a wide variety of color temperatures by adjusting the phosphor coating applied to the inside of the lamp's glass tube. This delivers the quality of light you need for YOUR purposes.

#### CRI

"Color Rendering Index" is the expression electrical engineers use to describe how white your white looks; how red your red; how blue your blue -- in other words, how closely your lamp reproduces colors to the way they look in ordinary daylight. The more color matters to you or to your business, the happier you'll be with a high CRI.

#### Lighting Efficiency

For cars, efficiency = MPG. For batters, it's RBIs. Lamp efficiency is expressed by Lm/Wt -- Lumens per Watt. That's light output per unit of energy input. Different lamps deliver different Lm/Wt ranges. Your choice.

# SCOTOPIC/PHOTOPIC (S/P) RATIO

SUN (CIE D65 ILLUMINANT) 6500K INDUCTION LAMP **5000K INDUCTION LAMP** 4100K INDUCTION LAMP METAL HALIDE (NA/SC) 3500K INDUCTION LAMP INCANDESCENT (2850K) WHITE HIGH PRESSURE SODIUM (50W) WARM WHITE FLUORESCENT HIGH PRESSURE SODIUM (50W) HIGH PRESSURE SODIUM (35W) LOW PRESSURE SODIUM (SOX)



Chart calculations by Berkley Labs - actual selection of induction lamp wattage and type will vary with installation and user requirement.

6 The scientific man does not aim at an immediate result. He does not expect that his advanced ideas will be readily taken up. His work is like that of the planter – for the future. His duty is to lay the foundation for those who are to come, and point the way. S. -Nikola Tesla

#### **COMPARE THE SPECS**

When compared to other common light sources, Induction's specifications clearly dominate the competition

|                              | INDUCTION   | LED        | METAL<br>HALIDE | HIGH PRESSURE<br>SODIUM |
|------------------------------|-------------|------------|-----------------|-------------------------|
| LAMP LIFE HRS                | 100k        | 30k - 50k  | 10k - 15k       | 15k - 24k               |
| LIGHTING<br>EFFICIENCY Lm/Wt | 65 - 90     | 90 - 120   | 60 - 110        | 60 - 120                |
| CRI                          | > 80        | > 70       | > 70            | > 20                    |
| S/P RATIO                    | 1.46 - 2.25 | 1.96       | 1.49            | 0.62                    |
| COLOR<br>TEMPERATURE         | Full Range  | Full Range | Limited Range   | Limited Range           |
| HOT RESTART                  | INSTANT     | INSTANT    | DELAY           | DELAY                   |
| MERCURY                      | Low         | N/A        | Low - High      | Low - Medium            |

#### **Hot Restart**

Your lamp goes dark. You need to light it up again. But how quickly can you do it? Some lamps are designed for instant re-start. Others need a cooling-off period, which could be as long as half an hour, sucking up valuable production time, ETC., ETC., ETC. This table shows which lamps jump right back on line (Induction, LED), and which need time to think things over (MH, HPS).

#### **Lumen Maintenance**

This "actuarial chart" below compares the active life expectancies of several of the most common lamps. Even though a lamp may still provide marginal light levels, industry norms consider its real potency gone at 65%, the failure level used in this diagram. All four lamps start at 100% efficiency, then gradually, as is to be expected in the real world, lose potency over their lifetime. Some maintain high levels fairly long; others reach dropoff (see the dotted line) relatively early.

HID lamps (MH and HPS) live fast, love hard and die fairly young. LEDs maintain robust levels until 50,000 hours or so, before dipping below useful levels. But induction lighting is engineered for the long haul. It unquestionably outlasts them all -- while still maintaining impressive strength.

## LUMEN MAINTENANCE

Induction's ultra long lamp life provides low maintenance costs through out the life of the lamp. This means big savings over the competition.



# LIGHTING SYSTEMS

- COMPLETE INDUCTION SYSTEMS WITH PREMIUM FULHAM LAMPS AND GENERATORS
- > OVER 1,100 SYSTEM MODELS
- > 100,000 HOUR AVERAGE LAMP LIFE
- $\rangle$  ENHANCED VISUAL ACUITY USING HALF THE ENERGY OF HID







TUBULAR 40W-400W

BULB 35W-200W



HighHorse Induction product specification sheets and other related literature online





#### CIRCULAR

120-277 50/60Hz

# Fulham. HIGHHORSE INDUCTION CIRCULAR SYSTEMS



| System Model Number  | Watts | Input<br>Current (Amp)<br>120V - 277V | Input<br>Power | Rated Initial<br>Luminance (LM) | Efficacy<br>(LM/W) <sup>††</sup> | Luminance<br>Maintenance<br>(60K Hrs) | CRI  | Color Temp. (Kelvin)                 | Average<br>Lamp Life<br>(Hours) |
|--|-------|---------------------------------------|----------------|---------------------------------|----------------------------------|---------------------------------------|------|--------------------------------------|---------------------------------|
| HH ILS CP40 5K<br>HH IL CP40 510M*<br>HH ILS CDS40 5K                        | 40    | 0.35-0.15                             | 42             | 2800-3000                       | 70-75                            |                                       |      |                                      |                                 |
| HH ILS CP70 5K<br>HH IL CP70 510M*<br>HH ILS CDS70 5K                        | 70    | 0.62-0.27                             | 74             | 4900-5250                       | 70-75                            |                                       |      |                                      |                                 |
| HH ILS CP80 5K<br>HH ILS CDS80 5K<br>HH ILS CDC80 5K                         | 80    | 0.70-0.30                             | 84             | 6000-6400                       | 75-80                            |                                       |      |                                      |                                 |
| HH ILS CP100 5K<br>HH IL CP100 510M*<br>HH ILS CDS100 5K<br>HH ILS CDC100 5K | 100   | 0.88-0.38                             | 105            | 7500-8000                       | 75-80                            |                                       |      |                                      |                                 |
| HH ILS CP120 5K<br>HH ILS CDS120 5K<br>HH ILS CDC120 5K                      | 120   | 1.05-0.45                             | 126            | 9000-9600                       | 75-80                            | 70%-75%                               | > 80 | Additional Color Temps:              | 100,000                         |
| HH ILS CP150 5K<br>HH IL CP150 510M*<br>HH ILS CDS150 5K<br>HH ILS CDC150 5K | 150   | 1.32-0.57                             | 158            | 12000-12750                     | 80-85                            |                                       |      | 4000K, 4100K, 4500K,<br>6000K, 6500K |                                 |
| HH ILS CP200 5K<br>HH IL CP200 510M*<br>HH ILS CDS200 5K<br>HH ILS CDC200 5K | 200   | 1.75-0.76                             | 210            | 16000-17000                     | 80-85                            |                                       |      |                                      |                                 |
| HH IL CP250 510M*<br>HH ILS CDS 2505K<br>HH ILS CDC250 5K                    | 250   | 2.19-0.95                             | 263            | 21250-22500                     | 85-90                            |                                       |      |                                      |                                 |
| HH ILS CDS300 5K<br>HH ILS CDC300 5K   | 300   | 2.63-1.14                             | 315            | 25500-27000                     | 85-90                            |                                       |      |                                      |                                 |
| HH ILS CDS400 5K<br>HH ILS CDC400 5K   | 400   | 3.50 - 1.52                           | 420            | 34000-36000                     | 85-90                            |                                       |      |                                      |                                 |

ITOUGI

\*10M denotes 0-10V Manual Dimming.

#### Fulham. HIGHHORS CIRCULAR SCREW-IN LAMPS



| System Model Number | Watts | Input<br>Current (Amp)<br>120V - 277V | Input<br>Power | Rated Initial<br>Luminance (LM) | Efficacy<br>(LM/W) <sup>††</sup> | Luminance<br>Maintenance<br>(60K Hrs) | CRI  | Color Temp. (Kelvin)   | Average<br>Lamp Life<br>(Hours) |
|---------------------|-------|---------------------------------------|----------------|---------------------------------|----------------------------------|---------------------------------------|------|------------------------|---------------------------------|
| HH IL CP40 5B       | 40    | 0.35 - 0.15                           | 42             | 2800 - 3000                     | 70 - 75                          |                                       |      |                        |                                 |
| HH IL CP70 5B       | 70    | 0.62 - 0.27                           | 74             | 4900 - 5250                     | 70 - 75                          |                                       |      | 5000K (standard)       |                                 |
| HH IL CP80 5B       | 80    | 0.70 - 0.30                           | 84             | 6000 - 6400                     | 75 - 80                          |                                       |      | Additional Color Temps |                                 |
| HH IL CP100 5B      | 100   | 0.88 - 0.38                           | 105            | 7500 - 8000                     | 75 - 80                          | 70%-75%                               | > 80 | 2700K. 3000K. 3500K.   | 100,000                         |
| HH IL CP120 5B      | 120   | 1.05 - 0.45                           | 126            | 9000 - 9600                     | 75 - 80                          |                                       |      | 4000K, 4100K, 4500K,   |                                 |
| HH IL CP150 5B      | 150   | 1.32 - 0.57                           | 158            | 12000 - 12750                   | 80 - 85                          |                                       |      | 6000K, 6500K           |                                 |
| HH IL CP200 5B      | 200   | 1.75 - 0.76                           | 210            | 16000 - 17000                   | 80 - 85                          |                                       |      |                        |                                 |

<sup>++</sup>LM/W is based on Lamp Power.

#### SYSTEM MODEL NUMBER EXAMPLE

**HH ILS BP35 5K** - A 35W HighHorse Induction System with a bulb lamp, profile generator and 5K color temp **HH IL TP150 510M** - A 150W HighHorse Induction System with a tube lamp, profile generator, 5K color temp and 0-10V manual dimming **HH IL TP150 5C** - A 150W Cold Start HighHorse Induction System with a tube lamp, profile generator and 5K color temp

| HH                    | ILS   | В  | Р   | 35    | 5K OR       | 5   | 10         | М               | OR | 5C                     |
|-----------------------|---|--|---|-------|-------------|-----|------------|-----------------|----|------------------------|
| <b>HH</b> = Highhorse | ILS = INDUCTION<br>LIGHTING<br>SYSTEM<br>IL = DIMMING<br>MODELS | <b>B</b> = BULB<br><b>T</b> = TUBULAR<br><b>C</b> = CIRCULAR | P = PROFILE<br>DS = DISC<br>DC = DIE CAST | WATTS | COLOR TEMP. | 0-1 | ov M<br>Di | ANUAL<br>IMMING |    | COLD<br>Start<br>Model |

#### **BULB / TUBULAR**

#### 120-277 50/60Hz



| System Model Number                 | Watts | Input<br>Current (Amp)<br>120V - 277V | Input<br>Power | Rated Initial<br>Luminance (LM) | Efficacy<br>(LM/W) <sup>††</sup> | Luminance<br>Maintenance<br>(60K Hrs) | CRI  | Color Temp. (Kelvin)                         | Average<br>Lamp Life<br>(Hours) |
|-------------------------------------|-------|---------------------------------------|----------------|---------------------------------|----------------------------------|---------------------------------------|------|--|---------------------------------|
| HH ILS BP35 5K                      | 35    | 0.31-0.13                             | 37             | 2450-2625                       | 70-75                            |                                       |      |  |                                 |
| HH ILS BP55 5K                      | 55    | 0.48-0.21                             | 58             | 4125-4380                       | 75-80                            |                                       |      |  |                                 |
| HH ILS BP85 5K<br>HH ILS BDS85 5K   | 85    | 0.74-0.32                             | 89             | 6375-6800                       | 75-80                            |                                       |      | 5000K (standard)                             |                                 |
| HH ILS BP100 5K<br>HH ILS BDS100 5K | 100   | 0.88-0.38                             | 105            | 7500-8000                       | 75-80                            | 70%-75%                               | > 80 | Additional Color Temps: 2700K, 3000K, 3500K, | 100,000                         |
| HH ILS BP120 5K                     | 120   | 1.05-0.45                             | 126            | 9000-9600                       | 75-80                            |                                       |      | 4000K, 4100K, 4500K,                         |                                 |
| HH ILS BP165 5K<br>HH ILS BDS165 5K | 165   | 1.44-0.62                             | 173            | 11550-12375                     | 70-75                            |                                       |      | 6000K, 6500K                                 |                                 |
| HH ILS BP200 5K<br>HH ILS BDS200 5K | 200   | 1.75-0.76                             | 210            | 14000-15000                     | 70-75                            |                                       |      |  |                                 |





| System Model Number   | Watts      | Input<br>Current (Amp)<br>120V - 277V | Input<br>Power | Rated Initial<br>Luminance (LM) | Efficacy<br>(LM/W) <sup>††</sup> | Luminance<br>Maintenance<br>(60K Hrs) | CRI  | Color Temp. (Kelvin)  | Average<br>Lamp Life<br>(Hours) |
|---|------------|---------------------------------------|----------------|---------------------------------|----------------------------------|---------------------------------------|------|---|---------------------------------|
| HH ILS TP40 5K<br>HH IL TP40 510M*  | 40         | 0.35-0.15                             | 42             | 2800-3000                       | 70-75                            |                                       |      |   |                                 |
| HH ILS TP70 5K<br>HH IL TP70 510M*  | 70         | 0.62-0.27                             | 74             | 4900-5250                       | 70-75                            |                                       |      |   |                                 |
| HH ILS TP80 5K<br>HH ILS TDC80 5K   | 80         | 0.70-0.30                             | 84             | 6000-6400                       | 75-80                            |                                       |      |   |                                 |
| HH ILS TP100 5K<br>HH IL TP100 510M*<br>HH ILS TDC100 5K  | 100        | 0.88-0.38                             | 105            | 7500-8000                       | 75-80                            |                                       |      |   |                                 |
| HH ILS TP120 5K<br>HH ILS TDC120 5K   | 120        | 1.05-0.45                             | 126            | 9000-9600                       | 75-80                            |                                       |      | 5000K (standard)  |                                 |
| HH ILS TP150 5K<br>HH IL TP150 510M*<br>HH ILS TDC150 5K  | 150        | 1.32-0.57                             | 158            | 12000-12750                     | 80-85                            | 70%-75%                               | > 80 | Additional Color Temps:<br>2700K, 3000K, 3500K,<br>4000K, 4100K, 4500K, | 100,000                         |
| HH ILS TP200 5K<br>HH IL TP200 510M*<br>HH ILS TDC200 5K  | 200        | 1.75-0.76                             | 210            | 16000-17000                     | 80-85                            |                                       |      | 6000K, 6500K  |                                 |
| HH ILS TP200 5K 17 <sup>†</sup><br>HH IL TP200 510M 17 <sup>†</sup><br>HH ILS TDC200 5K 17 <sup>†</sup> | 200        | 1.75-0.76                             | 210            | 16000-17000                     | 80-85                            |                                       |      |   |                                 |
| HH IL TP250 510M*<br>HH ILS TDC250 5K   | 250        | 2.19-0.95                             | 263            | 21250-22500                     | 85-90                            |                                       |      |   |                                 |
| HH ILS TDC300 5K<br>HH ILS TDC400 5K  | 300<br>400 | 2.63-1.14<br>3.50-1.52                | 315<br>420     | 25500-27000<br>34000-36000      | 85-90<br>85-90                   |                                       |      |   |                                 |

\*10M denotes 0-10V Manual Dimming. <sup>†</sup> This shorter 200W lamp is only 17" long to fit into more fixtures.

#### COMMON GENERATOR SPECIFICATIONS

| Input Voltage          | 120V-277V     | Case Temp.            | <65°C           |
|------------------------|---------------|-----------------------|-----------------|
| Input Frequency        | 50/60Hz       | Operating Temp.       | (0°C to 50°C)   |
| Output Frequency       | 250KHz        | Open Fixture          |                 |
| THD                    | < 10%         | Operating Temp.       | (-20°C to 50°C) |
| Power Factor           | > 0.95        | Closed Fixture        |                 |
| Constant Wattage Ouput | ± 5%          | Max Remote Distance** | 7 ft. (84")     |
| EMI/RFI Compliance     | FCC Part 18-A | Sound Rating          | Class A         |
| Surge Protection       | Yes           |                       |                 |

\*\*IMPORTANT: Do not modify wiring type or length without contacting Fulham. Special generator can be ordered from Fulham for a maximum remote distance of 49 ft.

#### CONTACT CUSTOMER SERVICE REGARDING THE FOLLOWING OPTIONS:

- Color Temperature: 2720K To 6500K
- Ambient -40°C To 0°C
- Dimming Options
- Replacement Ballast and Lamp
- Remote Mount Options

# **INDUCTION** EASY INSTALL KITS & CUSTOM RETROFIT SYSTEMS

 COMPLETE INDUCTION SYSTEMS WITH PREMIUM FULHAM LAMPS AND GENERATORS
 DOZENS OF STANDARD KITS OF VARYING FIXTURE TYPES
 100,000 HOUR AVERAGE LAMP LIFE



**BULB SYSTEMS** 

**CIRCULAR SYSTEMS** 

# EASY INSTALL CONVERSION KITS



# CUSTOM RETROFIT SYSTEMS

# COUNTLESS APPLICATIONS / PATENT-PENDING HIGH PERFORMANCE REFLECTOR SYSTEM

HighHorse Induction product specification sheets and other related literature online







# **CUSTOM SYSTEMS**

#### EASY INSTALL KITS

#### 120-277 50/60Hz

# սիթա HIGHBAY INDUCTION CONVERSION KITS FOR 16", 22" & 25" ACRYLIC REFRACTORS

#### **Fulham Highbay Induction Conversion**

Kits have been successfully conceptualized, engineered and tested as standard lighting alternatives for use with common 16" and 22"/25" acrylic refractors.

These ready-made, fully warranted kits make it easy to assemble energy-efficient induction highbay fixtures with minimal installation time. All components, hardware and instructions come standard with each kit. Compared with use of traditional HID units, end user Induction benefits include approximately 50% energy cost savings, between 3x – 5x increased life, far better lumen maintenance, and superior visual acuity (Scotopic/ Photopic [S/P] ratio). They have been designed for maximum thermal management and optical performance. (IES files available.)

#### **CRITERIA FOR SELECTING THE CORRECT SYSTEM INCLUDE:**

Bulb or Circular Shape: Both systems offer approximately 100,000 lamp hours.

Lamp Wattage: Generally, Induction offers approximately 50% energy savings over traditional HID.

Diameter of your Acrylic Refractor Opening: These conversion kits have been prefabricated specifically for use with either 16" acrylic refractors or 22"/25" acrylic refractors. (NOTE: Shades with both 22" and 25" diameter openings have identical mount plate measurements).

#### Additional aspects of the system include:

- Standard Junction Box (or larger J-box for step down transformer)
- 2 Disc Generator
- 3 Disc Mount
- Heat Sink (for bulb systems only)
- Fower Coupler (for bulb systems only)
- 👩 Collar Mount Plate
- 🕜 Lamp Bracket (for circular systems only)
- 8 Bulb or Circular Lamp



FRONT VIEW

16" Collar Mount Plate







Certain components/parts are patent pending by Fulham Co., Inc. UL recognized lamp and generator components. Pending UL listing for entire retro-fit kit.

#### EASY INSTALL KITS 120-277 50/60Hz

#### BULB SYSTEM FOR 16" AND 22"/25" ACRYLIC REFRACTORS

|         |                    |                          | Botto | m Lens? | Ambient   |
|---------|--------------------|--------------------------|-------|---------|-----------|
| Wattage | Refractor Diameter | Induction System Kit P/N | With  | Without | Certified |
| 85      | 16" Refractor      | HH ISK B85 HB 16         | Yes   | Yes     | 50°C      |
| 100     | 16" Refractor      | HH ISK B100 HB 16        | Yes   | Yes     | 50°C      |
| 165     | 16" Refractor      | HH ISK B165 HB 16        | Yes   | Yes     | 40°C      |
| 85      | 22"/25" Refractor  | HH ISK B85 HB 22         | Yes   | Yes     | 50°C      |
| 100     | 22"/25" Refractor  | HH ISK B100 HB 22        | Yes   | Yes     | 50°C      |
| 165     | 22"/25" Refractor  | HH ISK B165 HB 22        | Yes   | Yes     | 45°C      |
| 200     | 22"/25" Pofractor  |                          |       | Yes     | 40°C      |
| 200     |                    |                          | Yes   |         | 25°C      |

#### CIRCULAR SYSTEM FOR 16" AND 22"/25" ACRYLIC REFRACTORS

|         |                    |                          | Botto | Ambient |           |  |
|---------|--------------------|--------------------------|-------|---------|-----------|--|
| Wattage | Refractor Diameter | Induction System Kit P/N | With  | Without | Certified |  |
| 70      | 16" Refractor      | HH ISK C70 HB 16         | Yes   | Yes     | 50°C      |  |
| 80      | 16" Refractor      | HH ISK C80 HB 16         | Yes   | Yes     | 50°C      |  |
| 100     | 16" Refractor      | HH ISK C100 HB 16        | Yes   | Yes     | 50°C      |  |
| 120     | 16" Refractor      | HH ISK C120 HB 16        | Yes   | Yes     | 50°C      |  |
| 160     | 16" Defrector      |                          |       | Yes     | 45°C      |  |
| 150     | To Refractor       | HH ISK CISU HB TO        | Yes   |         | 40°C      |  |
| 70      | 22"/25" Refractor  | HH ISK C70 HB 22         | Yes   | Yes     | 50°C      |  |
| 80      | 22"/25" Refractor  | HH ISK C80 HB 22         | Yes   | Yes     | 50°C      |  |
| 100     | 22"/25" Refractor  | HH ISK C100 HB 22        | Yes   | Yes     | 50°C      |  |
| 120     | 22"/25" Refractor  | HH ISK C120 HB 22        | Yes   | Yes     | 50°C      |  |
| 150     | 22"/25" Refractor  | HH ISK C150 HB 22        | Yes   | Yes     | 50°C      |  |
| 200     | 22"/25" Refractor  | HH ISK C200 HB 22        | Yes   | Yes     | 50°C      |  |
| 250     | 22"/25" Refractor  | HH ISK C250 HB 22        | Yes   | Yes     | 45°C      |  |
| 000     |                    |                          |       | Yes     | 40°C      |  |
| 300     | 22"/25" Retractor  | HH I5K C300 HB 22        | Yes   |         | 30°C      |  |

#### GENERATOR SPECIFICATIONS

| Input Voltage:                 | 120V-277V       |
|--------------------------------|-----------------|
| Input Frequency                | 50/60Hz         |
| Output Frequency               | 250kHz          |
| THD                            | < 10%           |
| Power Factor                   | > 0.95          |
| Case Temp.                     | < 65°C          |
| Operating Temp. Open Fixture   | (0°C to 50°C)   |
| Operating Temp. Closed Fixture | (-20°C to 50°C) |
| Surge Protection               | Yes             |

#### 480V/347V STEP DOWN TRANSFORMER

| Wattage     | Transformer Model | Losses | Input Current<br>Max Load | Input<br>Current No<br>Load | Weight<br>Lbs |
|-------------|-------------------|--------|---------------------------|-----------------------------|---------------|
| 35W - 100W  | HH-ILS-SD-1-125VA | 7W     | 0.26 A                    | 0.070 A                     | 2.3           |
| 120W - 200W | HH-ILS-SD-2-245VA | 10W    | 0.57 A                    | 0.080 A                     | 5.3           |
| 250W - 400W | HH-ILS-SD-3-460VA | 18W    | 0.96 A                    | 0.220 A                     | 7.2           |
|             |                   |        |                           |                             |               |

\*J-box is required for Step Down Transformer (Model #: HHILPQ32840)

Input Voltage 480V or 347V Output / Step Down Voltage 277V Operating Frequency 60Hz Insulation Rating 90°C Class A Warranty 5-Years



Standard J-box



Required J-box for Step Down Transformer HHILPQ32840

#### EASY INSTALL KITS

#### 120-277 50/60Hz

# Fulham. HIGHHORSE STOCK AND SPECIAL ORDER INDUCTION CONVERSION KITS

#### HIGHBAY CONVERSION KITS FOR 16", 22" & 25" ACRYLIC REFRACTORS

#### FEATURES

- Includes lamp, disc generator, hardware and installation instructions
- Circular lamp and Bulb lamp options
- · Easy and fast to install
- Thermally tested and fully warranted

#### STOCK KITS

The following (7) Induction Kits for 22"/25" acrylic refractors are now stock items:

For 22"/25" Acrylic Refractors:

| Kit P/N           | System Type   |
|-------------------|---------------|
| HH ISK C120 HB 22 | Circular 120W |
| HH ISK C150 HB 22 | Circular 150W |
| HH ISK C200 HB 22 | Circular 200W |
| HH ISK C250 HB 22 | Circular 250W |
| HH ISK B165 HB 22 | Bulb 165W     |
| HH ISK B200 HB 22 | Bulb 200W     |

- · Patent pending components
- IES files available
- UL recognized lamp and generator components
- Pending UL listing for entire retrofit kit

#### SPECIAL ORDER KITS

The (14) kits listed below are special order items and have an (8) week lead time. These are also thermally tested but are build-to-order items:

| For 16" Acrylic   | C Retractors: |  |
|-------------------|---------------|--|
| Kit P/N           | System Type   |  |
| HH ISK B85 HB 16  | Bulb 85W      |  |
| HH ISK B100 HB 16 | Bulb 100W     |  |
| HH ISK B165 HB 16 | Bulb 165W     |  |
| HH ISK C70 HB 16  | Circular 70W  |  |
| HH ISK C80 HB 16  | Circular 80W  |  |
| HH ISK C100 HB 16 | Circular 100W |  |
| HH ISK C120 HB 16 | Circular 120W |  |
| HH ISK C150 HB 16 | Circular 150W |  |
|                   |               |  |



| For 22"/25" Acrylic Refractors: |               |  |  |
|---------------------------------|---------------|--|--|
| Kit P/N                         | System Type   |  |  |
| HH ISK B85 HB 22                | Bulb 85W      |  |  |
| HH ISK B100 HB 22               | Bulb 100W     |  |  |
| HH ISK C70 HB 22                | Circular 70W  |  |  |
| HH ISK C80 HB 22                | Circular 80W  |  |  |
| HH ISK C100 HB 22               | Circular 100W |  |  |
| HH ISK C300 HB 22               | Circular 300W |  |  |
|                                 |               |  |  |

#### GAS STATION CANOPY CONVERSION KITS

#### FEATURES

- Includes circular lamp, generator, hardware and installation instructions
- Easy and fast to install
- Thermally tested and fully warranted
- Patent pending components
- IES files available
- UL recognized lamp and generator components
- Pending UL listing for entire retrofit kit

|                             |                     | Ballast Mounted Inside/On |                   |                        |
|-----------------------------|---------------------|---------------------------|-------------------|------------------------|
| Kit P/N                     | System Type         | Enclosure                 | Top of<br>Fixture | Surface<br>2' X 2' Box |
| Canopy Kit (with enclosure) | - STOCK KITS        |                           |                   |                        |
| HH ISK C70 CNL S01          | Circular 70W        | Yes                       | =                 | <del>.</del>           |
| HH ISK C80 CNL S01          | Circular 80W        | Yes                       |                   | <del>.</del>           |
| HH ISK C100 CNL S01         | Circular 100W       | Yes                       |                   | <del></del>            |
| HH ISK C120 CNL S01         | Circular 120W       | Yes                       | _                 | _                      |
| Canopy Kit (with top mounte | ed ballast) - SPECI | AL ORDER KITS             |                   |                        |
| HH ISK C70 CNL S02          | Circular 70W        |                           | Yes               | <del></del>            |
| HH ISK C80 CNL S02          | Circular 80W        | <del></del>               | Yes               | <del>.</del>           |
| HH ISK C100 CNL S02         | Circular 100W       | <del></del>               | Yes               | <del>.</del>           |
| HH ISK C120 CNL S02         | Circular 120W       | _                         | Yes               | _                      |
| Canopy 2X2 Kit - SPECIAL O  | RDER KITS           |                           |                   |                        |
| HH ISK C70 CNL S03          | Circular 70W        |                           |                   | Yes                    |
| HH ISK C80 CNL S03          | Circular 80W        |                           | <del></del>       | Yes                    |
| HH ISK C100 CNL S03         | Circular 100W       | <del></del>               | <del>.</del>      | Yes                    |
| HH ISK C120 CNL S03         | Circular 120W       | _                         | _                 | Yes                    |





after Retro-fit Kit installation.

EASY INSTALL KITS 120-277 50/60Hz



#### FEATURES

- · Includes tubular lamp, generator, hardware and installation instructions
- · Easy and fast to install in popular billboard fixture types
- Thermally tested and fully warranted at maximum ambient temperature of 40°C
- Patent pending components
- IES files available
- UL recognized lamp and generator components
- Pending UL listing for entire retrofit kit

#### **Available Kits**

| Kit P/N        | System Watts |
|----------------|--------------|
| HH-ISK-120HP01 | 120 Watt     |
| HH-ISK-150HP02 | 150 Watt     |
| HH-ISK-200HP03 | 200 Watt     |

Illustration of a post-installation fixture

# **BEFORE**&AFTER

How can visual acuity actually be improved by replacing a 150W HID system with an 85W HighHorse® Induction system?



150W HPS

85W INDUCTION

#### The answer is found in how the human eye responds to light and how lighting sources affect vision.

The ratio of Scotopic light vs. Photopic light from a lamp is called the S/P ratio. This ratio determines the apparent visual brightness of a light source. Induction lighting produces a high S/P ratio and this is why the 85W lamp appears as bright or brighter to the human eye than a sodium vapor or metal halide of twice the wattage. Visual Effective Lumens (VEL) is a key factor in vision.

#### **CUSTOM RETRO-FIT KITS**

120-277 50/60Hz



Fulham provides a complete range of supportive services that may enable the customer to retro-fit their existing fixtures with HighHorse Induction Lamps & Generators. This unique Fulham retro-fit system not only takes full advantage of Induction technology, but also provides a cost-effective solution with minimal investment.

HighHorse Induction Retro-Fit systems services make it easy to retro-fit existing fixtures, minimize labor cost of conversion, ensure reliability and maximize the expected life of components.

The Fulham laboratories in Los Angeles, California are staffed with highly skilled engineering talent and the most state-of-the-art testing equipment in the world including lamp spheres for testing lumen output and efficiency.

#### BASIC 7-POINT ENGINEERED SYSTEM

- ✓ Generator Mounting and Thermal Management
- ✓ Lamp Mounting and Optical Enhancement
- ✓ Ease of Component Installation
- ✓ Thermal & Conductivity Test Report
- ✓ Component CAD Drawings\*
- ✓ Installation Instructions
- ✓ Warranty Evaluation

\*Contact Factory for Applicable Charges





Cobra head for street lighting. 100 Watt HPS retro-fitted to a 55 Watt Induction lighting system with profile generator.



Complete Generator & Lamp Mounting Assembly

#### 120-277 50/60Hz

#### ENGINEERING SERVICES

SYSTEM EVALUATION

Fulham determines the best lamp and generator combination for the existing fixture; this includes:

- Generator mounting & thermal management
- Lamp mounting and optical enhancement
- Ease of component installation options
- Retro-fit component CAD drawings
- Installation instructions
- Evaluation sample

## CERTIFICATION SERVICES

UL CERTIFICATION

Fulham takes the responsibility to ensure that the retro-fit meets the UL Certification standard and provides the customer with a Multiple Listing for the retro-fitted fixture. This ensures the fixtures operate safely and meet UL standards for this type of fixture conversion.

#### **IES PHOTOMETRIC FILES**

INDEPENDENT LAB TESTING

During the initial system evaluation Fulham evaluates basic performance; most often this performance level exceeds the existing levels of illumination. Fulham is contracted with an Independent Test Lab and can provide a new IES Photometric file for application specific purposes.

#### SAMPLE PROGRAM

BETA-SITE TESTING

Fulham provides flexible sample programs to ensure the HighHorse Retro-Fit System meets all the customer requirements.

To take full advantage of HighHorse Induction Lighting in various applications Fulham works with the customer to maximize the lighting effect and minimize the energy cost; this may require testing the retro-fit fixtures before wholesale conversion.





Decorative pole top fixture for pathway lighting. 70 Watt MH retro-fitted to a 35 Watt Induction lighting system with profile generator.

Highbay fixture for warehouse lighting. 400 Watt MH retro-fitted to a 200 Watt Induction lighting system with disc generator.

#### WARRANTY PROGRAM

APPLICATION EVALUATION PROCESS

Fulham is known for high quality products and superior support services; HighHorse Induction Systems are designed for the Lamp and Generator to operate as a system which provide long-life and consistent operation.

Before and during the process of retrofit evaluation Fulham provides a Warranty Evaluation Summary; this identifies all the critical data necessary to determine life-expectancy.

HighHorse Induction Systems come with a Full Five-Year Warranty; but much longer life is possible with proper thermal management.

#### **GREEN ENERGY SERVICES** REBATE PROGRAMS

Many programs have been or are being offered for converting conventional lighting systems to Induction Lighting technology. Fulham

to Induction Lighting technology. Fulham is constantly reviewing these programs and providing our customers with information about these financial offers.

Where rebate programs do not exist, we can assist by providing cost and technical evaluation materials that can assist with implementation of a rebate program.



HighHorse Induction product specification sheets and other related literature online

# REAKING A and a left of the second se

A Light Emitting Diode (LED) is a semiconductor designed to let electric current pass through in one direction and convert part of that energy to light while preventing backflow, not unlike a water valve.



# Here's to the red, blue and white!

The light-emitting diode, or LED, was invented in 1924 by the Soviet Russian scientist Oleg Losev (1903 - 1942). A skilled radio technician, Losev noticed that diodes in crystal set radios glowed when electrical current flowed through them. Based on that insight, he developed devices to generate light by electroluminesence -- light produced by substances charged with electrical current. Although Losev published papers on his findings in various technical journals, credit for his breakthrough came only decades after his premature death.

Nick Holonyak, Ph.D. (b.1928) gets credit for inventing the first practically useful LED in 1962 while consulting at GE labs. Some have dubbed him "the father of the LED," but that paternity has been at the very least a shared, if not a group, enterprise. Dr. Holonyak has fathered many other inventions, including the first light dimmer; the redlight semiconductor laser (used in CD, DVD and cell phones); and a transistor laser.

LED technology developed relatively slowly, partly due to high R&D costs. The earliest LEDs were red only, followed by green and amber. By the mid-1990's blue and white LEDs joined the spectrum.

# Pankove, Maruska, Nakamura: these guys gave us the blues

In 1968, Dr. James Tietjen of RCA labs - already envisioning what is now flat screen TV - tasked Herbert Paul Maruska (b. 1944) with finding a way to produce blue-yield LEDs. Maruska had already been "growing" red LEDs. He pored over research studies from the '30s and '40s, and beavered away for the next two years. In 1970, at 26, no longer eligible for the Vietnam draft, he moved to Stanford for his Ph.D. RCA financed the degree, stipulating only that his thesis consist of work on the blue LED.



H. Paul Maruska

He was to rejoin RCA's research team as Dr. Maruska, and destined to join forces with the legendary Russianborn, French-raised Jacques Pankove (b. 1922), a pioneer in LED luminescence. (Indeed, Pankove's groundbreaking research virtually spawned the LED industry.) With a Master's from Berkeley, Pankove had joined RCA's research team in 1948. Teamed with Maruska at RCA, he created the Gallium Nitride LED (GaN LED) and the first blue LED (1971), cornerstones of the category.

Later, halfway around the world, the founder of Nichia Corporation, Mr. Nobuo Ogawa, sponsored research headed by Shuji Nakamura (b. 1954) who was inventing the process that led to the first truly marketable GaN LED capable of emitting bright blue light. By 1993, Nichia had succeeded in developing a marketable product, which then went into production.

A year later Nakamura was awarded a Ph.D. in Engineering degree from his alma mater, the University of Tokushima. In 1999 Dr. Nakamura parted company with Nichia and accepted an engineering professorship at UC Santa Barbara.

In recent years he has worked on green and white LEDs, and also blue lasers (as in Blu-Ray).

# LED LIGHTING SYSTEMS SURE, THEY'RE COOL, BUT WHAT USE ARE THEY?

LEDs are an excellent choice for aviation and automotive lighting (indicator lights, turn signals, brake lamps, etc.); traffic signals; advertising billboards; VCRs, video and computer displays; communications applications and remote control units for a variety of consumer electronic products. Colored, Ultraviolet and Infrared LED lamps are ideal for signalling, tracking, inspection, forensics (tracing blood), fluorescent dyes or other marked substances. Infrared LEDs are an important component in night vision equipment.

#### Here's what users like about them

LED lamps use about 30% less power than high-intensity discharge (HID) lighting, and generate less heat. They're fast switching, and pack lots of lumens in a smaller size. LEDs are bright enough to be plainly visible in broad daylight. They're also tougher than typical incandescent lamps (Solid State means no filaments to break). LEDs are trustworthy "work horses," often burning far longer than comparably powered incandescent lamps. They also require no special disposal, because they are entirely mercury-free.



#### SSL forecast

This chart at left dramatizes the skyrocketing SSL forecast. These are heady times for LED development. Not only are new applications being discovered regularly, but outyear projections for LED efficacy are

LED Lumen/Watt efficacy is predicted to hit an amazing 220 in less than a decade!

nothing short of stunning. Latest data available shows LED efficacy indexing at 102. At its current rate of improvement, LED Lumen/ Watt efficacy is predicted to hit an amazing 220 in less than a decade! Meanwhile, other lamp categories are predicted to remain static.

#### CONSTANT CURRENT VS CONSTANT VOLTAGE

There are two different approaches to the electrical interconnection between an LED driver and LED modules. Those are called Constant Current and Constant Voltage. Factors considered when deciding whether to use Constant Current or Constant Voltage include how the system will be installed; how it will be configured; and overall system efficiency requirements.

With Constant Current, the LED driver feeds a steady current through all LEDs on the module. Since each individual LED requires a certain voltage for the current to flow (known as Vf), the driver must provide enough voltage to equal the sum total of all the voltages of that module's LEDs. Note that, while the LED module is frequently designed with all LEDs connected in one continuous serial electrical chain, it is also possible to create branches that split the current flowing through the module. So it's essential to understand the design of the module's circuitry, and the electrical rating of the LEDs themselves when connecting a Constant Current driver to Constant Current LED modules. Constant Current architectures offer higher operating efficiency than Constant Voltage, but less flexibility in connecting different modules and LEDs to the driver.

With Constant Voltage, the LED driver provides a steady voltage supply that enables power to flow through all LEDs connected. Since any given current flow requires a specific amount of voltage for each individual LED, it is necessary to buffer or regulate the voltage with a resistor (or equivalent component) in line with the connected LEDs. With proper resistance selection, the seriesconnected LEDs receive proper -- never excessive -- voltage to regulate the current inflow. The Constant Voltage approach is most commonly used when the number of LED modules varies widely from different installations or product designs.

## **DID YOU KNOW?** SIGNIFICANCE OF GALLIUM NITRIDE

Gallium Nitride (GaN) is a non-toxic compound composed of elements Gallium and Nitrogen that form the basis for most blue and white LEDs. For use in LEDs, it is formed by a process that takes place at >1000°C known as metal organic chemical vapor deposition (MOCVD). In addition to Gallium, small amounts of Indium and Aluminum can be added to GaN in order to change the wavelengths of the LEDs to be fabricated. Gallium Nitride is unique among semiconductor materials; it has a hexagonal crystal structure of its individual atoms that results in unique properties. Gallium Nitride is also used to make lasers for HD DVD and Blu-Ray players and can be used to fabricate microelectronic devices for applications such as highspeed wireless communication and electrical power conversion. Most recently, advanced scientific research is being conducted to explore uses of GaN in biomedical implants.

#### **ANSI BINNING**



Not everyone realizes that, despite advanced manufacturing techniques and our best intentions, LEDs are not all created equal. There is always some variation from one to another in color temperature, lumens and even voltage among newly-

minted LED "wafers," ranging from very slight to fairly significant.

This means that precise matching of color depends on further processing.

LEDs are taken one by one, activated, measured, then sorted into bins, each bin tagged for a Kelvin color range. This graph depicts that range, from bright white daylight (6500 K bin) all across the visual spectrum to soft mellow yellow (2700 K). There is an accepted industry standard for managing this color-matching process. Fulham follows that convention. This ensures that all our LEDs can be reliably interchanged with equivalent lamps of other manufacturers, either as original equipment (OE) or replacements.



COMPLETE LED SYSTEMS WITH PREMIUM FULHAM MODULES, DRIVERS, LIGHT ENGINES AND LAMPS

> HUNDREDS OF VERSATILE, STATE-OF-THE-ART LED ITEMS

> TOMORROW'S LIGHTING SYSTEMS... TODAY





# LED LAMPS & LIGHT ENGINES

LED DRIVERS



STANDARD AND CUSTOM



# LED DRIVERS

#### D.A.D., DIMMING, CONSTANT CURRENT, CONSTANT VOLTAGE

# LED LAMPS & LIGHT ENGINES

### PAR30 / PAR38 LAMPS, MR16 (GU5.3 / GU10) LAMPS, WHITE & RGB LIGHT ENGINES





# LED MODULES

DRIVERS 120-277 50/60Hz

#### c¶Uus ∰1º 🖄 CE SELV **DIGITAL ADDRESSABLE DRIVERS** NG INT ERFACE **FEATURES APPLICATIONS** · Expand your DALI environment to Office Spaces encompass the latest LED technology Airports · Dedicated single or double channel option Train Stations • Multiple current options • Shopping Malls • 5 Year Warranty • Over Time Protection · Fully potted for optimal thermal management & durability 4-Channel output, 100W total Part Number Description T1A4 UNV 0350 100L Single channel DALI control, 350mA constant current T1A4 UNV 0700 100L Single channel DALI control, 700mA constant current T1A4 UNV 1000 100L Single channel DALI control, 1000mA constant current

T2A4 UNV 0350 100L Two channel DALI control, 350mA constant current T2A4 UNV 0700 100L Two channel DALI control, 700mA constant current T2A4 UNV 1000 100L Two channel DALI control, 1000mA constant current T1A4 UNV 0350 100C Single channel DALI control, 350mA constant current Single channel DALI control, 700mA constant current T1A4 UNV 0700 100C Single channel DALI control, 1000mA constant current T1A4 UNV 1000 100C T2A4 UNV 0350 100C Two channel DALI control, 350mA constant current Two channel DALI control, 700mA constant current T2A4 UNV 0700 100C Two channel DALI control. 1000mA constant current T2A4 UNV 1000 100C L= Long case 370 x 40 x 30mm; C= Compact case 230 x 80 x 30mm

# c¶Us ∰1º 🖄 DIGITAL ADDRESSABLE DRIVERS

CE SELV

DA

#### FEATURES

- Support standalone & ROM protocol of DMX display for on-board set up of DMX; group commissioning through LED synch terminal
- · Configurable for up to four control channels (DMX or DALI Addresses)
- · Constant current or constant voltage options available
- RGB & RGBW Options
- 5 Year Warranty
- Over Time Protection
- Fully potted for optimal thermal
- management & durability
- 4-Channel output, 100W total

| Part Number                  | Description   |
|------------------------------|---|
| T4N4 UNV 0350 100K           | Four channel DALI and DMX control, 350mA constant current   |
| T4N4 UNV 0700 100K           | Four channel DALI and DMX control, 700mA constant current   |
| T4N4 UNV 1000 100K           | Four channel DALI and DMX control, 1000mA constant current  |
| T4N4 UNV 0350 100B           | Four channel DALI and DMX control, 350mA constant current   |
| T4N4 UNV 0700 100B           | Four channel DALI and DMX control, 700mA constant current   |
| T4N4 UNV 1000 100B           | Four channel DALI and DMX control, 1000mA constant current  |
| T4N4 UNV 012V 100K           | Four channel DALI and DMX control, 12V constant voltage     |
| T4N4 UNV 024V 100K           | Four channel DALI and DMX control, 24V constant voltage     |
| T4N4 UNV 012V 100B           | Four channel DALI and DMX control, 12V constant voltage     |
| T4N4 UNV 024V 100B           | Four channel DALI and DMX control, 24V constant voltage     |
| K= Long case with display 37 | 0 x 40 x 30mm; B= Compact case with display 230 x 80 x 30mm |

APPLICATIONS

- Theatrical Lighting
- Stage Lighting
- Movie Sets
- Night Clubs
- Casinos
- Color Shifting Environments

#### DRIVERS 120-277 50/60Hz





# FULHAM IS A REGULAR MEMBER OF THE ZHAGA CONSORTIUM.

Zhaga is a global cooperation with participation by luminaire manufacturers, lamp manufacturers, LED module makers, and companies that supply the lighting industry. The Zhaga Consortium aims to make the LED light sources ("LED light engines") manufactured by different companies interchangeable.

> Learn more about The Zhaga Consortium at: www.zhagastandard.org

Ξ

120 50/60Hz



#### FEATURES

DRIVERS

- Optimized System Efficiency
- Single or Multiple outputs for greater flexibility for LEDs run in Series
- High Efficiency
- UL Class 2
- Compact Size



c **FL**<sup>°</sup> us

|                     | TC1 120 0350-6 C                               | TC1 120 0350-15 C                              | TC1 120 0700-18 C                              | TC3 120 0500-75 LA                             |
|---------------------|--|--|--|--|
| cURus               | $\checkmark$                                   |  | $\checkmark$                                   |  |
| Input Voltage       | 120V   | 120V   | 120V   | 120V   |
| Frequency           | 50/60Hz  | 50/60Hz  | 50/60Hz  | 50/60Hz  |
| Number of Channels  | 1  | 1  | 1  | 3  |
| Output Wattage      | 6  | 15   | 18   | 75   |
| Output Volts        | 6~20VDC  | 24~50VDC                                       | 11~30VDC                                       | 20~50VDC                                       |
| Output Current (mA) | 350  | 350  | 700  | 500  |
| Driver Size         | L 2.6", W 1.8", H 1"<br>L 66mm, W 46mm, H 25mm | L 2.6", W 1.8", H 1"<br>L 66mm, W 46mm, H 25mm | L 3.2", W 2.4", H 1"<br>L 81mm, W 61mm, H 25mm | L 12", W 1.7", H 1"<br>L 305mm, W 43mm, H 25mm |
| Case Material       | Metal  | Metal  | Metal  | Metal  |
| Min. Operating Temp | -20ºC  | -20⁰C  | -20ºC  | -30°C  |
| Max. Case Temp      | 70°C   | 70°C   | 75°C   | 75⁰C   |

Dimmable

# <u>fulham</u>

TRIAC DIMMING

c **RL**us



- Smooth Dimming from 100% 10%
  Compatible with Leading Dimmer Brands
- Compact Size
- UL Class 2

|                     | TCD1 120 0700-9 C                              | TCD1 120 0350-11 C                             | TCD1 120 0650-18 C                             |
|---------------------|--|--|--|
| cURus               | ✓  | $\checkmark$                                   | $\checkmark$                                   |
| Input Voltage       | 120V   | 120V   | 120V   |
| Frequency           | 50/60Hz  | 50/60Hz  | 50/60Hz  |
| Number of Channels  | 1  | 1  | 1  |
| Output Wattage      | 9  | 11   | 18   |
| Output Volts        | 6~15VDC  | 18~40VDC                                       | 11~30VDC                                       |
| Output Current      | 700  | 350  | 650  |
| Driver Size         | L 3.2", W 1.8", H 1"<br>L 81mm, W 46mm, H 25mm | L 3.2", W 2.8", H 1"<br>L 81mm, W 71mm, H 25mm | L 3.2", W 2.4", H 1"<br>L 81mm, W 61mm, H 25mm |
| Case Material       | Metal  | Metal  | Metal  |
| Min. Operating Temp | -20°C  | -20°C  | -20°C  |
| Max. Case Temp      | 75⁰C   | 75⁰C   | 75⁰C   |
| Dimming Type        | Triac Phase Control<br>Dimmer Switch           | Triac Phase Control<br>Dimmer Switch           | Triac Phase Control<br>Dimmer Switch           |
| Dimming Range       | 100% - 10%                                     | 100% - 10%                                     | 100% - 10%                                     |

DRIVERS 120-277 50/60Hz



Dimmable

#### **FEATURES**

- Multiple Outputs for Greater Flexibility
- UL Class 2
- Size Similar to Standard Ballasts

|                     | TCD4 UNV 0300-34 L                                | TCD4 UNV 0350-39 L                                | TCD4 UNV 0385-42 L                                |
|---------------------|---|---|---|
| cURus               | $\checkmark$                                      | √   | √   |
| Input Voltage       | 120-277V  | 120-277V  | 120-277V  |
| Frequency           | 50/60Hz   | 50/60Hz   | 50/60Hz   |
| Number of Channels  | 4   | 4   | 4   |
| Output Wattage      | 34  | 39  | 42  |
| Output Volts        | 22~27VDC  | 22~27VDC  | 22~27VDC  |
| Output Current      | 300   | 350   | 385   |
| Driver Size         | L 9.5", W 1.7", H 1.2"<br>L 241mm, W 43mm, H 30mm | L 9.5", W 1.7", H 1.2"<br>L 241mm, W 43mm, H 30mm | L 9.5", W 1.7", H 1.2"<br>L 241mm, W 43mm, H 30mm |
| Case Material       | Metal   | Metal   | Metal   |
| Min. Operating Temp | 0°C   | 0°C   | 0°C   |
| Max. Case Temp      | 70°C  | 70°C  | 70°C  |
| Dimming Type        | 0-10V   | 0-10V   | 0-10V   |
| Dimming Range       | 0-1V=Off;<br>9-10V= Full Output                   | 0-1V=Off;<br>9-10V= Full Output                   | 0-1V=Off;<br>9-10V= Full Output                   |



#### FEATURES

- High Efficiency
- Reliability & Flexibility
- 12V, 24V & 48V
- Low Temperature Performance

|                     | T1UNV 012V-60 L                                   | T1UNV 024V-60 L                                   | T1UNV 024V-100 LS                                  | T1UNV 048V-150 L                                  |
|---------------------|---|---|--|---|
| cURus               | √   | ✓   | √  | ✓   |
| CE                  | √   | ✓   | √  |   |
| Input Voltage       | 120-277V  | 120-277V  | 120-277V   | 120-277V  |
| Frequency           | 50/60Hz   | 50/60Hz   | 50/60Hz  | 50/60Hz   |
| Number of Channels  | 1   | 1   | 1  | 1   |
| Output Wattage      | 60W   | 60W   | 100W   | 150W  |
| Output Volts        | 12VDC   | 24VDC   | 24VDC  | 48VDC   |
| Output Current      | max. 5A   | max. 2.5A   | max. 4.2A  | max. 3.1A   |
| Case Size           | L 9.5", W 1.7", H 1.2"<br>L 241mm, W 43mm, H 30mm | L 9.5", W 1.7", H 1.2"<br>L 241mm, W 43mm, H 30mm | L 10.3", W 1.7", H 1.2"<br>L 262mm, W 43mm, H 30mm | L 8.3", W 2.6", H 1.6"<br>L 211mm, W 66mm, H 41mm |
| Case Material       | Metal   | Metal   | Metal  | Metal   |
| Min. Operating Temp | -40°C   | -40°C   | -40ºC  | -40°C   |
| Max. Case Temp      | 90°C  | 90°C  | 90°C   | 80°C  |

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#### FEATURES

- High Brightness Using Less Power
- Long Life LEDs
- Easy Installation
- Superior Heat Management

#### **Lamp Specifications**

| Base                         | GU5.3                  | GU10     |  |  |  |
|------------------------------|------------------------|----------|--|--|--|
| Input Voltage                | 12V AC/DC              | 120/230V |  |  |  |
| Diameter                     | 50 mm                  | 50 mm    |  |  |  |
| MOL                          | 56 mm                  | 62 mm    |  |  |  |
| Input Power                  | 4                      | W        |  |  |  |
| Operating Temperature        | -20°C to +45°C         |          |  |  |  |
| Color Temperatures Available | 2800°K, 4000°K, 6000°K |          |  |  |  |
| LED Type                     | CREE                   |          |  |  |  |
| Beam Angle Available         | 30° / 45°              |          |  |  |  |
| LED Life Rating              | >35,000 Hours*         |          |  |  |  |
| IP Rating                    | 3                      | 30       |  |  |  |
| Warranty                     | 2 Years                |          |  |  |  |
| *Based upon LED LM-80 data   |                        |          |  |  |  |

#### Minimal UV or Heat Emission onto Lit Surface

- No Lead, No Mercury
- No Filaments To Break

|                         | 4                       |
|-------------------------|-------------------------|
| ission onto Lit Surface | GU5.3 Base<br>(Two-Pin) |

| Ordering Options    | GU5.3 Base     | GU10 Base      |
|---------------------|----------------|----------------|
| Product Family      | TL             | TL             |
| Lamp Type           | M16            | M16            |
| Input Voltage       | 012            | 120   230      |
| Wattage             | 04             | 04             |
| Color Temperature   | 28   40   60   | 28   40   60   |
| Beam Angle          | 30   45        | 30   45        |
| Part Number Example | TLM16012042830 | TLM16120044045 |

CE

GU10 Base (Twist Lock)

#### Photometric Specifications

| Color Temperature      | CRI | Typical<br>Output | Center Intensity<br>(Candlepower) |
|------------------------|-----|-------------------|-----------------------------------|
| Warm White (2800°K)    | 75  | 160 lm            | 1140 Candelas                     |
| Natural White (4000°K) | 75  | 180 lm            | 1280 Candelas                     |
| Cool White (6000°K)    | 80  | 190 lm            | 1350 Candelas                     |

#### LIGHT ENGINES 9-15 AC/DC 50/60Hz



Light Plugz<sup>™</sup>, the most versatile LED Light Engines available, offer high performance and reliability in an easy-to-incorporate package. The threaded housings of Light Plugz LED Light Engines are designed to mate with a variety of accessories, such as lens, heat sink or custom-designed housings.

Light Plugz<sup>™</sup> are designed to be powered by magnetic 12VAC transformers, selected electronic 12VAC transformers, and 12VDC power supplies.

| Input Voltage                | 9V-15V AC/DC  |
|------------------------------|---|
| Input Watts                  | 1.5W, 2.3W, 4.3W  |
| Available LED Colors         | WW (2800°K), NW (4000°K), CW (6000°K)<br>Contact Fulham for other colors, e.g. red, green, blue |
| CRI                          | 2800°K CCT - 80; 4000°K, 6000°K CCT - 75  |
| Dimmability                  | 3.5V - 8V, Phase Modulation or Voltage Control  |
| Maximum View Angle           | 80°   |
| Lens                         | Standard: 40° (Contact Fulham for other options)  |
| Operating Temperature        | -20°C to +50°C  |
| Maximum Operating Case Temp. | 65°C  |
| IP Rating                    | 67  |
| Life Span                    | >35,000 hours* at no less than 70% lumen output   |
| Dimensions                   | Thread: M26 x 1.5; Length: 47mm-64mm;<br>Diameter: 3.1cm  |
| Bezel Color                  | Silver, Black, White  |
| Wire                         | UL 18 Gauge SPT-2; Length: (std) 36"  |



RoHS

\*Based upon LED LM-80 data.

#### **Ordering Options:**

| Base Part Number    | TLE                             |
|---------------------|---------------------------------|
| Input Voltage       | 012                             |
| Wattage             | 1 3 5                           |
| Bezel Color         | Silver: S   Black: B   White: W |
| LED Color           | WW   NW   CW                    |
| Lens Pattern        | 40°                             |
| Lens Surface        | Flat: F                         |
| Part Number Example | TLE0125SNW40F                   |

#### Luminous Flux (White LEDs):

|    | 2800°K<br>Warm White | 4000°K<br>Natural White | 6000⁰K<br>Cool White |
|----|----------------------|-------------------------|----------------------|
| 1W | 70                   | 85                      | 95                   |
| 3W | 100                  | 130                     | 160                  |
| 5W | 170                  | 220                     | 260                  |

#### **Accessories:**

#### Locking Nuts & Heat Sinks (sold separately)

- 3-Groove Nut for 1W TLE<sup>†</sup>: TLE-HSK3 (black), TLE-HSK3S (silver), or TLE-HSK3W (white) TLE-HSK5 (black), TLE-HSK5S (silver), or TLE-HSK5W (white)
- Heat Sink for 3W TLE<sup>+</sup>: TLE-HSK-001 (silver)
- Heat Sink for 5W TLE<sup>+</sup>: TLE-HSK-002 (silver)

<sup>†</sup>HSK Nut is not designed to provide thermal management in most applications.

#### **Acrylic Drop Lens and Cap**

Lens: 2-inch (TLE-OPT-000-001) & 4-inch (TLE-OPT-000-002) Cap: TLE-ALCAP

#### **Custom Heat Sinks**

Fulham will work with customers, using a third-party design and manufacturing group, to design custom heat sinks.



#### **Thermal Management**

Proper thermal dissipation is required for LED life and lumen output. A minimum of 25cm per LED watt of surface area is recommended.

#### **CUSTOM RETRO-FIT**

# **∖fulham**。 **ENGINE APPLICATION PROGRAM**

Fulham offers a comprehensive set of engineering services that can enable OEM customers and other lighting professionals to convert existing fixture styles or new lighting products to take advantage of ThoroLED Light Engines. This unique Fulham program takes full advantage of LED technology and provides a cost efficient solution with a relatively low investment.

#### The ThoroLED L.E.A.P. makes it easy to:

- 1) Convert existing fixture product lines or installations;
- 2) Design new LED lighting products for optimized performance and cost;
- 3) Minimize time to market for new LED fixture products;
- 4) Ensure reliability and performance of LED modules and LED drivers; and,
- 5) Maximize the expected life of all LED Light Engine components.

Fulham's engineering laboratories in Los Angeles, California are replete with highly skilled staff and an extensive array of testing equipment for successful implementation of LED technology into lighting products and applications.

#### LED LIGHTING SYSTEMS: ENGINEERED FOR VALUE AND PERFORMANCE

- Thermal and optical optimization for LED Modules and Assemblies
- Thermal management solutions for LED Driver mounting
- Configuration for ease of component installation
- Conversion accessory component CAD drawings
- Complete installation instructions for the LED Light Engine Kit
- Prototype assembly and optimization
- Regulatory and Standards Compliance evaluation

Engine solution.





#### **ENGINEERING SERVICES**

SYSTEM EVALUATION

Fulham determines the best LED Light Engine for the existing OEM fixture, including:

- LED module mounting; thermal and optical optimization
- Driver mounting and thermal management
- Ease of component installation options
- Conversion Component CAD drawings
- Complete installation instructions for the LED Light Engine
- Prototype assembly and optimization

#### **CERTIFICATION SERVICES**

#### **UL CERTIFICATION**

Fulham's components are designed to meet or exceed UL's new exacting LED Lighting Products safety standard known as UL8750. Similarly, Fulham's products are compliant with international standards such as CE and others. Employment of Fulham's UL Recognized LED drivers and LED modules ensures that customers are able to successfully achieve UL certification for their products.

#### **IES PHOTOMETRIC FILES**

INDEPENDENT LAB TESTING

During the initial converted system evaluation, Fulham can provide basic photometric performance and evaluation. Fulham is contracted with a National Recognized Independent Test Lab and can provide a new IES Photometric file for application specific purposes.



LED Light Engine solution for 2' x 2' flat panel commercial light.

#### SAMPLE PROGRAM

BETA-SITE TESTING

Fulham provides flexible sample programs to ensure the ThoroLED L.E.A.P. systems meet customer requirements. To take full advantage of the ThoroLED L.E.A.P. in various applications, Fulham works with the customer to maximize the lighting effect and minimize the energy cost.

#### WARRANTY PROGRAM

#### APPLICATION EVALUATION PROCESS

Fulham is reputed for high quality products and superior support services; ThoroLED Systems are designed for the LED Light Engine to operate as a system that provides long-life and consistent operation.

Before and during the process of conversion evaluation, Fulham offers a Warranty Evaluation Summary that identifies critical data and performance attributes needed to insure the life expectancy of the LED Light Engine is achieved. ThoroLED Systems come with a Five-Year Warranty, while in most cases much longer life is possible due to superior thermal management of the components.

#### **GREEN ENERGY SERVICES**

REBATE PROGRAMS

Many government programs are being offered for converting conventional lighting systems to more efficient, new lighting technologies such as LED technology. Fulham is constantly reviewing these programs and adapting our products and solutions to meet these money-saving program

requirements. Many of Fulham's LED Light Engine are designed and tested to be capable for use in a fixture that will meet all crtiteria for certification under EPA's Energy Star Program for Luminaires, version 1.0.



ThoroLED product specification sheets and other related literature online



67

#### MODULES

## Fulham. HOROLED STANDARD & CUSTOM LED MODULES

Fulham offers a wide range of LED modules tailored for applications currently using incandescent, CFL, linear fluorescent and HID light sources.

# Fulham LED Modules:

- 1.Enable maximum flexibility through modular design for a wide range of applications
- 2.Feature optimized thermal management/ heat dissipation to ensure extended LED life
- 3.Are offered in both Constant Voltage and Constant Current designs
- 4.Use leading brand, highest quality LEDs

Fulham Co., Inc. www.fulham.com 323-779-2980

68



In addition to Fulham's various linear, circular, cluster and H-shaped standard modules, custom LED modules can also be developed to customers' individual specifications.

#### **LIGHT ENGINE SOLUTIONS**

### Fulham. HORO ED STANDARD LED LIGHT ENGINE SOLUTIONS GUIDE

#### ThoroLED LED Light Engines for Upgrading Luminaires to LED Technology

In additional to the Fulham L.E.A.P. program for custom LED solutions, Fulham offers a host of standard pairings of LED drivers and LED modules to match your application. Follow the four steps below to utilize this matrix indicating standard Fulham LED options for six main categories of fixtures: Ceiling, Linear Fluorescent, Wall Sconce & Decorative, Desk Lamp & Undercabinet, Low Bay & Wall Pack, and Downlight fixtures. New solutions are being developed continually, so please contact Fulham Customer Service if your fixture type does not appear below.

**120V Input Non-Dimmable** 

4

- 1. Find your present luminaire type or light application.
- 2. Determine the current type of light source installed.
- 3. Select your LED Light Module/Assembly equivalent and determine LED driver options. Current options within the Fulham LED driver product portfolio will be indicated by a number and letter combination (e.g. 1, A). The number refers to the quantity of required drivers; the letter refers to the related Wiring Diagrams on Page 72. Details of individual modules and assemblies can be found on Page 73.
- 4. Contact Fulham Customer Service if you do not find your specific application or have additional requirements.

| additional re<br>Fixture Type | quirements.<br>Traditional<br>Light Source | To<br>I<br>Module L<br>Module** Assembly (@ |                | Total LED<br>Module<br>Lumens<br>(@4000K) | Oty of LED Modul | TC1 120 0350-6C | TC1 120 0350-15 | TC3 120 0500-75 | TC1 120 0700-18 |  |
|-------------------------------|--|---|----------------|---|------------------|-----------------|-----------------|-----------------|-----------------|--|
| Ceiling Fixture               |  | TM02LN40xx-001                              |                | 1100                                      | 2                |                 |                 |                 | 1, C            |  |
|                               |  | TM02LN40xx-002                              |                | 1100                                      | 2                |                 |                 |                 | 1, B            |  |
|                               | 2x 18W Quad CFL                            | TM03LN40xx-001                              |                | 1650                                      | 2                |                 | 2, A            |                 |                 |  |
|                               | Dv DGW Qued CEI                            | TM04LN40xx-001                              |                | 2200                                      | 2                |                 | 2, A            |                 |                 |  |
|                               | ZX ZOW QUAU GFL                            | TM04LN40xx-002                              |                | 2200                                      | 2                |                 |                 |                 | 2, A            |  |
|                               | 1x T9, 32W - Circline                      |   | TM03LN05xx-F01 | 1000                                      | 1                |                 | 1, A            |                 |                 |  |
|                               | 1x T9, 22W - Circline                      |   | TM03LN05xx-E01 | 600                                       | 1                | 1, A            |                 |                 |                 |  |
|                               | 1x T9, 20W - Circline                      |   | TM03LN05xx-D01 | 400                                       | 1                | 1, A            |                 |                 |                 |  |
| Linear Fluorescent            | 1x T5, 28W or T8, 32W                      |   | TM18LN05xx-G01 | 2200                                      | 1                |                 |                 |                 |                 |  |
|                               | Flat Panels - 2'x4'                        | TM25SQ05xx-001                              |                | 6000                                      | 8                |                 |                 | 1, F(3)*        |                 |  |
|                               | Flat Panels - 2'x2'                        | TM16SQ12xx-001                              |                | 4800                                      | 4                |                 |                 | 1, F(2)*        |                 |  |
|                               |  |   | TM24LN05xx-A01 | 5400                                      | 3                |                 |                 | 1, E            |                 |  |
| Wall Sconce and               |  | TM06LN13xx-001                              |                | 600                                       | 1                |                 | 1, A            |                 |                 |  |
| Decorative                    |  |   | TM03LN05xx-E01 | 600                                       | 1                | 1, A            |                 |                 |                 |  |
|                               | 13W GFL/ OUW INCANCESCENT                  | TM02LN40xx-001                              |                | 550                                       | 1                |                 |                 |                 |                 |  |
|                               |  | TM02LN40xx-002                              |                | 550                                       | 1                |                 |                 |                 |                 |  |
| Desk Lamp and                 | 1x T2, 13W                                 |   | TM03LN05xx-G01 | 600                                       | 1                |                 |                 |                 |                 |  |
| Undercabinet                  | 1x T5, 14W                                 | TM18LN05xx-003                              |                | 600                                       | 1                |                 |                 |                 | 1, A            |  |
| Downlight 3"/4"               | 50W PAR30                                  | TM02LN40xx-001                              |                | 550                                       | 1                |                 |                 |                 |                 |  |
| Downlight 6"                  | 65W BR30/13W CFL/ 75W PAR38                | TM06SQ26xx-001                              |                | 1000                                      | 1                |                 |                 |                 | 1, A            |  |
| Downlight 8"                  |  | TM04LN40xx-001                              |                | 2200                                      | 2                |                 | 2, A            |                 |                 |  |
|                               | 2x20 QUAU OFL, 100W FANJO                  | TM04LN40xx-002                              |                | 2200                                      | 2                |                 |                 |                 | 2, A            |  |
| Low Bay and                   | 70W HID                                    | TM05SQ40xx-001                              |                | 2800                                      | 2                |                 |                 |                 |                 |  |
| Wall Pack                     |  | TM06SQ40xx-001                              |                | 3300                                      | 2                |                 |                 |                 |                 |  |

\*Number in parenthesis denotes maximum number of LED Modules per channel of the driver. \*\*When ordering modules, replace "xx" with desired CCT option. 27 = 2700K, 30 = 3000K, 35 = 3500K, 40 = 4000K, 50 = 5000K, 65 = 6500K

#### LIGHT ENGINE SOLUTIONS

120V

OU



|       | 120V Input, 120-240V Input, 120-277V Input, 1<br>Triac Dimming Non-Dimming Non-Dimming ( |                  |                   | 120-277V Input,<br>0-10V Dimming |                           |                           | Digital Addressable<br>Driver, 0-10V<br>Dimming |                   |                   | Digital Addressable Driver,<br>DALI Control*** |                    |                    |   |  |   |   |   |   |   |
|-------|--|------------------|-------------------|----------------------------------|---------------------------|---------------------------|---|-------------------|-------------------|--|--------------------|--------------------|---|--|---|---|---|---|---|
|       | ICD1 120 0350-11C  | rcd1 120 0700-9C | ICD1 120 0650-18C | IC3 MLT 0350-50L                 | IC3 MLT 0500-80L          | rt unv o12v-6ol           | 11 UNV 0700-36C                                 | ICD4 UNV 0300 34L | ICD4 UNV 0350 39L | ICD4 UNV 0385 42L                              | r1 m2 unv 0600 36L | r1 m2 unv 0700 49L | r1M4 UNV 0350 100L,<br>r1M4 UNV 0350 100C | MA UNV 0500 100L,<br>11 M4 UNV 0500 100C | r1 M4 UNV 0700 100L,<br>r1 M4 UNV 0700 100C | IXA4 UNV 0350 100L,<br>IXA4 UNV 0350 100C | IXA4 UNV 0500 100L,<br>IXA4 UNV 0500 100C | IXA4 UNV 0700 100L,<br>IXA4 UNV 0700 100C | F4N4 UNV 012V 100K,<br>F4N4 UNV 012V 100B |
|       | 2, A   |                  | 1, C              |                                  | <b></b>                   |                           |   |                   |                   |  |                    | 1, G               |   |  |   |   |   |   |   |
|       |  | 2, A             | 1, B              |                                  |                           |                           |   |                   |                   |  |                    | 1, F               |   |  |   |   |   |   |   |
|       | 2, A   |                  |                   | 1, E                             |                           |                           | 1, C  |                   |                   |  |                    | 1, G               |   |  |   |   |   |   |   |
|       | •••••  |                  | • •               | 1, E                             |                           |                           | 1, C  |                   |                   |  |                    |                    | 1, E                                      |  | 1, G  | 1,E                                       |   | 1,G                                       |   |
|       | 1 /  | •••••            | 2, A              |                                  |                           |                           | Ι, Β  |                   | •••••             | • • • • • •                                    | •••••              | I,E                |   |  | I, E  |   |   | I,E                                       |   |
| ••••• | 1,A  |                  | •••••             |                                  |                           |                           | •••••   |                   | •••••             | •••••  | •••••              |                    |   | •••••                                    |   |   |   | •••••                                     |   |
| ••••• | 1, A   |                  |                   |                                  |                           |                           |   |                   |                   | • • • • •                                      |                    |                    | •••••                                     |  |   |   |   |   |   |
|       |  |                  |                   |                                  |                           | 1, A                      |   |                   |                   |  |                    |                    |   |  |   |   |   |   | 1, E                                      |
|       |  |                  |                   |                                  | 1, F(3)*                  |                           |   |                   |                   |  |                    |                    |   | 1, F(3)*                                 |   |   | 1, F(3)*                                  |   |   |
|       |  |                  |                   |                                  | 1, F(2)*                  |                           |   |                   |                   |  |                    |                    |   | 1, F(2)*                                 |   |   | 1, F(2)*                                  |   |   |
|       |  |                  |                   |                                  | 1, E                      |                           |   |                   |                   |  |                    |                    |   | 1, E                                     |   |   | 1, E                                      |   |   |
|       | 1, A   |                  | •••••             |                                  |                           |                           |   |                   |                   | •••••  |                    |                    |   |  |   |   |   |   |   |
| ••••• | 1Λ   |                  | •••••             |                                  | ÷                         |                           |   |                   | •••••             | •••••  | •••••              | •••••              |   | •••••                                    |   |   |   | •••••                                     |   |
| ••••• | 1, 7   | 1 A              | •••••             | •••••                            | • • • • • • • • • • • • • | • • • • • • • • • • • • • | •••••   | •••••             | •••••             | •••••  | •••••              | •••••              |   | •••••                                    | ••••••                                      | •••••                                     |   | •••••                                     |   |
|       | 1, A   | .,               |                   |                                  |                           |                           |   |                   |                   |  |                    |                    |   |  |   |   |   |   |   |
| ••••• | ••••   | 1,A              | 1, A              |                                  | <u>.</u>                  | <u>.</u>                  |   |                   |                   | •••••  |                    |                    |   |  |   |   |   |   |   |
|       | 1, A   |                  |                   |                                  |                           |                           |   |                   |                   |  |                    |                    |   |  |   |   |   |   |   |
|       |  |                  | 1, A              |                                  |                           |                           |   |                   |                   |  |                    | 1, E               |   |  | 1, E  |   |   | 1, E                                      |   |
|       |  |                  |                   | 1, E                             |                           |                           | 1, C  |                   |                   |  |                    |                    | 1, E                                      |  | 1, G  | 1, E                                      |   | 1, G                                      |   |
|       |  |                  | 2, A              |                                  |                           |                           | 1, B  |                   |                   |  |                    | 1, E               |   |  | 1, E  |   |   | 1, E                                      |   |
|       |  |                  |                   | 1, E                             |                           |                           |   |                   |                   |  |                    |                    | 1, E                                      |  |   |   | 1, E                                      |   |   |

\*Number in parenthesis denotes maximum number of LED Modules per channel of the driver. \*\*\*The "x" in these part numbers = 1 or 2.

1,E 1,E

1, E

#### LIGHT ENGINE SOLUTIONS

# Fulham. HOROED LED LIGHT ENGINES WIRING DIAGRAMS

#### SINGLE CHANNEL

A - Single Channel Driver, 1 LED Module connected



B - Single Channel Driver LED Modules connected in series



C - Single Channel Driver LED Modules connected in parallel



D - Single Channel Driver LED Modules connected in series & parallel



#### **MULTI-CHANNEL**

E - Multi-Channel Driver LED Module/channel connected



F - Multi-Channel Driver LED Modules connected in series

|        | + | + | LED<br>MODULE | ] | + | LED<br>MODULE |  |
|--------|---|---|---------------|---|---|---------------|--|
| DRIVER | + | + | LED<br>MODULE |   | + | LED<br>MODULE |  |

G - Multi-Channel Driver LED Modules connected in parallel



H - Multi-Channel Driver

LED Modules connected in series & parallel


## **LIGHT ENGINE SOLUTIONS**



IMAGES NOT SHOWN TO SCALE

### MODULE MODEL NUMBERS:

When ordering modules, replace "xx" with desired CCT option. 27 = 2700K, 30 = 3000K, 35 = 3500K, 40 = 4000K, 50 = 5000K, 65 = 6500KExample: TM02LN40xx-001 would convert to TM02LN4027-001 for a system with a CCT of 2700K.

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## TM02LN40xx-001

7W LED Module 550 Lumens @4000K



TM02LN40xx-002 7W LED Module 550 Lumens @4000K

いた 無名







### TM04LN40xx-001 TM04LN40xx-002 14W LED Module 1100 Lumens @4000K



TM03LN05xx-D01 Four, 1.1W LED Modules

400 Lumens @4000K (total)



TM03LN05xx-E01 Six, 1.1W LED Modules 600 Lumens @4000K (total); String Length ~24"



TMO3LN05xx-G01 Six, 1.1W LED Module 600 Lumens @4000K (total); String Length ~20"



TMO3LN05xx-F01 Ten, 1.1W LED Modules 1000 Lumens@4000K (total)



## TM18LN05xx-G01

Four, 7.2W LED Module 2200 Lumens @4000K (total)

|   |     |       |     | (      |         |      |              |   |       |     |        |
|---|-----|-------|-----|--------|---------|------|--------------|---|-------|-----|--------|
| E | 1.0 | LUCAL | 100 | 100.00 | 1       | 1 in | 1002 14 1000 | 1 | 18141 | • 1 | 1000 H |
|   |     |       |     | 10     | and and |      |              |   |       |     |        |

### TM06LN13xx-001 7W LED Module

600 Lumens @4000K

tilles tilles tilles



## TM18LN05xx-003

7W LED Module 600 Lumens @4000K

T + T

161 1.161 1.9. TM-1 761.1 TAT 1.6

TM25SQ05xx-001

### 8W LED Modules 750 Lumens @4000K

TM06SQ26xx-001 14W LED Module







-08



### TM16SQ12xx-001 12.5W LED Modules

1200 Lumens @4000K



TM06SQ40xx-001 21W LED Module 1650 Lumens @4000K



NOTE: See page 97 for HotSpot2 LED Emergency Lighting System options.



# AN ARC OF GENIUS

The light from HID lamps is produced by electricity passing between tungsten electrodes inside a tube that's filled with an ignition gas and metal salts. Firing up the arc converts the salts into an intensely glowing plasma. Despite the brilliance, HID power consumption is less than ordinary incandescent or fluorescent lamps, delivering far more lumens per watt.

| Electrode | 1-1-1        | Alumina Arc Tube  | ATT - CONTRACT |
|-----------|--------------|-------------------|--|
|           |              | ARC               |  |
|           |              | Sodium-mercury am | halgam   |
|           |              |                   |  |
|           | A.C. Voltage | Ballast           |  |

≘

## More Light, Less Heat

High Intensity Discharge lamps are, in fact, pretty intense. They belong to a group of gas-discharge lamps that literally developed over centuries.

The earliest work on what evolved into mercury vapor lamps was done by the English scientist Francis Hauksbee (1666-1713), a Fellow of the Royal Society. Around 1705, he found that electrical charges on metals in an airless globe produced a glow not unlike St. Elmo's Fire (that scary electricity that zigzags on airplane wings and in mad scientists' labs). This work eventually led to developments such as neon lighting and vapor lamps.

In 1912, the gnomish German-born mathemetician/engineer Charles Steinmetz (1865-1923) promoted the development of alternating current, helping to grow the U.S. electric power industry. Steinmetz experimented with metal halide compounds in mercury lamps, which laid an important foundation for productive research in the 1950s, when many physicists were testing the feasability of halogen lamps.

Xenon gas short-arc lamps - the model for HID - were developed by German scientists in the 1940s. The lamps were quickly adopted by cinema projectionists, as a replacement for the less efficient carbon arc lamps because of their daylight-quality luminance. This benefit was subsequently improved upon by Gilbert Reiling (b. 1928), who in 1959 began work on the thermodynamics of mercury discharge lamps at GE labs. A year later he produced a lamp with about twice the light output of the standard 400 Watt mercury-vapor lamp with an even brighter white light. This became the metal halide lamp, which GE began to develop vigorously in 1962.







H

## HID LIGHTING SYSTEMS INTENSE LIGHT, WITH LOW ENERGY CONSUMPTION

HID lamps have been in use, as an alternative to "regular" light bulbs, since the introduction of the mercury lamp in 1901. All versions of HID are more efficient than electric filament lamps, delivering more light per unit of electrical energy.

Some of today's HIDs have phosphor coating inside the lamp, providing a powerful and broad color and light spectrum. This makes them highly desirable for architectural, industrial, municipal and commercial lighting.

## HID lamp attractive advantages

HID lamps take a moment to fire up, because they run off ballasts. But they last longer and burn brighter than their incandescent cousins. They consume less wattage – electricity is only to start – so they cost less to operate. HID delivers high light output from a concentrated source. They come in four iterations. Mercury Vapor was the earliest version but can no longer be sold in fixtures. High Pressure Sodium lamps often line highways, with their yellowish-orange glow. Low Pressure Sodium delivers the best Lumens per Watt ratio (about 200!), but probably has the least light quality. Metal Halide, on the market since 1960, seems to deliver the best blend of benefits, so it has become the lamp of choice for big stores, warehouses, industrial plants, outdoor arenas and municipal locales. These lamps are cost efficient; the light quality is good enough for home use; and they are color-friendly.

## Magnetic ballasts

With your basic "core and coil" magnetic HID ballast, a coil of (usually copper and/or aluminum) wire is wound around some

## LUMEN MAINTENANCE

This graph illustrates Lumen dropoff for the four basic categories of Metal Halide (MH) lamps, comparing efficacy of magnetic vs. electronic ballasts. Probe Start Metal Halide lamps with magnetic ballasts show the earliest and steepest lumen decline. Pulse Start Metal Halide lamps with magnetic ballasts fare somewhat better, maintaining a relatively higher lumen level for longer. Pulse Start electronic ballast MHs have a much higher lumen level, staying fairly consistent through 20,000 hours; while Ceramic MH lamps managed by electronic ballasts do best of all, achieving 80% lumen maintenance at 20,000 hours and beyond.



**CERAMIC METAL HALIDE** W/ ELECTRONIC BALLAST

PULSE START METAL HALIDE W/ ELECTRONIC BALLAST

PULSE START METAL HALIDE W/ MAGNETIC BALLAST

PROBE START METAL HALIDE W/ MAGNETIC BALLAST

## PULSE START VS PROBE START MAGNETIC HID BALLASTS





## **MORE LUMENS PER WATT**



kind of metallic core. Electricity charging through the wire loops produces an electromagnetic field – hence "magnetic" ballast. It modulates current inflow at a fairly low cycle rate. Because "core and coil" technology involves metals, magnetic HID ballasts are heavier, therefore somewhat more expensive to operate than Electronic HID ballasts.

Magnetic ballasts operate a variety of metal halide and high pressure sodium HID lamps, using either Probe or Pulse technology.

Probe technology consists of a starter electrode and two operating electrodes inside the lamp. The electrical charge arcs from the starter to one of the operating electrodes, which in turn bounces electrons over to the other one. Once the lamp is "live," the starter electrode switches off. Side effect: continued operation of the lamp results in tungsten atom deposits on the tube's wall, eventually dimming the light output and affecting true color perception.

The Pulse system, instead of a starter probe, employs an ignitor that sends high voltage "pulses" which heat the electrodes faster. Pulse starting has a reputation for extending MH lamp life up to 50%, providing faster starts even in extreme cold, and delivering faster re-strike times with less warm-up time. The eyes have it: Pulse CRI and general luminescence is about a third better than Probe, since the ignitor system cuts down on tungsten escape.

## Electronic ballasts

Sophisticated Electronic HID ballasts are computerized to sense the appropriate power level for their designated lamp(s), and restrict current flow to that level. So they can quite precisely regulate the current flowing through the circuit. Their higher cycle rate reduces or eliminates most noise and flicker.

Electronic ballasts offer the advantages of increased over-

all efficiency and lower operating costs. They run cooler than magnetic ballasts and aren't energy gluttons. They operate at higher frequencies. This cuts end losses, and delivers 10% to 15% higher

## MAGNETIC VS ELECTRONIC

Running on magnetic ballasts, you can expect lumen depreciation of about 60%... as opposed to only 20% over the same time period from electronic ballasts.

lamp-ballast efficacy. They extend lamp life by at least 50%. EHID ballasts are lighter than magnetic ballasts, because they have no copper coils.

When HID is boosted with electronic ballasts, lighting becomes more efficient and less expensive. Switching to EHID significantly cuts the need for service visits, resulting in fewer service charges. You can use the same lamps, but they will work better and last longer. And you can get the same illumination from lower-wattage lamps or fewer fixtures!

## HID LIGHTING SYSTEMS

- COMPLETE HID SYSTEMS WITH PREMIUM FULHAM LAMPS AND BALLASTS
- > OVER 200 SYSTEM MODELS
- > PREFERRED CHOICE WHEN EFFICIENT, RELIABLE HIGH LUMEN OUTPUT IS REQUIRED



## **ELECTRONIC HID BALLASTS**



Fulham. HIGH HORSE

## BALLASTS 70W-1000W BALLASTS

22W-1000W

50W - 1000W HPS LAMPS 70W - 1000W PROBE, PULSE & PROTECTED METAL HALIDE LAMPS 39W - 150W CERAMIC MH LAMPS 175W MERCURY VAPOR LAMPS

## **HID LAMPS**

**BALLASTS** 

BALLASTS

**ELECTRONIC HID** 

**MAGNETIC HID** 



**HID LAMPS** 

## **MAGNETIC HID BALLASTS**

## 230 · 240 · 347 · 400 DUAL 120 or 240 • 120-240 50/60Hz

## rulham. Newlighting HORTICULTURAL/NIGHT FISHING

GREENHOUSE COMMERCIAL HORTICULTURE HIGH PRESSURE SODIUM MH BALLAST-REFLECTOR KITS

- 230V: CE 400W, 600W, 750W, 1000W
- 240V: UL, cULus 400W, 600W, 750W, 1000W

**ELECTRONIC** 

- 347V: UL, cULus 600W, 750W, 1000W
- 400V: CE, UL, cULus 600W, 750W, 1000W
- 0-10V Dimming Options
- Greenhouse Applications / Commercial Growers
- . HPS and MH Models

Dedicated 230V: CE



Dimmable

OPTIONS AVAILABLE



## Fulham. Newlighting HORTICULTURAL/HOBBY ELECTRONIC HID BALLASTS







### FEATURES

- Short Circuit Operation Protection
- Open Circuit Operation Protection
- Ignitor Failure Protection
- Thermal Protection (UNV only)
- Energy-Efficient Compared to Magnetic
- Extended Lamp Life
- Less Color Shift Over Time

### COMMON SPECIFICATIONS

| Frequency       140-220Hz         CCF       <1.5         Min Starting Temp       -30°C/-20°F         Max Case Temp       85°C         EMI/RFI       FCC PART18 CLASS A, NON-CONSUMER         Short Circuit Operation Protection       Yes         Open Circuit Operation Protection       Yes         Ignitor Failure Protection       Yes         End of Lamp Life Protection       Yes |                                    |                                  |
|--|------------------------------------|----------------------------------|
| CCF       <1.5   | Frequency                          | 140-220Hz                        |
| Min Starting Temp       -30°C/-20°F         Max Case Temp       85°C         EMI/RFI       FCC PART18 CLASS A, NON-CONSUMER         Short Circuit Operation Protection       Yes         Open Circuit Operation Protection       Yes         Ignitor Failure Protection       Yes         End of Lamp Life Protection       Yes  | CCF                                | <1.5                             |
| Max Case Temp     85°C       EMI/RFI     FCC PART18 CLASS A, NON-CONSUMER       Short Circuit Operation Protection     Yes       Open Circuit Operation Protection     Yes       Ignitor Failure Protection     Yes       End of Lamp Life Protection     Yes  | Min Starting Temp                  | -30°C/-20°F                      |
| EMI/RFI     FCC PART18 CLASS A, NON-CONSUMER       Short Circuit Operation Protection     Yes       Open Circuit Operation Protection     Yes       Ignitor Failure Protection     Yes       End of Lamp Life Protection     Yes   | Max Case Temp                      | 85℃                              |
| Short Circuit Operation Protection     Yes       Open Circuit Operation Protection     Yes       Ignitor Failure Protection     Yes       End of Lamp Life Protection     Yes  | EMI/RFI                            | FCC PART18 CLASS A, NON-CONSUMER |
| Open Circuit Operation Protection         Yes           Ignitor Failure Protection         Yes           End of Lamp Life Protection         Yes   | Short Circuit Operation Protection | Yes                              |
| Ignitor Failure Protection Yes<br>End of Lamp Life Protection Yes  | Open Circuit Operation Protection  | Yes                              |
| End of Lamp Life Protection Yes  | Ignitor Failure Protection         | Yes                              |
|  | End of Lamp Life Protection        | Yes                              |

- Type 1 Outdoor Listed
- Low Noise
- Compact Ballast Profiles
- Superior Lumen Maintenance
- Faster Strike and Restrike Times
- Side and Back Lead Options Available
- Light Weight



(VL)<sub>US</sub>

| MODELS        | DESCRIPTION                              | CASE SIZE<br>(mm)<br>LxWxH | CASE SIZE<br>(inches)<br>LxWxH | ANSI CODES                  |
|---------------|--|----------------------------|--------------------------------|-----------------------------|
| H1-120-22HSC  | 22 W, 120V MH Side Leads                 | 89 x 75 x 30.5             | 3.50 x 2.95 x 1.20             | M156, C156, C175, M175      |
| H3-120-39HSC  | 39 W, 120V MH Side Leads                 | 89 x 75 x 30.5             | 3.50 x 2.95 x 1.20             | M130, C179, C130            |
| H3-UNV-39HBC  | 39 W, Universal Voltage MH Back Leads    | 131 x 91.5 x 38            | 5.16 x 3.60 x 1.50             | M130, C179, C130            |
| H3-UNV-39HSC  | 39 W, Universal Voltage MH Side Leads    | 131 x 91.5 x 38            | 5.16 x 3.60 x 1.50             | M130, C179, C130            |
| H4-120-50HSC  | 50 W, 120V MH Side Leads                 | 89 x 75 x 30.5             | 3.50 x 2.95 x 1.20             | M110, M148                  |
| H5-UNV-70HBC  | 70 W, Universal Voltage MH Back Leads    | 131 x 91.5 x 38            | 5.16 x 3.60 x 1.50             | M98, M139, C139, M143       |
| H5-UNV-70HSC  | 70 W, Universal Voltage MH Side Leads    | 131 x 91.5 x 38            | 5.16 x 3.60 x 1.50             | M98, M139, C139, M143       |
| H6-UNV-100HBC | 100 W, Universal Voltage MH Back Leads   | 131 x 91.5 x 38            | 5.16 x 3.60 x 1.50             | M90, M140                   |
| H6-UNV-100HSC | 100 W, Universal Voltage MH Side Leads   | 131 x 91.5 x 38            | 5.16 x 3.60 x 1.50             | M90, M140                   |
| H7-UNV-150HBC | 150 W, Universal Voltage MH Back Leads 🖲 | 164 x 91.5 x 38            | 6.46 x 3.60 x 1.50             | M102, M142, C142, M81, M107 |
| H7-UNV-150HSC | 150 W, Universal Voltage MH Side Leads 🖲 | 164 x 91.5 x 38            | 6.46 x 3.60 x 1.50             | M102, M142, C142, M81, M107 |
| H8-UNV-175HBC | 175 W, Universal Voltage MH Back Leads 🖲 | 164 x 91.5 x 38            | 6.46 x 3.60 x 1.50             | M57, M152, M137             |
| H8-UNV-175HSC | 175 W, Universal Voltage MH Side Leads 🖲 | 164 x 91.5 x 38            | 6.46 x 3.60 x 1.50             | M57, M152, M137             |

Back Lead Option has 8/32 studs on bottom, 2" on center.

MAGNETIC 120 • 208 • 240 • 277 • 480 60Hz



### FEATURES

- 5-tap voltage range (120, 208, 240, 277, 480V)
- All include high temperature rated capacitor, ignitor (where applicable), and mounting brackets
- Dry capacitors standard on all models except 1000W MH and HPS which offer wet capacitors
- CWA circuits, Class H (180C) and select Class N (200C) models
- Precision wound, vacuum impregnation coils for quiet operation and long life
- Starting temperature HPS -40°C; MH -30°C
- · Color coded and voltage marked wires for ease of installation



| Part Number                   | Watts            | Description                                       | ANSI CODE              |   |
|-------------------------------|------------------|---|------------------------|---|
| High Pressure Sodium 5 Tap I  | Ballast Kits     | D=Dry / W=Wet                                     |                        |   |
| HH HPS MLT5 250D              | 250W             | 250W HPS 5 Tap CWA with Dry Capacitor             | S50                    |   |
| HH HPS MLT5 400D              | 400W             | 400W HPS 5 Tap CWA with Dry Capacitor             | S51                    |   |
| HH HPS MLT5 1000W             | 1000W            | 1000W HPS 5 Tap CWA with Wet Capacitor            | S52                    |   |
| Probe Start Metal Halide 5 Ta | p Ballast Kits   |   |                        | ļ |
| HH MH MLT5 175D               | 175W             | 175W MH 5 Tap Probe Start CWA with Dry Capacitor  | M57 or M107(150W)      |   |
| HH MH MLT5 250D               | 250W             | 250W MH 5 Tap Probe Start CWA with Dry Capacitor  | M58                    |   |
| HH MH MLT5 400D               | 400W             | 400W MH 5 Tap Probe Start CWA with Dry Capacitor  | M59                    |   |
| HH MH MLT5 1000W              | 1000W            | 1000W MH 5 Tap Probe Start CWA with Wet Capacitor | M47                    |   |
| Pulse Start Metal Halide 5 Ta | p Ballast Kits 🖲 |   |                        |   |
| HH MH MLT5 250PD              | 250W             | 250W MH 5 Tap Pulse Start with Dry Capacitor      | M138 or M153           |   |
| HH MH MLT5 320PD              | 320W             | 320W MH 5 Tap Pulse Start with Dry Capacitor      | M132 or M154           |   |
| HH MH MLT5 400PD              | 400W             | 400W MH 5 Tap Pulse Start with Dry Capacitor      | M135 or M155           |   |
| HH MH MLT5 1000PW             | 1000W            | 1000W MH 5 Tap Pulse Start with Wet Capacitor     | M141/M47 or M166(875W) |   |
|                               |                  |   |                        |   |

## EVERYTHING YOU NEED IN **1 KIT**

## Ballast, Lamp, Wet or Dry Capacitor, Ignitor and Mounting Hardware

- Available from 175W to 1000W
- UL Recognized Components
- Attractive, Durable Packaging
- Competitive Pricing
- Multivolt 120V/208V/240V/277V/480V



| Kit Part Number            | Kit Description                                    | Lamp Part Number | (+Ignitor +Capacitor) |
|----------------------------|--|------------------|-----------------------|
| Probe Start Metal Halide 5 | Tap Ballast & Lamp Kits                            |                  | D=Dry / W=Wet         |
| HH MH Q5 175 DM3           | Ballast & Lamp Kit 175W MH 5 Tap w/ Dry Capacitor  | HM0175DBU4K      | HHMHMLT5175D          |
| HH MH Q5 250 DM3           | Ballast & Lamp Kit 250W MH 5 Tap w/ Dry Capacitor  | HM0250DBU4K      | HHMHMLT5250D          |
| HH MH Q5 400 DM7           | Ballast & Lamp Kit 400W MH 5 Tap w/ Dry Capacitor  | HM0400GBU4K      | HHMHMLT5400D          |
| HH MH Q5 1000 WM7          | Ballast & Lamp Kit 1000W MH 5 Tap w/ Wet Capacitor | HM1000GBU4K      | HHMHMLT51000W         |
| High Pressure Sodium 5 Taj | p Ballast & Lamp Kits                              |                  | D=Dry / W=Wet         |
| HH HPS Q5 250 DM5          | Ballast & Lamp Kit 250W HPS 5 Tap w/ Dry Capacitor | HL0250CBU        | HHHPSMLT5250D         |
| HH HPS Q5 400 DM5          | Ballast & Lamp Kit 400W HPS 5 Tap w/ Dry Capacitor | HL0400CBU        | HHHPSMLT5400D         |

## MAGNETIC 120 • 208 • 240 • 277 60Hz

## Fulham. HIGHHORSE 4 TAP MAGNETIC HID MH & HPS CORE & COIL BALLASTS



- 70W 1000W Range
- Contractor Replacement Kits Include Ballast, Capacitor, Ignitor and Mounting Hardware
- Probe Start and 2009 Energy Savings Compliant Pulse Start Models
- High Temperature Rated Capacitor & Ignitor
- HX-HPF & CWA Circuits
- Four-Tap Voltage 120/208/240/277V
- Precision Coil Winding
- Starting Temperature HPS -40°C
- Starting Temperature MH -30°C



| Description                                     | ANSI CODE            | Input<br>Watts | Ballast + Ignitor<br>+ Dry Capacitor<br>+ Mounting<br>Hardware | Ballast + Ignitor<br>+ Wet Capacitor<br>+ Mounting<br>Hardware | Ballast + Ignitor<br>(Less Capacitor)<br>+ Mounting<br>Hardware | Ignitor Only | Dry<br>Capacitor | Dry Capactior<br>VAC Rating | Wet<br>Capactior | Wet Capactior<br>VAC Rating | Ballast<br>Weight<br>Ibs. |
|---|----------------------|----------------|--|--|---|--------------|------------------|-----------------------------|------------------|-----------------------------|---------------------------|
| High Pressure Sodium                            |                      |                | HHHPS-<br>MLT4-  | HHHPS-<br>MLT4-  | HHHPS-<br>MLT4-   | HHHPS-       | HHHPS-<br>DCAP-  |                             | HHHPS-<br>WCAP-  |                             |                           |
| HX-HPF HPS70W/120V/208V/240V/277V               | S62                  | 91             | 70D  | 70W  | 70  | IG70-150     | 70               | 7uF/280VAC                  | 70               | 7uF/280VAC                  | 4.85                      |
| HX-HPF HPS100W/120V/208V/240V/277V              | S54                  | 123            | 100D   | 100W   | 100   | IG70-150     | 100              | 10uF/280VAC                 | 100              | 10uF/280VAC                 | 6.61                      |
| HX-HPF HPS150W/120V/208V/240V/277V              | S55                  | 185            | 150D   | 150W   | 150   | IG70-150     | 150              | 14uF/280VAC                 | 150              | 14uF/280VAC                 | 7.71                      |
| CWA HPS200W /120V/208V/240V/277V                | S66                  | 240            | 200D   | 200W   | 200   | IG200-400    | 200              | 28uF/330VAC                 | 200              | 28uF/300VAC                 | 7.71                      |
| CWA HPS250W/120V/208V/240V/277V                 | S50                  | 290            | 250D   | 250W   | 250   | IG200-400    | 250              | 35uF/330VAC                 | 250              | 35uF/300VAC                 | 11.13                     |
| CWA HPS400W/120V/208V/240V/277V                 | S51                  | 460            | 400D   | 400W   | 400   | IG200-400    | 400              | 55uF/240VAC                 | 400              | 55uF/300VAC                 | 13.77                     |
| CWA HPS600W/120V/208V/240V/277V                 | S106                 | 665            | 600D   | 600W   | 600   | IG600        | 600              | 64uF/280VAC                 | 600              | 64uF/300VAC                 | 20.06                     |
| CWA HPS1000W/120V/208V/240V/277V                | S52                  | 1,090          | N/A†   | 1000W  | 1000  | IG1000       | N/A†             | N/A†                        | 1000             | 26uF/525VAC                 | 25.79                     |
| Probe Start Metal Halide                        |                      |                | HHMH-<br>MLT4-   | HHMH-<br>MLT4-   | HHMH-<br>MLT4-  | ННМН-        | HHMH-<br>DCAP-   |                             | HHMH-<br>WCAP-   |                             |                           |
| HX-HPF MH70W/120V/208V/240V/277V                | M98/M143             | 90             | 70D  | 70W  | 70  | IG70-150     | 70               | 8uF/280VAC                  | 70               | 8uF/280VAC                  | 5.51                      |
| HX-HPF MH100W/120V/208V/240V/277V               | M90/M140             | 129            | 100D   | 100W   | 100   | IG70-150     | 100              | 12uF/280VAC                 | 100              | 10uF/280VAC                 | 5.62                      |
| HX-HPF MH150W/120V/208V/240V/277V               | M102/M142            | 185            | 150D   | 150W   | 150   | IG70-150     | 150              | 16uF/280VAC                 | 150              | 16uF/280VAC                 | 7.71                      |
| CWA MH175W /120V/208V/240V/277V                 | M57/H39<br>150w-M107 | 205            | 175D*  | 175W*  | 175*  | N/A          | 175              | 10uF/400VAC                 | 175              | 10uF/400VAC                 | 6.83                      |
| CWA MH250W/120V/208V/240V/277V                  | M58/H37              | 305            | 250D*  | 250W*  | 250*  | N/A          | 250              | 15uF/400VAC                 | 250              | 15uF/400VAC                 | 9.03                      |
| CWA MH400W/120V/208V/240V/277V                  | M59/H33              | 445            | 400D*  | 400W*  | 400*  | N/A          | 400              | 24uF/400VAC                 | 400              | 24uF/400VAC                 | 10.58                     |
| CWA MH1000W/120V/208V/240V/277V                 | M47/H36              | 1,075          | N/A†   | 1000W*   | 1000*   | N/A          | N/A†             | N/A†                        | 1000             | 24uF/480VAC                 | 25.8                      |
| 2009 Compliant Pulse Start M                    | letal Halido         | • E            | HHMH-<br>MLT4-   | HHMH-<br>MLT4-   | HHMH-<br>MLT4-  | ННМН-        | HHMH-<br>DCAP-   |                             | HHMH-<br>WCAP-   |                             |                           |
| CWA MH175W /120V/208V/240V/277V                 | M137/M152            | 198            | 175PD  | 175PW  | 175P  | IG175-200    | 175P             | 11uF/400VAC                 | 175P             | 11uF/370VAC                 | 9.29                      |
| CWA MH200W /120V/208V/240V/277V                 | M136                 | 225            | 200PD  | 200PW  | 200P  | IG175-200    | 200P             | 15uF/330VAC                 | 200P             | 15uF/350VAC                 | 7.93                      |
| CWA MH250W /120V/208V/240V/277V                 | M138/M153            | 281            | 250PD  | 250PW  | 250P  | IG175-400    | 250P             | 17uF/330VAC                 | 250P             | 17uF/400VAC                 | 9.85                      |
| CWA MH320W /120V/208V/240V/277V                 | M132/M154<br>M170    | 362            | 320PD  | 320PW  | 320P  | IG175-400    | 320P             | 21uF/400VAC                 | 320P             | 21uF/400VAC                 | 11.00                     |
| CWA MH350W /120V/208V/240V/277V                 | M131/M171            | 392            | 350PD  | 350PW  | 350P  | IG175-400    | 350P             | 22.5uF/400VAC               | 350P             | 23uF/400VAC                 | 11.00                     |
| CWA MH400W /120V/208V/240V/277V                 | M135/M155<br>M172    | 445            | 400PD  | 400PW  | 400P  | IG175-400    | 400P             | 26uF/400VAC                 | 400P             | 26uF/400VAC                 | 11.02                     |
| CWA MH450W /120V/208V/240V/277V                 | M144                 | 504            | 450PD  | 450PW  | 450P  | IG450        | 450P             | 26.5uF/400VAC               | 450P             | 26uF/400VAC                 | 13.12                     |
| *Integral Ignitor. †Dry Cap not available in 10 | 000W models.         |                |  |  |   |              |                  |                             |                  |                             |                           |



 fulham.

 IGH HORSE

 & METAL HALIDE KITS

## **EVERYTHING YOU NEED IN 1 KIT** Ballast, Lamp, Wet or Dry Capacitor, Ignitor and Mounting Hardware

- Available from 70W to 1000W
- UL Recognized Components
- Attractive, Durable Packaging
- Competitive Pricing
- Multivolt 120V/208V/240V/277V



| Dry Kit Model #            | Wet Kit Model #   | Watts | Lamp         | Coil & Core Ballast Kit |
|----------------------------|-------------------|-------|--------------|-------------------------|
| High Pressure Sodium 4 1   | ap Kits           |       |              | D=Dry / W=Wet           |
| HH HPS Q4 70 DE1           | HH HPS Q4 70 WE1  | 70W   | HL0070AU     | HHHPSMLT470 D or W      |
| HH HPS Q4 70 DM2           | HH HPS Q4 70 WM2  | 70W   | HL0070BBU    | HHHPSMLT470 D or W      |
| HH HPS Q4 100 DE1          | HH HPS Q4 100 WE1 | 100W  | HL0100AU     | HHHPSMLT4100 D or W     |
| HH HPS Q4 100 DM2          | HH HPS Q4 100 WM2 | 100W  | HL0100BBU    | HHHPSMLT4100 D or W     |
| HH HPS Q4 150 DE1          | HH HPS Q4 150 WE1 | 150W  | HL0150AU     | HHHPSMLT4150 D or W     |
| HH HPS Q4 150 DM2          | HH HPS Q4 150 WM2 | 150W  | HL0150BBU    | HHHPSMLT4150 D or W     |
| HH HPS Q4 250 DM5          | HH HPS Q4 250 WM5 | 250W  | HL0250CBU    | HHHPSMLT4250 D or W     |
| HH HPS Q4 400 DM5          | HH HPS Q4 400 WM5 | 400W  | HL0400CBU    | HHHPSMLT4400 D or W     |
| Probe Start Metal Halide   | 4 Tap Kits        |       |              |                         |
| HH MH Q4 70 DE1            | HH MH Q4 70 WE1   | 70W   | HM0070AU4K   | HHMHMLT470 D or W       |
| HH MH Q4 100 DE1           | HH MH Q4 100 WE1  | 100W  | HM0100AU4K   | HHMHMLT4100 D or W      |
| HH MH Q4 175 DE1           | HH MH Q4 175 WE1  | 175W  | HM0175AU4K   | HHMHMLT4175 D or W      |
| HH MH Q4 175 DM3           | HH MH Q4 175 WM3  | 175W  | HM0175DU4K   | HHMHMLT4175 D or W      |
| HH MH Q4 250 DM3           | HH MH Q4 250 WM3  | 250W  | HM0250DU4K   | HHMHMLT4250 D or W      |
| HH MH Q4 400 DM3           | HH MH Q4 400 WM3  | 400W  | HM0400DU4K   | HHMHMLT4400 D or W      |
| HH MH Q4 400 DM4           | HH MH Q4 400 WM4  | 400W  | HM0400EU4K   | HHMHMLT4400 D or W      |
| N/A                        | HH MH Q4 1000 WM7 | 1000W | HM1000GBU4K  | HHMHMLT41000W           |
| Pulse Start Metal Halide 4 | l Tap Kits 🖲      |       |              |                         |
| HH MH Q4 175 PDM3          | HH MH Q4 175 PWM3 | 175W  | HP0175DPBU4K | HHMHMLT4175P D or W     |
| HH MH Q4 200 PDM3          | HH MH Q4 200 PWM3 | 200W  | HP0200DPBU4K | HHMHMLT4200P D or W     |
| HH MH Q4 250 PDM3          | HH MH Q4 250 PWM3 | 250W  | HP0250DPBU4K | HHMHMLT4250P D or W     |
| HH MH Q4 320 PDM3          | HH MH Q4 320 PWM3 | 320W  | HP0320DPBU4K | HHMHMLT4320P D or W     |
| HH MH Q4 400 PDM7          | HH MH Q4 400 PWM7 | 400W  | HP0400GPBU4K | HHMHMLT4400P D or W     |

## LAMPS

## **HIGH PRESSURE SODIUM LAMPS**

- Medium Base 50W 150W
- Mogul Base 70W 400W
- 24,000+ Hour Long Life
- High Efficiency
- · Coated Finishes, 600W, and 1000W Lamps Available as Special Order





| Part Number | Install<br>Method | Description     | Watts | CCT (K) | Avg. Life<br>(Hr.) | Initial<br>Lumens (Im) | Mean<br>Lumens (Im) | MOL<br>(inches) |
|-------------|-------------------|-----------------|-------|---------|--------------------|------------------------|---------------------|-----------------|
| Medium Base |                   |                 |       |         |                    |                        |                     |                 |
| HL 0050 AU  | UNV               | LU50/ED17/MED   | 50W   | 2000    | 24,000+            | 3400                   | 2800                | 5.43            |
| HL 0070 AU  | UNV               | LU70/ED17/MED   | 70W   | 2000    | 24,000+            | 6000                   | 4800                | 5.43            |
| HL 0100 AU  | UNV               | LU100/ED17/MED  | 100W  | 2000    | 24,000+            | 9500                   | 7700                | 5.43            |
| HL 0150 AU  | UNV               | LU150/ED17/MED  | 150W  | 2000    | 24,000+            | 15000                  | 12000               | 5.43            |
| Mogul Base  |                   |                 |       |         |                    |                        |                     |                 |
| HL 0070 BBU | UNV               | LU70/ED23.5     | 70W   | 2000    | 24,000+            | 6000                   | 4800                | 7.75            |
| HL 0100 BBU | UNV               | LU100/ED23.5    | 100W  | 2000    | 24,000+            | 9500                   | 7700                | 7.75            |
| HL 0150 BBU | UNV               | LU150/55/ED23.5 | 150W  | 2000    | 24,000+            | 15000                  | 12000               | 7.75            |
| HL 0250 CBU | UNV               | LU250/ET18      | 250W  | 2000    | 24,000+            | 26000                  | 22100               | 9.65            |
| HL 0400 CBU | UNV               | LU400/ET18      | 400W  | 2000    | 24,000+            | 47000                  | 39950               | 9.65            |

## STANDARD METAL HALIDE LAMPS

- Medium Base 70W 175W
- Mogul Base 175W 1000W
- High Color Rendering
- 15,000 Hour Long Life
- Standard MH Suitable for Enclosed Fixtures
- Coated Finish Available as Special Order



| Part Number | Install<br>Method | Description    | Watts | CCT (K) | Avg. Life<br>(Hr.) | Initial<br>Lumens (Im) | Mean<br>Lumens (Im) | MOL<br>(inches) |
|-------------|-------------------|----------------|-------|---------|--------------------|------------------------|---------------------|-----------------|
| Medium Base |                   |                |       |         |                    |                        |                     |                 |
| HM 0070 AU  | UNV               | MH70/ED17/U    | 70W   | 3K, 4K  | 15000              | 6000                   | 4400                | 5.44            |
| HM 0100 AU  | UNV               | MH100/ED17/U   | 100W  | 3K, 4K  | 15000              | 8000                   | 5500                | 5.44            |
| HM 0175 AU  | UNV               | MH175/ED17/U   | 175W  | 3K, 4K  | 15000              | 14000                  | 9300                | 5.44            |
| Mogul Base  |                   |                |       |         |                    |                        |                     |                 |
| HM 0175 DU  | UNV               | MH175/ED28/U   | 175W  | 3K, 4K  | 15000              | 16000                  | 12800               | 8.31            |
| HM 0250 DU  | UNV               | MH250/ED28/U   | 250W  | 3K, 4K  | 15000              | 20500                  | 17500               | 8.31            |
| HM 0400 DU  | UNV               | MH400/ED28/U   | 400W  | 3K, 4K  | 15000              | 36000                  | 27200               | 8.31            |
| HM 0400 EU  | UNV               | MH400/ED37/U   | 400W  | 3K, 4K  | 15000              | 36000                  | 28000               | 11.5            |
| HM 1000 FBU | UNV               | MH1000/BT56/BU | 1000W | 3K, 4K  | 15000              | 110000                 | 86000               | 15.38           |
|             |                   |                |       |         |                    |                        |                     |                 |

 $^{*}$  CCT Standard colors: 3K= 3200K; 4K= 4200K Add Color Temperature CCT (K) required to item number when ordering; Example HP0070AU4K

Lamp Notes:

(1)

All lamps listed are CLEAR finish. COATED lamps available for special order. Other Wattages and Lamp types available special order. Please contact Fulham at 323-599-5000 (2)

## **PROTECTED METAL HALIDE**

- Medium Base 70W 175W
- Mogul Base 400W, 1000W
- High Color Rendering
- 15,000+ Hour Long Life
- Protected Metal Halide Lamps Suitable for Open and Enclosed Fixtures
- · Coated Finish Available as Special Order







| UNIVERSAL                |  |
|--------------------------|--|
| INSTALLATION ORIENTATION |  |

| i | INSTALLATION ORIENTATION |  |
|---|--------------------------|--|
|   |                          |  |

| Part Number | Install<br>Method | Description       | Watts | CCT (K) | Avg. Life (Hr.) | Initial<br>Lumens (Im) | Mean<br>Lumens (Im) | MOL<br>(inches) |
|-------------|-------------------|-------------------|-------|---------|-----------------|------------------------|---------------------|-----------------|
| Medium Base |                   |                   |       |         |                 |                        |                     |                 |
| HP 0070 AU  | UNV               | MP70/ED17/U/4K    | 70W   | 3K, 4K  | 15000           | 6000                   | 4400                | 5.44            |
| HP 0100 AU  | UNV               | MP100/ED17/U/4K   | 100W  | 3K, 4K  | 15000           | 8500                   | 5800                | 5.44            |
| HP 0150 AU  | UNV               | MP150/ED17/U/4K   | 150W  | 3K, 4K  | 15000           | 12500                  | 10000               | 5.44            |
| HP 0175 AU  | BU                | MP175/ED17/U/4K   | 175W  | 3K, 4K  | 15000           | 16000                  | 12800               | 5.44            |
| Mogul Base  |                   |                   |       |         |                 |                        |                     |                 |
| HP 0400 GBU | BU                | MP400/BT37/BU/4K  | 400W  | 3K, 4K  | 20000           | 36000                  | 30500               | 11.5            |
| HP 1000 GBU | BU                | MP1000/BT37/BU/4K | 1000W | 3K, 4K  | 20000           | 107000                 | 85000               | 11.5            |

## PULSE START PROTECTED METAL HALIDE 2009 EISA COMPLIANT

- 175W to 1000W
- Suitable for Open and Enclosed Fixtures
- · Better Color Uniformity
- Better Lumen Maintenance
- Faster Re-Strike & Warm-Up Time
- · Coated Finish Available as Special Order



BASE UP 15° INSTALLATION ORIENTATION

| Part Number     | Install<br>Method | Description          | Watts | CCT (K) | Avg. Life<br>(Hr.) | Initial<br>Lumens (Im) | Mean<br>Lumens (Im) | MOL<br>(inches) |
|-----------------|-------------------|----------------------|-------|---------|--------------------|------------------------|---------------------|-----------------|
| Mogul Base      |                   |                      |       |         |                    |                        |                     |                 |
| HP 0175 DPBU 4K | BU                | MP175/ED28/PS/BU/4K  | 175W  | 3K, 4K  | 15000              | 17000                  | 12500               | 8.31            |
| HP 0200 DPBU 4K | BU                | MP200/ED28/PS/BU/4K  | 200W  | 3K, 4K  | 15000              | 20000                  | 16000               | 8.31            |
| HP 0250 HPBU 4K | BU                | MP250/BT28/PS/BU/4K  | 250W  | 3K, 4K  | 15000              | 23800                  | 19000               | 8.31            |
| HP 0250 DPBU 4K | BU                | MP250/ED28/PS/BU/4K  | 250W  | 3K, 4K  | 15000              | 23800                  | 19000               | 8.31            |
| HP 0320 DPBU 4K | BU                | MP320/ED28/PS/BU/4K  | 320W  | 3K, 4K  | 15000              | 28600                  | 21000               | 8.31            |
| HP 0350 DPBU 4K | BU                | MP350/ED28/PS/BU/4K  | 350W  | 3K, 4K  | 15000              | 33000                  | 24500               | 8.31            |
| HP 0400 GPBU 4K | BU                | MP400/BT37/PS/BU/4K  | 400W  | 3K, 4K  | 15000              | 42000                  | 33600               | 11.5            |
| HP 0450 EPBU 4K | BU                | MP450/ED37/PS/BU/4K  | 450W  | 3K, 4K  | 15000              | 47000                  | 37000               | 11.5            |
| HP 1000 FPBU 4K | BU                | MP1000/BT56/PS/BU/4K | 1000W | 3K, 4K  | 15000              | 105000                 | 80000               | 11.5            |
|                 |                   |                      |       |         |                    |                        |                     |                 |

 $^{*}$  CCT Standard colors: 3K= 3200K; 4K= 4200K Add Color Temperature CCT (K) required to item number when ordering; Example HP0070AU4K

Lamp Notes:

All lamps listed are CLEAR finish. COATED lamps available for special order. Other Wattages and Lamp types available special order. Please contact Fulham at 323-599-5000 (1) (2)

## LAMPS

## PAR20 CERAMIC METAL HALIDE LAMPS

- Medium Base 39W
- Excellent CRI
- Superior lumen maintenance
- High efficiency output
- Compact size
- Universal lamp orientation
- For decorative use, supermarkets, display windows, flood and spot lighting





KECOMPLIANT CE

RoHS CE

| Part Number       | Install<br>Method | Watts | CCT (K) | Lamp<br>Voltage (V) | Lamp<br>AMP (A) | Luminous<br>Flux (LM) | Avg. Life<br>(Hr.) | DIA<br>(mm) | MOL<br>(mm) | Beam<br>Angle |
|-------------------|-------------------|-------|---------|---------------------|-----------------|-----------------------|--------------------|-------------|-------------|---------------|
| HC 0039 P2PU 3K 1 | UNV               | 39W   | 3000    | 88                  | 0.53            | 80                    | 8000               | 65          | 95          | 10°           |
| HC 0039 P2PU 3K 3 | UNV               | 39W   | 3000    | 88                  | 0.53            | 80                    | 8000               | 65          | 95          | 30°           |
| HC 0039 P2PU 4K 1 | UNV               | 39W   | 4200    | 85                  | 0.53            | 90                    | 8000               | 65          | 95          | 10º           |
| HC 0039 P2PU 4K 3 | UNV               | 39W   | 4200    | 85                  | 0.53            | 90                    | 8000               | 65          | 95          | 30°           |
|                   | ••••••            |       | ••••••  |                     |                 | ••••••                | •••••              |             | •••••       |               |

## PAR30 CERAMIC METAL HALIDE LAMPS

- Medium Base 39W 70W
- Excellent CRI
- High efficiency output
- Superior lumen maintenance

Compact size

- Universal lamp orientation
- For commercial lighting applications, hotels, airports, flood and decorative lighting



| Part Number       | Install<br>Method | Watts | CCT (K) | Lamp<br>Voltage (V) | Lamp<br>AMP (A) | Luminous<br>Flux (LM) | Avg. Life<br>(Hr.) | DIA<br>(mm) | MOL<br>(mm) | Beam<br>Angle |
|-------------------|-------------------|-------|---------|---------------------|-----------------|-----------------------|--------------------|-------------|-------------|---------------|
| HC 0039 P3PU 3K 1 | UNV               | 39W   | 3000    | 88                  | 0.53            | 80                    | 8000               | 95          | 125         | 10º           |
| HC 0039 P3PU 3K 3 | UNV               | 39W   | 3000    | 88                  | 0.53            | 80                    | 8000               | 95          | 125         | 30°           |
| HC 0039 P3PU 3K 4 | UNV               | 39W   | 3000    | 88                  | 0.53            | 80                    | 8000               | 95          | 125         | 40°           |
| HC 0039 P3PU 4K 1 | UNV               | 39W   | 4200    | 85                  | 0.53            | 90                    | 8000               | 95          | 125         | 10º           |
| HC 0039 P3PU 4K 3 | UNV               | 39W   | 4200    | 85                  | 0.53            | 90                    | 8000               | 95          | 125         | 30°           |
| HC 0039 P3PU 4K 4 | UNV               | 39W   | 4200    | 85                  | 0.53            | 90                    | 8000               | 95          | 125         | 40°           |
| HC 0070 P3PU 3K1  | UNV               | 70W   | 3000    | 88                  | 0.98            | 80                    | 9000               | 95          | 125         | 10º           |
| HC 0070 P3PU 3K 3 | UNV               | 70W   | 3000    | 88                  | 0.98            | 80                    | 9000               | 95          | 125         | 30°           |
| HC 0070 P3PU 3K 4 | UNV               | 70W   | 3000    | 88                  | 0.98            | 80                    | 9000               | 95          | 125         | 40°           |
| HC 0070 P3PU 4K 1 | UNV               | 70W   | 4200    | 85                  | 0.98            | 90                    | 9000               | 95          | 125         | 10º           |
| HC 0070 P3PU 4K 3 | UNV               | 70W   | 4200    | 85                  | 0.98            | 90                    | 9000               | 95          | 125         | 30°           |
| HC 0070 P3PU 4K 4 | UNV               | 70W   | 4200    | 85                  | 0.98            | 90                    | 9000               | 95          | 125         | 40°           |



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## LAMPS

## T15 CERAMIC METAL HALIDE LAMPS

- · Approved for enclosed fixtures only
- G8.5 Two-Pin Base 39W 70W
- Excellent CRI
- High efficiency output
- Long life
- · Compact Size
- · Universal lamp orientation
- · For decorative use, supermarkets, display windows, supermarkets, stadiums, gymnasiums, flood and spot lighting

**T20 CERAMIC METAL HALIDE LAMPS** 



| <br>Part Number | Install<br>Method | Watts | CCT (K) | Lamp<br>Voltage (V) | Lamp<br>AMP (A) | Luminous<br>Flux (LM) | Avg. Life<br>(Hr.) | DIA<br>(mm) | MOL<br>(mm) |
|-----------------|-------------------|-------|---------|---------------------|-----------------|-----------------------|--------------------|-------------|-------------|
| HC 0039 TPY 3K  | UNV               | 39W   | 3000    | 88                  | 0.53            | 3300                  | 10000              | 15          | 85          |
| HC 0039 TPY 4K  | UNV               | 39W   | 4200    | 85                  | 0.53            | 3300                  | 10000              | 15          | 85          |
| HC 0070 TPY 3K  | UNV               | 70W   | 3000    | 88                  | 0.98            | 6600                  | 10000              | 15          | 85          |
| HC 0070 TPY 4K  | UNV               | 70W   | 4200    | 85                  | 0.98            | 6300                  | 10000              | 15          | 85          |



## MERCURY VAPOR LAMPS

- · For replacement purposes only
- Mogul Base 175W
- Rated Life 10.000 hours
- Mean Lumen Output is 6800
- Light Output (Lumens 100 Hrs) = 7800

| Part Number     | Install<br>Method | Watts | CCT (K) | MOL  |  |
|-----------------|-------------------|-------|---------|------|--|
| HG 0175 DCBU 4K | UNV               | 175W  | 3900    | 8.3" |  |



EXPERIENCE Civilized societies take seriously the health and security of their citizens. Therefore they use technology not just for material security of their citizens. for people's well-being. Along with the rise of social awareness, safety lighting evolved for normal daily convenience, and especially for emergencies.

> Emergency lighting can be provided by just about any lighting technology. When trouble strikes, we don't much care about specifics -- we just want to see well enough to get to safety. Fulham engineering has developed a variety of reliable systems to handle any emergency lighting situation.



LIGHTING

WAY

EMERGENCY EXIT

## "Hey, Pop, What's An Egress?"

Let's admit it. Deep down, we're all afraid of the dark. This is especially true in emergencies, when bad things can happen in the dark, even in familiar places. Can't find the exit. Trip over the cat. Bump into something lethal, harmful or just plain messy. Even if it's not a fire or an earthquake, when lights fail, we're back in prehistoric times.

That's why, in modern times, we created emergency backup lighting, designed to kick in automatically when the main system goes down. This is usually a secondary generator or battery system that provides temporary illumination until a location is vacated, or the lights go back on. Until recently, backup lighting was noticeably inferior to the main system. It was, after all, designed to be just a stopgap measure, like those dinky 25-mile emergency spare tires we slap on when our high quality, 100,000-mile radials unexpectedly plotz.

But now, in response to increasingly stringent safety code requirements, the lighting industry has developed a variety of reliable, long-lasting and brighter-burning emergency systems. These range from incandescent bulbs to LED clusters to banks of batteries to newer self-luminescent technologies. The objective is to get us out of some dark, maybe smoky, danger zone. So besides lamps to light the "egress path," an approved emergency system usually includes illuminated signage to speed the evacuation process safely along.

In most cities, emergency lighting is mandatory for all commercial, industrial and multiple residence buildings. Code specs list requirements for lamp locations; wiring; mimimum illumination levels; periodic

system testing and maintenance; timely equipment replacement; and clear indications of emergency service call box locations, stairnosing, handrails, stairwell landings, clear delineations for paths of egress and related code requirements. Inexpensive home emergency lighting packages have also become increasingly popular.

## EMERGENCY/EXIT LIGHTING SYSTEMS

- COMPLETE EMERGENCY/EXIT SYSTEMS, INCLUDING PREMIUM FULHAM EXIT SIGNS, BATTERY BACK-UP BALLASTS, AND LED & HALOGEN LIGHTING SYSTEMS
- > OVER 400 SYSTEM MODELS
- FULL LINE OF EXIT & EMERGENCY FIXTURES INCLUDE AC ONLY, BATTERY BACK UP, SELF DIAGNOSTIC & PHOTOLUMINESCENT







## LED EMERGENCY LIGHTING SYSTEMS

## EMERGENCY LIGHTING BALLASTS

1W-5W 90 - 350MIN

EMERGENCY LIGHTING BALLASTS

EMERGENCY LIGHTING 450 - 3000 LUMEN OUTPUT



LED & INCANDESCENT 90 MINUTE BATTERY BACK UP

**EXIT SIGNS** 

## LED AC ONLY, 90 MINUTE BATTERY BACK UP & PHOTOLUMINESCENT



FireHorse product specification sheets and other related literature online



EMERGENCY



**EXIT SIGNS** 



## \fulhəm PATENT PENDING T1 LED EMERGENCY G SYSTEM EXCLUSIVE FireHorse HotSpot1 modular LED systems add inconspicuous emergency lighting capability to existing non-emergency fixtures, such as recessed lighting and wall sconces. A wide choice of lumen output levels, run times, discrete size, universal input voltage, and plug-n-play low voltage output wiring provide extreme adaptability, low cost of installation, and a high level of safety during operation. **COMPLETE HOTSPOT1 SYSTEM:**

**Fixture** 

**LED Module** 



**HotSpot1 Battery Pack** 









## **LED MODULES**

| inear arrays are linka |  |  |  |                                       |  |
|------------------------|--|--|--|---------------------------------------|--|
|                        | LINEAR   | CIRCULAR                                       | H-CONFIG SMAL  | L H-CONFIG LARGE                      | CLUSTER  |
| Model No.              | FHS1 AR 4W L   | FHS2 AR 4W C                                   | FHS3 AR 10W SH<br>FHS3 AR 6W SH  | FHS4 AR 10W LH<br>FHS4 AR 8W LH       | FHS5 AR 6W CL  |
| Wattage                | 4W   | 4W   | 10W<br>6W  | 10W<br>8W                             | 6W   |
| Applications           | Wall Sconce<br>Ceiling Flush Mount<br>Low Level Lighting | Recessed Down Light<br>Wall Sconce<br>Cylinder | ing Wa<br>Ceiling  | Il Sconce<br>Flush Mount              | Circular Lamp<br>Applications,<br>e.g. Induction Parking<br>Lot Fixtures |
| HOTSPO                 | T1 DRIVER  |  |  |                                       |  |
|                        |  | Model  | FHS1-UNV-3.6L  | Input Current                         | 0.07 A   |
|                        | - mail   | Compatible Batterie                            | s NiCd, 3.6 VDC  | Input Wattage                         | 4W   |
|                        | I BEER AND   | Battery Capacities                             | 3AH, 4AH, 7AH  | No Load Power Loss                    | 0.5W   |
|                        | NGTUNV 2 BL  | LED Types                                      | 1W - 5W  | Surge Protection                      | C62.41 (TVS)   |
|                        |  | LED Currents                                   | 350mA - 1,500mA  | Over Current Protection               | Fuse   |
| A                      |  | Total LED power                                | 10W  | Recharge Time                         | 24 Hrs - 48 Hrs  |
| Manager                | •  | Illumination time                              | 90 - 240 Min.  | LED Connection                        | Parallel   |
|                        |  | Input Voltage                                  | 120-277VAC   | LED Output Protection                 | Self Resetting PTC   |
| JOTEDO                 |  |  | 50/60Hz  | Output Classification                 | UL1310/Class 2   |
|                        | FHSRA  |  | FHSBATT3-D4  | FHS                                   | BATT3-F7   |
| Rattory Atu/Tu         | ng 2   | с.   | ייים אוניים איניים איניים<br>אוניים איניים |                                       | 3 F  |
|                        | he of  |  | J U  | · · · · · · · · · · · · · · · · · · · |  |
| Dutput Power/          | <b>Time</b> 4W:145min                                    | , 6W:90min 4                                   | 4 Anip Hours<br>W:200min, 6W:125min, 8W:90   | min 4W:360r                           | nin, 6W:235min,  |
| 0 0!                   |  | N 0 111  |  | 8W:175n                               | nin, 10W:135min  |
| Case Size              | 1"H, 2"\   | W, 3.1"L                                       | 1.35"H, 2.5"W, 4"L   | 1.35"                                 | H, 3.6"W, 4"L  |





## fulham OT2 LED EMERGENCY A FULHAM EXCLUSIVE

FireHorse HotSpot2 is a UL924 recognized emergency lighting system useable with LED modules driven by a constant current source. The battery charger automatically adjusts to the battery size and use. With the proper connector, the driver provides output current based on the module connected, allowing a wide choice of lumen output and run times.







**LED Fixture** 

**HotSpot2 Driver** 







## **HOTSPOT2 DRIVER**



| Model                | FHS2-UNV-36L  |
|----------------------|---|
| Compatible Batteries | LiFePo4, NiCd, 9.6 VDC                              |
| Battery Capacities   | .9Ah, 1Ah, 1.2Ah,<br>1.5Ah, 1.8Ah, 3Ah, 4Ah,<br>6Ah |
| LED Types            | 1W or 2W  |
| LED Currents         | 350mA - 700mA                                       |
| Total LED power      | 20W   |
| Illumination time    | 90 - 350 Min.                                       |
| Input Voltage        | 120-277VAC  |
| Input Frequency      | 50/60Hz   |

| Input Current                | 0.07 A             |
|------------------------------|--------------------|
| Input Wattage                | 4W                 |
| No Load Power Loss           | 0.5W               |
| Surge Protection             | C62.41 (MOV)       |
| Over Current Protec-<br>tion | Fuse               |
| Recharge Time                | 24 Hrs - 48 Hrs    |
| LED Connection               | Series             |
| LED Output Protection        | Self Resetting PTC |
| Output Classification        | UL1310/Class 2     |

## HOTSPOT2 BATTERY PACKS (LiFePo4, NiCd, 9.6 VDC)



| Model #       | Dimensions            | Chemistry | Capacity | Battery<br>Count | Max Load<br>for 90 min. | Recharge<br>Time |
|---------------|-----------------------|-----------|----------|------------------|-------------------------|------------------|
| FHSBATT8-AA.9 | 5.23" x 2.39" x 0.66" | NiCd      | 900mAh   | 8 Cells          | 4W                      | 24Hrs            |
| FHSBATT8-C3   | 4.15" x 3.29" x 2.11" | NiCd      | 3000mAh  | 8 Cells          | 16W                     | 32Hrs            |
| FHSBATT8-D4   | 4.95" x 3.84" x 2.66" | NiCd      | 4000mAh  | 8 Cells          | 20W                     | 32Hrs            |
| FHSBATL3-1    | 3.48" x 2.29" x 0.91" | LiFePo4   | 1000mAh  | 3 Cells          | 4W                      | 24Hrs            |
| FHSBATL3-1.5  | 3.48" x 2.70" x 0.91" | LiFePo4   | 1500mAh  | 3 Cells          | 8W                      | 24Hrs            |
| FHSBATL3-3    | 4.39" x 2.76" x 1.22" | LiFePo4   | 3000mAh  | 3 Cells          | 16W                     | 32Hrs            |
| FHSBATL6-1.5  | 5.70" x 2.70" x 0.91" | LiFePo4   | 3000mAh  | 6 Cells          | 16W                     | 32Hrs            |
| FHSBATL6-3    | 7.52" x 2.76" x 1.22" | LiFePo4   | 6000mAh  | 6 Cells          | 20W                     | 48Hrs            |
| FHSBATL66     | 5.23" x 1.81" x 0.79" | LiFePo4   | 1200mAh  | 6 Cells          | 6W                      | 24Hrs            |
| FHSBATL96     | 5.23" x 1.81" x 0.79" | LiFePo4   | 1800mAh  | 9 Cells          | 10W                     | 24Hrs            |

## BALLASTS DUAL 120 or 277 60Hz



### FEATURES

• Factory or Field Installation

- End of Life (EOL) Time Delay (FH7, 8, 9, 10)
  Wide Range of Lamp and Ballast Compatibility
- Damp Location Rated
- Wide Range of Lumen Output

Ű

• 2, 3 and 5 Year Warranties

### COMMON SPECIFICATIONS

• Low Profile Models for Integral Mounting

| Operating Voltage                 | Dual 120V or 277V           | Ballast Compatibility              | Electronic / Energy Saving        |
|-----------------------------------|-----------------------------|------------------------------------|-----------------------------------|
| Frequency                         | 60Hz                        | Special Ballast Compatibility      | Electronic Dimming Type           |
| Listing                           | Emergency                   | Lamp Compatibility                 | Fluorescent Type - See next page  |
| Alternate Listing                 | Inverter / Charger Pack     | Fixture Wiring                     | Switched Or Unswitched            |
| Regulatory Approval               | UL                          | Installation                       | Factory Or Field                  |
| Regulatory Compliance             | Meets Or Exceeds N.E.C./LSC | Remote Mounting                    | See Installation Instructions     |
| Location Rating                   | Damp                        | Battery Type                       | Long Life Rechargable Ni-Cad      |
| Operating Temp Range (Except FH7) | 0°C - 50°C                  | Minimum Emergency Operation        | 90 Minutes                        |
| Operating Temp Range FH7          | 20°C - 55°C                 | Min. Required Charging Time        | 24 Hours                          |
| Test Switch                       | Single Pole                 | Case Construction (FH1, 3, 4 5, 6) | Vandal Resistant Painted Steel    |
| Test Indicator                    | LED Type                    | Case Construction (FH7, 8, 9, 10)  | Vandal Resistant Galvanized Steel |

|                        | FH1-DUAL-750CFL                  | FH3-DUAL-450L                    | FH4-DUAL-700L                    | FH5-DUAL-1400L                     | FH6-DUAL-3000L                     |
|------------------------|----------------------------------|----------------------------------|----------------------------------|------------------------------------|------------------------------------|
| Initial Lumen Output   | 750                              | 450                              | 700                              | 1400                               | 3000                               |
| EOL Time Delay         | No                               | No                               | No                               | No                                 | No                                 |
| AC Input               | 3.5W                             | 2.5W                             | 3.5W                             | 3.5W                               | 8.0W                               |
| Charging Current       | 280mA Max.                       | 280mA Max.                       | 280mA Max.                       | 280mA Max.                         | 280mA Max.                         |
| Battery Voltage        | 3.6VDC                           | 2.4VDC                           | 3.6VDC                           | 6.0VDC                             | 14.4VDC                            |
| Battery Rating         | 14.4Wh                           | 9.6Wh                            | 14.4Wh                           | 24.0Wh                             | 57.6Wh                             |
| Warranty               | 2 Years                          | 2 Years                          | 3 Years                          | 5 Years                            | 5 Years                            |
| Ballast Size           | H 1.5" W 2.4"<br>L 9.4" Ctr 8.9" | H 1.5" W 2.4"<br>L 9.4" Ctr 8.9" | H 1.5" W 2.4"<br>L 9.4" Ctr 8.9" | H 1.5" W 2.4"<br>L 13.3" Ctr 12.1" | H 1.7" W 5.5"<br>L 16.3" Ctr 15.1" |
| Ballast Weight         | 2.8 lbs                          | 2.5 lbs                          | 2.8 lbs                          | 3.4 lbs                            | 9.2 lbs                            |
| Case Quantity          | 1 pc.                            | 1 pc.                            | 1 pc.                            | 1 pc.                              | 1 pc.                              |
| Master Carton Quantity | 6 pcs.                           | 6 pcs.                           | 6 pcs.                           | 6 pcs.                             | 2 pcs.                             |

|                        | FH7-DUAL-500L                         | FH8-DUAL-1300L                     | FH9-DUAL-800L                      | FH10-DUAL-500L                     |
|------------------------|---------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| Initial Lumen Output   | 500                                   | 1300                               | 800                                | 500                                |
| EOL Time Delay         | Yes                                   | Yes                                | Yes                                | Yes                                |
| AC Input               | 2.5W                                  | 2.5W                               | 2.5W                               | 2.5W                               |
| Charging Current       | 280mA Max.                            | 126mA Max.                         | 126mA Max.                         | 127mA Max.                         |
| Battery Voltage        | 6.0Vdc                                | 8.4Vdc                             | 6.0Vdc                             | 3.6Vdc                             |
| Battery Rating         | 9.0Wh                                 | 21.0Wh                             | 15.0Wh                             | 9.0Wh                              |
| Warranty               | 5 Years                               | 5 Years                            | 5 Years                            | 5 Years                            |
| Ballast Size           | H 1.125" W 2.25"<br>L 9.8" Ctr 9.125" | H 1.2" W 1.3"<br>L 21.5" Ctr 21.0" | H 1.2" W 1.3"<br>L 17.5" Ctr 17.0" | H 1.2" W 1.3"<br>L 14.2" Ctr 13.7" |
| Ballast Weight         | 2.3 lbs                               | 2.1 lbs                            | 1.7 lbs                            | 1.4 lbs                            |
| Case Quantity          | 1 pc.                                 | 1 pc.                              | 1 pc.                              | 1 pc.                              |
| Master Carton Quantity | 6 pcs.                                | 6 pcs.                             | 6 pcs.                             | 6 pcs.                             |

LAMP OPERATION

|                       | FH1              | FH3          | FH4    | FH5          | FH6              | FH7          | FH8    | FH9          | FH10   |
|-----------------------|------------------|--------------|--------|--------------|------------------|--------------|--------|--------------|--------|
| LUMEN OUTPUT          | 750              | 450          | 700    | 1400         | 3000             | 500          | 1300   | 800          | 500    |
| CFT/CFQ/CFTR -        | 4 PIN            |              |        |              |                  |              |        |              |        |
| 9W - 32W              | 1 or 2           | 1            | 1 or 2 | 1 or 2       | 1 or 2           |              | •••••• |              |        |
| 42W                   | 1                | 1            | 1      | 1            | 1 OF 2           | •••••        | •••••• | •••••        | •••••  |
| 57W - 70W             | DIN              |              |        | I            | -                |              |        |              |        |
| FI/GFW/FQL - 4        | 1 or 2           | -1           | 1 or 2 | 1 or 2       | 1 or 2           | 1            | 1      | - 1          |        |
| 24W - 20W             | 1 01 2<br>1 or 2 | ····· !<br>1 | 1 01 2 | 1 or 2       | 1 01 2<br>1 or 2 | ····· !<br>1 | ·····  | ····· !<br>1 | •••••  |
| 24W - 39W             | 1 UI Z           | ····· !<br>1 | ·····  | 1 01 2       | 1 01 2           | ····· !<br>1 | ·····  | ····· !<br>1 | •••••  |
| 40W                   |                  | •••••        | ·····  | ·····        | ·····            | ••••••       | ·····  | ····· •      | •••••  |
| CIRCIII AR - ECR      | T5               |              |        |              | 1                |              |        |              |        |
| 15W - 30W             | 1                | 1            | 1      | 1            | 1                | 1            |        |              |        |
| 40W                   |                  | ·····<br>1   |        |              | 1                |              | •••••  | •••••        | •••••  |
| 55W                   | •••••            | ••••••       | 1      |              | 1                | ·····        | •••••  | •••••        | •••••  |
| CIRCULAR - FCR        | T9               |              | -      | -            | -                |              |        |              |        |
| 20W - 32W             | 1                | 1            | 1      | 1            | 1                | 1            |        |              |        |
| 40W                   | 1                | 1            | 1      | 1            | 1                | 1            | •••••  |              | •••••  |
| 2D/4P                 |                  |              |        |              |                  |              |        |              |        |
| 10W - 28W             | 1 or 2           | 1            | 1      | 1 or 2       | 1 or 2           | 1            |        |              |        |
| 38W - 39W             | 1 or 2           | 1            | 1      | 1 or 2       | 1 or 2           | 1            | •••••  | •••••        | •••••  |
| <b>T5 LOW WATTAG</b>  | E                |              |        |              |                  |              |        |              |        |
| F4 - F13              | 1                | 1            | 1      | 1            | 1                | 1            | 1      | 1            | 1      |
| <b>T5 STANDARD</b>    |                  |              |        |              |                  |              |        |              |        |
| F14 - F21             | 1                | 1            | 1      | 1            | 1                | 1            | 1      | 1            | 1      |
| F28                   |                  |              | 1      | 1            | 1                | 1            | 1      | 1            | 1      |
| F35                   |                  |              |        | 1            | 1                |              | 1      | 1            |        |
| <b>T5 HIGH OUTPUT</b> | 1                |              |        |              |                  | _            |        | _            |        |
| F24 - F39             |                  |              |        | 1            | 1                |              | 1      | 1            | 1      |
| F54                   |                  |              |        | 1            | 1                |              | 1      | 1            |        |
| <b>T8 STANDARD (I</b> | ncludes U-B      | ent)         |        |              |                  |              |        |              |        |
| F13 - F25             | 1 or 2           | 1            | 1 or 2 | 1 or 2       | 1 or 2           | 1            | 1      | 1            | 1      |
| F28                   | 1                | 1            | 1 or 2 | 1 or 2       | 1 or 2           | 1            | 1      | 1            | 1      |
| F30 - F32             |                  | 1            | 1 or 2 | 1 or 2       | 1 or 2           | 1            | 1      | 1            | 1      |
| F35 - F40             | ••••••           | 1            | ·····  |              |                  |              | 1      | 1            | •••••  |
|                       |                  |              |        | l            | l                |              |        |              |        |
|                       |                  |              | 1      | 1            | 1                |              |        |              |        |
| F44<br>F55 - F86      | ••••••           | •••••        |        | ····· !<br>1 | ·····            | •••••        | •••••• | •••••        | •••••  |
| T12/T10 STAND/        | ARD (Include     | e II-Ront)   | 1      | I            | I                |              |        |              |        |
| F14 - F25             | 1 or 2           | 1            | 1 or 2 | 1 or 2       | 1 or 2           | 1            | 1      | 1            |        |
| F30 - F40             |                  | ·····.<br>1  | 1 or 2 | 1 or 2       | 1 or 2           |              |        |              | •••••  |
| F50 - F75             | •••••            | ••••••       | 1      | 1            | 1                | ••••••       | •••••• | ••••••       | •••••  |
| T12 HIGH OUTPU        | JT               |              |        |              |                  |              |        |              |        |
| F25 - F48             |                  |              | 1      | 1            | 1                |              |        |              |        |
| F55 - F96             |                  | •••••        | 1      | 1            | 1                | •••••        |        | •••••        | •••••• |
| F100 - F110           |                  | •••••        | 1      | 1            | 1                |              |        | ••••••       |        |
| T12/T10 VERY H        | IGH OUTPUT       |              |        |              |                  |              |        |              |        |
| F110                  |                  |              | 1      | 1            | 1                |              |        |              |        |
| F115 - F215           |                  | •••••        |        | 1            | 1                | •••••        |        | •••••        |        |





### **FEATURES**

- Inventory reduction benefits and installation cost-savings based on combination AC/Emergency Ballast design
- Multiple-region certifications for versatility (UL, cULus, CE)
- · Reduces wiring assembly time through use of push-in connectors instead of leads
- Modular battery allows easy replacement in the field and continued use of AC/Emergency module
- Pre-connected battery eliminates need for contractor to connect external battery in the field
- · Battery low voltage cutoff
- · Recommended applications include staircases, ocean liners and more

### COMMON SPECIFICATIONS

| Model               | FHR1-UNV-218T8-L            |
|---------------------|-----------------------------|
| Operating Voltage   | 120V - 277V                 |
| Frequency           | 50/60Hz                     |
| Power Factor        | .95                         |
| Regulatory Approval | UL, cULus, CE               |
| THD                 | <20%                        |
| Charging Current    | 110mA                       |
| Battery Voltage     | 6V                          |
| Battery Capacity    | 2.0Ah                       |
| Battery Type        | High Temperature NiCad      |
| Emergency Mode      | Minimum 90 Minutes Run Time |

### LAMP OPERATION

| Model Number     | # of Lamps | Lamp Type / Designation     |
|------------------|------------|-----------------------------|
| FHR1-UNV-218T8-L | 1 or 2     | F17T8 (U.S), F18T8 (Europe) |

## ulham **ORDERING INSTRUCTIONS QUICK REFERENC**

## HOW TO ORDER = SERIES NUMBER + OPTIONS

PRODUCT LISTING EXAMPLE : FHE11 model with white case color, high lumen reflector and self-diagnostic test.



## SYMBOL KEY



UL meets UL924 - N.E.C. and LSC minimal emergency operational standards; local fire and safety codes are primary consideration for model selection. FireHorse Emergency Exit Products provide a wide range of models to meet all national and models meet most local fire and safety codes. It is recommended to review your local codes when selecting a FireHorse Emergency Exit Product. Selected models ETL listed only.



Damp Location Rated for indoor locations where fixtures are not exposed to direct contact with water or washdown conditions.



Wet Location Rated for locations where fixtures are exposed to water and washdown conditions.



LED light source (Red and Green) is available with a wide range of FireHorse Emergency Lighting Exit Products for long life and low power consumption. Selected models now available with all White LED light source for ultra-bright performance and reduced inventory requirements.



RC provides the capability for remote emergency lighting heads to be operated with the FireHorse emergency fixture; a broad range of head type, wattage and application is available for models with this capability.





Sealed Lead Acid battery type.

## SELF-TEST/DIAGNOSTIC OPERATION



The SELF TESTING feature included in the circuitry tests the fixture every 30 days for 15 minutes and once every 12 months for a full 90 minute discharge test, simulating a maximum use power failure. After each test, it recharges the battery automatically and returns to normal operating mode. Any problems found during or after the test are reported through the user interface.

This SELF TESTING actually helps prolong the life of the batteries by keeping them exercised and fresh. Without the ST feature, the battery can remain idle for long periods of time, only being used in an actual power failure and thereby depleting their ability to hold and maintain a proper charge.

Self-Test/Diagnostic option is available on selected FireHorse models by specifying suffix "SD."

## **NEW YORK CITY APPROVED**





|                       | FHNY10                                 | SERIES     | DESCRIPTION                      |
|-----------------------|--|------------|----------------------------------|
| Z.                    | Slim profile metal LED exit sign       | FHNY1029*  | Emergency light with 6-Volt 18-V |
| efficiency and unifor | efficiency and uniform illumination in | FHNY1039*  | Emergency light with 6-Volt 27-W |
|                       | an economical package.                 | FHNY10312* | Emergency light with 12-Volt 50- |

| 029*  | Emergency light with 6-Volt 18-Watt lead-acid battery, two lamp heads    |
|-------|--|
| 039*  | Emergency light with 6-Volt 27-Watt lead-acid battery, three lamp heads  |
| 0312* | Emergency light with 12-Volt 50-Watt lead-acid battery, three lamp heads |







|   | F |   | H |   | l | Y | 2 | 2 | 0 | ļ | ١ | C | 7 | ł |   |   |   |   | E | ) | K |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| • | • | • | • | • | • | • | ÷ | • | ٠ | • | • | ÷ | • | • | • | 1 | • | • | ÷ | • | • |

DESCRIPTION

tit Sign, 20-GA Steel, White Housing, Universal Face, Red Lettering, AC only Exit Sign, 20-GA Steel, White Housing, Universal Face, Red Lettering, Battery B/UP



FHNY21 8" die-cast aluminum exit sign designed to New York City specifications, offering rich, unparalleled aesthetics in a durable, all-metal construction.



| SERIES | Housing<br>Color  | # of Faces             | OPERATION                               | OPTIONS              |
|--------|---|------------------------|---|----------------------|
| FHNY21 | Blank = Black<br>w/Brushed<br>Faceplate<br>W = White<br>B = Black | S = Single<br>D = Dual | AC = AC Only<br>EM = Battery<br>Back Up | SD = Self-Diagnostic |

| F    | FHNY22  | SERIES | HOUSING<br>COLOR                     | # of Faces             | OPERATION                               | OPTIONS              |
|------|---|--------|--------------------------------------|------------------------|---|----------------------|
| VITZ | 8" Edge-lit exit sign designed to New<br>York City specifications, providing<br>superior aesthetics in a recessed<br>design. Excellent LED performance<br>and energy efficiency combined with | FHNY22 | A = Aluminum $W = White$ $B = Black$ | S = Single<br>D = Dual | AC = AC Only<br>EM = Battery<br>Back Up | SD = Self-Diagnostic |
|      | infield installation flexibility.   |        | <b>I</b> NiC                         |                        |   |                      |



FHNY23 8" Edge-lit exit sign designed to New York City specifications, provides superior aesthetics in a surfacemount design. Excellent LED performance and energy efficiency combined with infield installation flexibility.

| SERIES  | HOUSING<br>Color | # of<br>Faces | OPERATION            |
|---------|------------------|---------------|----------------------|
| FHNY23* | A = Aluminum     | S = Single    | AC = AC Only         |
|         | W = White        | D = Dual      | EM = Battery Back Up |
|         | B = Black        |               |                      |



FHNY30 8" Steel LED exit sign and emergency unit combo is designed to New York City specifications.

ST

SERIES FHNY30\*

### DESCRIPTION

Combo, 20-GA Steel, White Housing, Single Face, Red Lettering, **Battery B/UP** 



SI

## \*Options available for quick ship are bolded.













## CHICAGO APPROVED & EMERGENCY LIGHTING







### FHCH10

Steel emergency light designed for new construction or retrofit applications that must meet all City of Chicago listing requirements. Ideal for wall-mounted applications in stores, offices, hospitals and schools.



DESCRIPTION Emergency light with 6V 24W sealed lead acid battery and two heads

|                       | FH  |
|-----------------------|-----|
|                       | Hea |
| and the second second | ann |

fulham

## **CH20**

avy duty steel exit signs are Chicago approved. Ideal for applications such as schools, offices, retail and hospitals.



FHEM10

SERIES # of Faces S = SingleFHCH20

D = Dual

CEDIEC

SERIES

FHEM15

### DIRECTIONAL **OPERATION** LA = Left Arrow AC = AC Only

RA = Right Arrow DA = Double Arrow EM = Battery Back Up

NA = No Arrow



Contemporary, low profile, quick-installing emergency

| SERIES  | HUUSING CULUR |
|---------|---------------|
| FHEM10* | W = White     |
|         | B = Black     |



light with fully adjustable heads.

| SERIES  | HOUSING COLOR | OPTIONS                 |  |
|---------|---------------|-------------------------|--|
| FHEM11* | W = White     | H = High Lumen Reflecto |  |
|         | B = Black     | SD = Self-Diagnostic    |  |

RC = Remote Capable

OUTPUT LAMP WATTAGE

Low profile, thermoplastic emergency lighting unit with adjustable LED lamp heads.

| FH | EI | M | 13 | 3 |
|----|----|---|----|---|

SL

Low profile, compact emergency light with fixed optics provides a consistent, predictable aiming pattern for wall or ceiling mounting.

| SERIES  | HOUSING COLOR |
|---------|---------------|
| FHEM13* | W = White     |
|         | B = Black     |

| 9 |  |
|---|--|
|   |  |

## FHEM14

High Capacity units with larger batteries to operate additional remote lamp heads or extended emergency operation. 12 Volt units are ideal for operating remote lamps with long runs, minimizing voltage drop issues.

|   | OLIVIEO     | VOLINGE | 0011 01 |          |
|---|-------------|---------|---------|----------|
| J | FHEM141250  | 12V     | 50W     | 2 x 9W   |
| 7 | FHEM1412100 | 12V     | 100W    | 2 x 9W   |
| 1 | FHEM14650   | 6V      | 50W     | 2 x 7.2W |
|   | FIEW146100  | 6V      | 100W    | 2 x 7.2W |

VOI TAGE



## FHEM15

Rugged, sealed and gasketed emergency units are ideal for wet or corrosive environments, providing resistance to dust, hose-downs, water spray and splashing water.

\*Options available for quick ship are bolded.











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S







## **EXIT SIGNAGE**





### FHEX20 – Thermoplastic **Micro LED**

Slim profile thermoplastic LED exit sign offers long lamp life, energy efficiency and uniform illumination in an economical package.



SERIES

FHEX20\*

HOUSING

COLOR

LETTER



OPERATION

OPTIONS

| /IT | FHEX21 – Thermoplastic LED<br>Thin-profile, thermoplastic LED exit                                | SERIES  | HOUSING<br>COLOR              | LETTER<br>COLOR      | OPERATION                            | OPTIONS                                   |
|-----|---|---------|-------------------------------|----------------------|--------------------------------------|---|
|     | sign offers long life, energy efficiency<br>and uniform illumination in an<br>economical package. | FHEX21* | <b>W = White</b><br>B = Black | R = Red<br>G = Green | AC = AC Only<br>EM = Battery Back Up | SD = Self-Diagnostic<br>DC = Dual Circuit |

HOUSING COLOR

SERIES



-124

| Die-Cast aluminum exit signs offer rich, unparalleled aesthetics in a durable all- |
|--|
| metal construction.  |
|  |

FHEX22 – Aluminum Die Cast



| FHE      | X22*    | Blank = Black w/<br>Brushed Faceplate<br>W = White<br>B = Black | R = Red<br>G = Green | AC = AC Only<br>EM = Battery<br>Back Up | SD = Self-Diagnostic |
|----------|---------|---|----------------------|---|----------------------|
| H<br>3 ( | HOUSING | # of Faces  | LETTER<br>COLOR      | OPFRATION                               | OPTIONS              |

LETTER

COLOR

| FHEX23 – Recessed   |       |
|---|-------|
| <br>Edge Lit  | SERIE |
| Architectural LED Edge-Lit<br>exit signs recess into the<br>ceiling, offering superior<br>aesthetic appeal. | FHEX  |
|   |       |



| ERIES | HOUSING<br>COLOR | # of Faces | LETTER<br>COLOR               | OPERATION    | OPTIONS              |
|-------|------------------|------------|-------------------------------|--------------|----------------------|
| HEX23 | A = Aluminum     | S = Single | R = Red                       | AC = AC Only | SD = Self-Diagnostic |
|       | W = White        | D = Dual   | $\mathbf{G} = \mathbf{Green}$ | EM = Battery |                      |
|       | B = Black        |            |                               | Back Up      |                      |



### FHEX24 – Surface Edge Lit Ideal for architectural applications,

surface mount Edge-Lit LED exit signs offer specification-grade aesthetics with in-field installation flexibility.



| SERIES | HOUSING<br>COLOR | # OF<br>Faces | LETTER<br>COLOR               | OPERATION            |
|--------|------------------|---------------|-------------------------------|----------------------|
| FHEX24 | A = Aluminum     | S = Single    | R = Red                       | AC = AC Only         |
|        | W = White        | D = Dual      | $\mathbf{G} = \mathbf{Green}$ | EM = Battery Back Up |
|        | B = Black        |               |                               |                      |

OPERATION

AC = AC Only

EM = Battery Back Up



### Wet location approved exit signs feature an enclosure resistant to corrosive atmospheres, non-hazardous dust environments, hose-downs, water spray and splashing water.

ST



## \*Options available for quick ship are bolded.









SERIES

FHEX25

LETTER

COLOR

 $\mathbf{R} = \mathbf{Red}$ 

G = Green







Fulham Co., Inc. www.fulham.com 323-779-2980

## EXIT COMBO & ACCESSORIES





## FHEC30 - Thermoplastic Micro LED

Energy-saving combination LED exit sign and emergency lighting unit in one compact, modern design. Flexibility and multi-function capabilities include LED performance on both the exit sign and the lamp heads.





### FHEC31 - Thermoplastic Square Head Combo 5.4W T5 Wedge Base

Energy saving combination LED exit sign and emergency lighting unit provides contemporary design, flexibility and multi-function capabilities.



| SERIES  | HOUSING<br>COLOR | LETTER<br>COLOR | OPTIONS             |
|---------|------------------|-----------------|---------------------|
| FHEC31* | W = White        | R = Red         | SD= Self-Diagnostic |
|         | B = Black        | G = Green       | RC=Remote Capable   |
|         |                  |                 |                     |

HOUSING

W = White

B = Black

LETTER COLOR

 $\mathbf{R} = \mathbf{Red}$ 

G = Green

COLOR

SERIES

FHEC30\*



### FHEC32 - Wet Location Combo Round Head 5.4W T5 Wedge Base Wet location LED exit sign and emergency unit includes

SERIES LETTER COLOR

two sealed and gasketed, weatherproof lamp heads with tempered glass lenses. NiC

| FHEC32 | R = Red   |  |
|--------|-----------|--|
|        | G = Green |  |
|        |           |  |







## **FireHorse Series**

FHEC – FireHorse Combo FHEM - FireHorse Emergency FHEX - FireHorse Exit

## FireHorse Model Number (Remote Heads Only)

- 11 Square Head Emergency 14 - High Output Emergency 15 - Wet Location
- Accessory Type RH1 - Remote Head Single RH2 - Remote Head Dual

RIFS

VS - Vandal Shield WG - Wire Guard





## **Operation (Remote Head Only)**

- 12V12 12V 12W Lamp (FHEM14 Only)
- 12V7 12V 7W Lamp (Not available on FHEM15)
- 6V9 6V 9W Lamp (Not available on FHEM15)
- 6V7 6V 7W Lamp (FHEM15 Only)
- 6V5 6V 5W Lamp (Not available on FHEM15)

### \*Options available for quick ship are bolded.

















## ZERO ELECTRICITY REQUIRED

Like many modern technological marvels, photoluminescence (PL) appeared first in nature, in this case as fireflies and glow worms. Actually, they're not flies, but flying beetles; and they're not worms, but insect larvae. And what they exhibit is technically bioluminescence, but let's not get picky. Nature's glow inspired a concept of lighting which humans earned to emulate.

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| 40.078<br>strontium<br>38<br>Sr<br>87.62<br>barium<br>56<br>57-70<br>Baa *<br>1 137.38<br>im radium<br>88<br>89-10<br>Raa * | 44.956         47.867         50,942           Vitridm         Ziroonium         niobium           39         40         41           Y         Ziroonium         niobium           88,906         91.224         92:906           104eitum         hafnium         73           104         174.97         178,49           174.97         178,49         180.9           2         103         104         105           40         Rf         104         105 | olybdenum         technetium         rothenou           42         43         44           Mo         Tc         Ru           95,94         [98]         100,07           1         103,00         76         76           W         Ree         Og         Og           183,84         190,27         190,27           106         107         190,27           106         107         109,20           0         Sgg         Bh         H           0         106         107         109,20           0         268         [264]         [264]         [264]   | A5         A6           A5         A6           Rha         Pdd           102.91         106.42           n         iridium         platinum           77         78         Pd           33         192.22         19508           109         110         110           8         109         110           9         12681         12711 | 47     Cd     In       107.87     112.41     114.82       gold     mercury     thallium       79     80     81       Au     Hg     TI       196.97     200.69     204.38       111     112     111       111     112       Uuuu     Uuubuu       121     1271 | Sin         Sio         Ie           118.71         121.76         127.60         127           lead         bismuth         polonium         ast           82         83         84         9           Pbb         2012         2018.98         120.91         14           Unfunguadium         114         124         124         124           114         Uuquq         1289         120.91         14 |
|---|--|---|---|---|---|
| anthanide seri  | [262]     [261]     [20]       es     [anthanum]     cerium]     praseo       57 <b>Ce F La Ce F</b> 138.91     140.12     14       actinium     90 <b>Acc Th</b> 89     90 <b>La La</b> 221     232.04     2  | byrnium         neodymium         promethium         same           9         60         61         S           9         0.91         144.24         [145]         11           0.91         144.24         [145]         11           91         92         93         93           91         92         93         93           93         0         10         Np         10           91         92         93         93         10         10           91         92         93         10         10         10         10           91         93         0.91         10         10         10         10         10           91         92         93         10         10         10         10         10           93         0         10         < | arium europium gadolinium,<br>62 63 64<br>63 64<br>64 64<br>64 64<br>64<br>64<br>64<br>64<br>64<br>64<br>64<br>64<br>64<br>64<br>64<br>64<br>6  | terbium<br>65dysprostum<br>66holmit<br>67Tbo<br>7Db<br>168.93Dys<br>162.50H<br>164158.93162.50164berkelium<br>979899Bk<br>[247]Cf<br>[251]E<br>[251]  | um endium 68 69 70<br><b>D</b> Er Tmulium 970<br><b>D</b> 167.26 168.93 173.04<br>100 101 102<br><b>F</b> Fm Mdd Noe<br>152 [257] [258] [259]   |

FREELITE

## The glow in the dark that saves lives.

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In simplest terms, PL is a kind of "light echo." Certain rare earth elements, when exposed to ambient light energy, gobble up the photons, then re-emit them into the environment even when the light source is no longer present.

Many American children have photoluminescent glow-in-the-dark toys, bedroom ceiling "stars" and spooky Halloween toys. The same principle applies to emergency safety lighting. PL systems are just like those glowing toys -- only more so.

### "GLOWING" IS GROWING, NATIONWIDE

"Safety first" is more than just a slogan -- it's the law. Safety codes in most cities require sufficient and prominently positioned exit and emergency signs. Specifics vary, but the basic requirement nationwide is for commerical buildings, factories and multiple tenant residences to clearly indicate safe egress -- day or night -- for all hazardous conditions (fires, earthquakes, power outages, hostile incidents, severe weather or floods, etc.). PL is ideally suited to comply with these laws.

## PL PROVIDES MULTIPLE BENEFITS

Photoluminescent lighting is highly visible in dark and smoke emergencies. It's virtually failure proof, since it doesn't depend on electrical power. (Just 5 foot candles of light during the day is enough to keep it charged.) It can't just go out.

| 10-YEAR COST COMPARISON (EST.)            | COMPACT<br>Fluorescent | LED          | <b>FREELITE PL</b><br>(Without frame) |
|---|------------------------|--------------|---------------------------------------|
| Lamp Life                                 | 14,000 Hrs             | 50,000 Hrs   | None                                  |
| Energy Consumption                        | 21 Watts               | 5 Watts      | -0-                                   |
| Sign Cost                                 | \$60                   | \$75         | \$64                                  |
| Installation Materials                    | \$48                   | \$48         | \$0                                   |
| Installation Labor                        | \$196                  | \$196        | \$6                                   |
| Total Initial Costs                       | \$304                  | \$319        | \$70                                  |
| 10 Year Costs                             |                        |              |                                       |
| Electrical Power                          | \$184                  | \$53         | \$0                                   |
| Lamp Replacement Costs                    | \$100                  | \$50         | \$0                                   |
| Lamp Replacement Labor                    | \$120                  | \$24         | \$0                                   |
| Battery Replacement Costs                 | \$20                   | \$20         | \$0                                   |
| Battery Replacement Labor                 | \$24                   | \$24         | \$0                                   |
| Total Operating Costs                     | <b>\$448</b>           | <b>\$171</b> | <mark>\$0</mark>                      |
| Total 10 Yr Life Cycle Cost for 100 signs | \$75,200               | \$49,000     | \$7,000                               |

PL is non-toxic, non-radioactive (Tritium-free), recyclable and shock proof. There are no batteries to buy, replace or dispose

of, which also eliminates the significant cost and hassles of testing and record keeping for Code compliance.

Energy savings are especially significant in larger structures. And the savings last for years -- a typical PL system's life span is about 25 years!

This chart outlines typical expenses for 10-year operation of three major lamp categories, dramatizing the astonishing

cost effectiveness of Freelite PL. Compare the numbers for CFL and LED against Freelite. Then tell us which column you'd rather have represent your operation. We didn't even include T10 incandescents, which score "off the chart" in terms of cost and energy use.



## FREELITE EMERGENCY EXIT PRODUCTS

- COMPLETE PHOTOLUMINESCENT EXIT OPTIONS
   OVER 150 VARIETIES
- CUTTING-EDGE, NEW EGRESS AND DECORATIVE TECHNOLOGY THAT REQUIRES NO ADDITIONAL POWER OR MAINTENANCE










# **EXIT SIGNS** MANY STYLES & COLORS FOR DIFFERENT VIEWING DISTANCES

# CUSTOM SOLUTIONS

# ENDLESS POSSIBILITIES FOR DECORATIVE & SAFETY APPLICATIONS



FREELITE product specification sheets and other related literature online



FREELITE

# FREELITE EXIT SYSTEMS

# FREELITE PHOTOLUMINESCENT EMERGENCY EXIT PRODUCTS EXIT SYSTEMS



FRAME COLOR

B = BLACK

G = GREEN

W = WHITE

R = RED

**BLANK = NO FRAME** 

S = SILVER POWDER COAT

#### FEATURES

- LEED points qualified
- Manufactured in the United States
- Reduces emergency generator loads
- Architectural and aesthetically pleasing designs
- Meets low location egress requirements
- Flexibility of design

- No energy cost Uses no electricity
- Stores and re-emits ambient light minimum 5 footcandles required.

SERIES

FLPL50\*

- No maintenance cost
- No disposal cost
- Reduces overhead costs
- Non-radioactive (Tritium free)
- Recyclable

G = GREEN

 $\mathbf{R} = \mathbf{R}\mathbf{E}\mathbf{D}$  $\mathbf{B} = \mathbf{B}\mathbf{L}\mathbf{A}\mathbf{C}\mathbf{K}$ 

50' Viewing Distance with PL Legend

# of Faces

S = SINGLE

D = DUAL

- Lower labor and material cost
- No conduit or wire to run
- No emergency circuit required

BACKGROUND COLOR

SR = BRUSHED ALUMINUM

W/ RED LETTER OUTLINE

SG = BRUSHED ALUMINUM

W/ GREEN LETTER OUTLINE

• Standard bracket options for easy mounting

# FLPL50







#### MOUNTING BRACKETS

# MODEL COLOR FLPLMB\* For FLPL50 and FLPL75 signs B – Black R – FLPLMB10\* For FLPL10 signs only G – Green W –

MOUNTING BRACKETS FOR USE WITH FRAMED SIGNS.

\*Options available for quick ship are bolded.

50' Viewing Distance, Vandal Resistant with PL Legend

| SERIES  | # of Faces | BACKGROUND COLOR | FRAME COLOR            |
|---------|------------|------------------|------------------------|
| FLPL51* | S = SINGLE | G = GREEN        | B = BLACK              |
|         | D = DUAL   | R = RED          | G = GREEN              |
|         |            | B = BLACK        | R = RED                |
|         |            |                  | S = SILVER POWDER COAT |
|         |            |                  | W = WHITE              |

#### 75' Viewing Distance with PL Background

| SERIES  | # of Faces | LETTER COLOR | FRAME COLOR            |
|---------|------------|--------------|------------------------|
| FLPL75* | S = SINGLE | G = GREEN    | BLANK = NO FRAME       |
|         | D = DUAL   | R = RED      | B = BLACK              |
|         |            |              | G = GREEN              |
|         |            |              | R = RED                |
|         |            |              | S = SILVER POWDER COAT |
|         |            |              | W = WHITE              |

#### **100' Viewing Distance with PL Legend**

R - Red

W - White

| SERIES  | # of Faces | BACKGROUND COLOR | FRAME COLOR            |
|---------|------------|------------------|------------------------|
| FLPL10* | S = SINGLE | G = GREEN        | BLANK = NO FRAME       |
|         | D = DUAL   | R = RED          | B = BLACK              |
|         |            | W = WHITE        | G = GREEN              |
|         |            | B = BLACK        | R = RED                |
|         |            |                  | S = SILVER POWDER COAT |
|         |            |                  | W = WHITE              |

FREELITE

# FREELITE CUSTOM SOLUTIONS





Fulham offers a wide range of Photoluminescent solutions, limited only by your imagination!

Photoluminescent FreeLite material can be cast into tile, molded into shapes or used for custom signs. It is particularly well-suited as stair nosing and for handrail demarkation in buildings. Minimum order quantities apply. Please contact Fulham Customer Service for details.









SWITCHPLATES



HANDRAIL DEMARKATION & STAIR STRIPS FREELITI

| LAMPS       | WO      | RKH     | ORSI     | _        |          |         |         |          |         |         | WH      | AM      | 0       | NGH     | IORS     | SF       |         |         |
|-------------|---------|---------|----------|----------|----------|---------|---------|----------|---------|---------|---------|---------|---------|---------|----------|----------|---------|---------|
|             | WH<br>1 | WH<br>2 | WH<br>22 | WH<br>3  | WH<br>33 | WH<br>4 | WH<br>5 | WH<br>6  | WH<br>7 | WH<br>8 | WM<br>1 | WM<br>2 | LH<br>1 | LH<br>2 | LH<br>3  | LH<br>4  | LH<br>5 | LH<br>6 |
| TWIN        |         |         |          |          |          |         | -       |          |         |         |         |         |         |         | -        |          |         |         |
| 1 X 5W      | 3       | 2       |          |          |          | 2       |         |          |         |         | 15      | 2       | 3       | 2       |          | 2        |         |         |
| 2 X 5W      |         | 1       | 1        |          |          | 1       |         | 9        |         |         |         |         |         | 1       |          | 1        |         | 9       |
| 3 X 5W      |         |         |          |          |          |         |         | 8        |         |         |         |         |         |         |          |          |         | 8       |
| 4 X 5W      |         |         |          |          | 7        |         |         | 7        |         |         |         |         |         |         |          |          | 7       | 7       |
| 1 X 7W      | 3       | 2       |          |          |          |         |         |          |         |         | 15      | 2       | 3       | 2       |          |          |         |         |
| 2 X 7W      |         | 1       |          |          |          | 1       |         | 9        |         |         |         | 1       |         | 1       |          | 1        | -       | 9       |
| 2 X 7W      |         |         |          |          |          |         |         | 8        |         |         |         |         |         |         |          |          |         | 8       |
| 3 X 7 W     |         |         |          |          |          | _       |         | 7        |         |         |         |         |         |         |          |          | _       | 7       |
| 4 X / W     | 2       | 9       |          | _        |          | _       |         | <i>'</i> |         |         | 15      | 2       | 2       | 2       |          |          | _       | '       |
| 1 X 9W      | 3       | 2       |          |          |          | 1       |         |          |         |         | IJ      | - 1     | 3       | 1       | _        | 1        |         |         |
| 2 X 9W      | _       |         |          |          |          |         |         | 0        |         |         |         | -       |         | -       |          | <u> </u> |         | 0       |
| 3 X 9W      |         |         |          |          |          |         |         | ð        |         |         |         |         |         |         |          |          |         | ð       |
| 4 X 9W      |         |         |          |          |          |         |         | /        |         |         |         |         |         |         |          |          |         | /       |
| 1 X 11W     | 3       |         |          |          |          |         |         |          |         |         | 15      | 2       | 3       |         |          |          |         |         |
| 2 X 11W     |         |         |          |          |          |         |         |          |         |         |         |         |         | 1       |          | 1        |         |         |
| 3 X 11W     |         |         |          |          |          |         |         | 8        |         |         |         |         |         |         |          |          |         | 8       |
| 4 X 11W     |         |         |          |          |          |         |         | 7        |         |         |         |         |         |         |          |          |         | 7       |
| 1 X 13W     |         | 3       | 2        | 2        |          | 2       |         | 14       |         |         |         | 3       |         | 3       | 2        | 2        |         | 14      |
| 2 X 13W     |         |         | 1        | 1        | 9        |         |         | 11       |         |         |         |         |         |         | 1        |          | 9       | 11      |
| 3 X 13W     |         |         |          |          | 8        |         | 8       |          |         |         |         |         |         |         |          |          | 8       |         |
| 4 X 13W     |         |         |          |          | 7        |         | 7       |          |         |         |         |         |         |         |          |          | 7       |         |
| 1 V 10W     |         | 3       | 2        | 2        | 14       | 2       |         | 14       |         |         |         | 3       |         | 3       | 2        | 2        |         | 14      |
| 1 X 10W     |         |         | -        | 1        | 9        | -       |         | 9        |         |         |         | -       |         |         | -        | -        | 9       | 9       |
| 2 X 18W     | _       |         | <u>'</u> |          | 0        |         | 0       |          |         |         |         |         |         |         |          |          | ,<br>0  | '       |
| 3 X 18W     |         |         |          |          | 0        | _       | 0       |          |         |         |         |         |         |         |          |          | 0       |         |
| 4 X 18W     |         |         |          |          | 14       |         | /       | 14       |         |         |         |         |         |         | •        | 0        | /       | 14      |
| 1 X 24W     |         | 3       | 2        | 2        | 14       | 3       |         | 14       |         |         |         | 3       |         | 3       | 2        | 3        | 14      | 14      |
| 2 X 24W     |         |         |          | <u> </u> | 9        |         | 9       | 11       |         |         |         |         |         |         | <u> </u> |          | 9       | 11      |
| 3 X 24W     |         |         |          |          |          |         | 8       |          |         |         |         |         |         |         |          |          | 8       |         |
| 1 X 27W     |         | 3       | 2        | 2        | 14       | 3       |         | 14       |         |         |         | 3       |         | 3       | 2        | 3        | 14      | 14      |
| 2 X 27W     |         |         |          |          | 9        |         | 9       | -11      |         |         |         |         |         |         |          |          | 9       | 11      |
| 4 X 27W     | 7.8     |         |          |          |          |         |         |          | 7       |         |         |         |         |         |          |          |         |         |
| 1 X 28W PA  |         |         | 3        | 3        | 14       |         |         | 10       |         |         |         |         |         |         | 3        |          | 14      | 10      |
| 2 X 28W PA  |         |         |          |          | 11       |         |         |          |         |         |         |         |         |         |          |          | 11      |         |
| 3 X 28W PA  |         |         |          |          |          |         |         |          | 8       |         |         |         |         |         |          |          |         |         |
| 4 X 28W PA  |         |         |          |          |          |         |         |          | 7       |         |         |         |         |         |          |          |         |         |
| 1 X 36/39W  |         |         | 2        | 2        | 14       | 3       |         | 10       |         |         |         |         |         |         | 2        | 3        | 14      | 10      |
| 2 X 36/20W  |         |         |          |          |          |         | 9       | 11       |         | 22      |         |         |         |         |          |          | 9       | 11      |
| 2 X 36/37W  |         |         |          |          |          |         |         |          | 8       | 25      |         |         |         |         |          |          |         |         |
| 3 A 30/ 39W |         |         |          |          |          |         |         |          | 7       | 25      |         |         |         |         |          |          |         |         |
| 4 X 36/ 39W |         |         |          |          |          |         |         |          | '       | 27      |         |         |         |         |          |          |         |         |
| 5 X 36/39W  |         |         |          |          |          |         |         |          |         | 20      |         |         |         |         |          |          |         |         |
| 6 X 36/39W  |         |         |          |          |          |         |         |          |         | 29      |         |         |         |         |          |          |         |         |
| 1 X 40W     |         |         |          | 2        | 14       | 2       |         | 14       |         |         |         |         |         |         | 2        | 2        |         | 14      |
| 2 X 40W     |         |         |          |          |          |         | 9       | 11       |         |         |         |         |         |         |          |          | 9       | 11      |
| 3 X 40W     |         |         |          |          |          |         | 8       |          |         | 25      |         |         |         |         |          |          | 8       |         |
| 4 X 40W     |         |         |          |          |          |         |         |          | 7       | 27      |         |         |         |         |          |          |         |         |
| 5 X 40W     |         |         |          |          |          |         |         |          |         | 28      |         |         |         |         |          |          |         |         |
| 1 X 50W     |         |         |          | 3        | 14       | 3       | 14      | 10       |         |         |         |         |         |         | 3        | 3        | 14      | 10      |
| 2 X 50W     |         |         |          |          |          |         | 11      | 11       |         | 22      |         |         |         |         |          |          | 11      | 11      |
| 3 X 50W     |         |         |          |          |          |         |         |          | 8       | 25      |         |         |         |         |          |          |         |         |
| 4 ¥ 50W     |         |         |          |          |          |         |         |          | 7       | 27      |         |         |         |         |          |          |         |         |
|             |         |         |          | 2        | 10       |         | 10      | 12       |         | 16      |         |         |         |         | 2        |          | 10      | 12      |
|             |         |         |          | 3        | 10       |         | 11      | 12       | 0       | 10      |         |         |         |         | 5        |          | 11      | 12      |
| 2 X 55W     |         |         |          |          |          |         | 11      |          | 7<br>0  | 24      |         |         |         |         |          |          |         |         |
| 3 X 55W     |         |         |          |          |          |         |         |          | ð       | 20      |         |         |         |         |          |          |         |         |

1. Find your lamp type.

. Find the quantity and wattage of lamps.

. Look across and find the ballast you need.

. The colored number represents wiring diagram.











### **FLAT QUAD**



QUAD



TRIPLE



| LAMPS      | WO | RKH | ORSE     | _       |          |    |    |    |    |         | WH       | AM | LOI      | NGF | IORS    | ЭE |         |         |
|------------|----|-----|----------|---------|----------|----|----|----|----|---------|----------|----|----------|-----|---------|----|---------|---------|
|            | WH | WH  | WH<br>22 | WH<br>2 | WH<br>22 | WH | WH | WH | WH | WH<br>• | WM       | WM | LH       | LH  | LH<br>2 | LH | LH      | LH      |
|            | -  | 2   | 22       | 3       | 33<br>10 | 4  | 2  | 0  | 14 | 0       | <u> </u> | 2  | <u> </u> | 7   | 3       | 4  | ر<br>12 | 0<br>13 |
|            |    |     |          |         | 10       |    | _  | 10 | 11 | 23      |          |    |          |     |         |    | 12      | 15      |
|            |    |     |          |         |          |    |    |    |    | 26      |          |    |          |     | _       |    |         |         |
| 3 X 33WFA  |    |     |          |         |          |    |    |    | 14 | 17      |          |    |          |     | _       |    | 12      |         |
| 1 X 90W    |    |     |          |         |          |    |    |    | 11 | 24      |          |    |          |     | _       |    | 12      |         |
|            |    |     |          | _       |          |    |    |    |    | 21      |          |    |          |     | _       |    |         |         |
| 1 X 18W    |    | 3   | 2        | 2       | 14       | 3  |    | 14 |    |         |          | 3  |          | 3   | 2       | 3  | 14      | 14      |
| 2 X 18W    |    |     |          |         | 9        |    | 9  | 11 |    |         |          |    |          |     |         |    | 9       | 11      |
| 3 X 18W    |    |     |          |         |          |    | 8  |    |    |         |          |    |          |     |         |    | 8       |         |
| 3 X 18W PA |    |     |          |         |          |    |    |    |    |         |          |    |          |     |         |    |         |         |
| 4 X 18W PA |    |     |          |         |          |    |    |    | 7  |         |          |    |          |     |         |    |         |         |
| 1 X 24W    |    | 3   | 2        | 2       | 14       | 3  |    | 14 |    |         |          | 3  |          | 3   | 2       | 3  |         | 14      |
| 2 X 24W    |    |     |          | 1       | 9        |    | 9  | 11 |    |         |          |    |          |     | 1       |    | 9       | 11      |
| 3 X 24W    |    |     |          |         |          |    | 8  |    |    |         |          |    |          |     |         |    | 8       |         |
| 1 X 28W PA |    |     |          | 3       | 10       |    | 10 |    |    |         |          |    |          |     | 3       |    | 10      | 13      |
| 2 X 28W PA |    |     |          |         |          |    |    |    | 9  |         |          |    |          |     |         |    |         |         |
| 1 X 36W    |    |     |          | 2       | 14       | 3  | 14 | 10 |    |         |          |    |          |     | 2       | 3  | 14      | 10      |
| 2 X 36W    |    |     |          |         | 9        |    | 9  | 11 |    |         |          |    |          |     |         |    | 9       | 11      |
| 3 X 36W    |    |     |          |         |          |    |    |    |    | 25      |          |    |          |     |         |    |         |         |
| 4 X 36W    |    |     |          |         |          |    |    |    | 7  |         |          |    |          |     |         |    |         |         |
| 1 X 55W PA |    |     |          |         | 10       |    |    | 13 | 14 |         |          |    |          |     |         |    | 12      | 13      |
| 2 X 55W PA |    |     |          |         |          |    |    |    | 11 |         |          |    |          |     |         |    |         |         |
| 1 X 96W PA |    |     |          |         |          |    |    |    | 14 |         |          |    |          |     |         |    | 12      |         |
| 2 X 96W PA |    |     |          |         |          |    |    |    | 11 |         |          |    |          |     |         |    |         |         |
| QUAD       |    |     |          |         |          |    |    |    |    |         |          |    |          |     |         |    |         |         |
| 1 X 10W    | 3  | 2   |          |         |          | 2  |    |    |    |         | 15       | 2  | 3        | 2   |         | 2  |         |         |
| 2 X 10W    |    | 1   | 1        |         |          | 1  |    | 9  |    |         |          |    |          | 1   |         | 1  |         | 9       |
| 3 X 10W    |    |     |          |         |          |    |    | 8  |    |         |          |    |          |     |         |    |         | 8       |
| 4 X 10W    |    |     |          |         | 7        |    |    | 7  |    |         |          |    |          |     |         |    |         | 7       |
| 1 X 13W    | 3  | 2   |          |         |          |    |    |    |    |         | 15       | 2  | 3        | 2   |         |    |         |         |
| 2 X 13W    |    | 1   |          |         |          |    |    |    |    |         |          | 1  |          |     |         | 1  |         |         |
| 3 X 13W    |    |     |          |         |          |    |    | 8  |    |         |          |    |          |     |         |    |         | 8       |
| 4 X 13W    |    |     |          |         |          |    |    | 7  |    |         |          |    |          |     |         |    |         | 7       |
| 1 X 18W    | 3  | 2   |          |         |          | 2  |    |    |    |         | 15       | 2  | 3        | 2   |         | 2  |         |         |
| 2 X 18W    |    |     |          | 1       |          |    |    | 9  |    |         |          |    |          |     | 1       | 1  |         | 9       |
| 3 X 18W    |    |     |          |         | 8        |    | 8  | 8  |    |         |          |    |          |     |         |    | 8       | 8       |
| 4 X 18W    |    |     |          |         |          |    | 7  |    |    |         |          |    |          |     |         |    | 7       |         |
| 1 X 26W    |    | 3   | 2        | 2       | 14       | 3  |    | 14 |    |         |          | 3  |          | 3   | 2       | 3  |         | 14      |
| 2 X 26W    |    |     |          |         | 9        |    | 9  | 11 |    |         |          |    |          |     | 1       |    | 9       | 11      |
| 3 X 26W    |    |     |          |         |          |    | 8  |    |    |         |          |    |          |     |         |    | 8       |         |
| 4 X 26W    |    |     |          |         |          |    | 7  |    |    |         |          |    |          |     |         |    | 7       |         |
| 1 X 27W PA |    |     |          |         | 10       |    |    | 13 | 14 |         |          |    |          |     |         |    | 10      | 13      |
| 2 X 27W PA |    |     |          |         |          |    |    |    | 9  |         |          |    |          |     |         |    |         |         |
| TRIPLE     | 0  | 0   |          |         |          |    |    |    |    |         | 15       |    | 0        | 0   |         |    |         |         |
| 1 X 13W    | 3  | 2   |          |         |          | 1  |    |    |    |         | 15       | 2  | 3        | 2   |         | 1  |         |         |
| 2 X 13W    |    |     |          |         |          |    |    | 0  |    |         |          |    |          |     |         |    |         | 0       |
| 3 X 13W    |    |     |          |         |          |    |    | 0  |    |         |          |    |          |     |         |    |         | 0       |
| 4 X 13W    | 2  | 0   |          |         |          | 0  |    | /  |    |         | 16       | 2  | 2        | 0   |         | 9  |         | 7       |
| I X 18W    | 3  | 2   |          | 1       |          | 1  |    | 0  |    |         | 15       | 2  | 3        | 2   | 1       | 2  |         | 0       |
| Z X 18W    |    |     |          |         | 0        |    |    | 9  |    |         |          |    |          |     |         |    |         | 9       |
| 3 X 18W    |    |     |          |         | 0        |    | 7  | 0  |    |         |          |    |          |     |         |    | 7       | 0       |
| 4 X 18W    |    | 2   | 2        | 2       | 14       | 2  | /  | 14 |    |         |          | 2  |          | 2   | 2       | 2  |         | 14      |
| I X 26W    |    |     | 2        | 7       | 14       | J  |    | 14 |    |         |          | 3  |          | 3   | 2       | 3  |         | 14      |

| LAMPS       | WO | RKH( | ORSF | -  |     |    |          |    |    |    | WH | AM | 1.01 | VGH | ORS      | SF |          |    |
|-------------|----|------|------|----|-----|----|----------|----|----|----|----|----|------|-----|----------|----|----------|----|
|             | WH | WH   | WH   | WH | WH  | WH | WH       | WH | WH | WH | WM | WM | LH   | LH  | LH       | LH | LH       | LH |
|             | 1  | 2    | 22   | 3  | 33  | 4  | 5        | 6  | 7  | 8  | 1  | 2  | 1    | 2   | 3        | 4  | 5        | 6  |
| 2 X 26W     |    |      |      |    | 9   |    | 9        | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 3 X 26W     |    |      |      |    |     |    | 8        |    |    |    |    |    |      |     |          |    | 8        |    |
| 4 X 26W     |    |      |      |    |     |    | 7        |    |    |    |    |    |      |     |          |    | 7        |    |
| 1 X 32W     |    | 3    | 2    | 2  | 14  | 3  |          | 14 |    |    |    |    |      | 3   | 2        | 3  | 14       | 14 |
| 2 X 32W     |    |      |      | 1  | 9   |    | 9        | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 3 X 32W     |    |      |      |    |     |    | 8        |    |    |    |    |    |      |     |          |    | 8        |    |
| 1 X 42W     |    |      |      | 2  | 14  | 3  |          | 14 |    |    |    |    |      |     | 2        | 3  | 14       | 14 |
| 2 X 42W     |    |      |      |    |     |    |          | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 3 X 42W     |    |      |      |    |     |    |          |    |    |    |    |    |      |     |          |    | 8        |    |
| 2-D         |    |      |      |    |     |    |          |    |    |    |    |    |      |     |          |    |          |    |
| 1 X 10W     | 3  | 2    |      |    |     |    |          |    |    |    | 15 | 2  | 3    | 2   |          |    |          |    |
| 2 X 10W     |    | 1    |      |    |     | 1  |          | 9  |    |    |    | 1  |      | 1   |          | 1  |          | 9  |
| 3 X 10W     |    |      |      |    |     |    |          | 8  |    |    |    |    |      |     |          |    |          | 8  |
| 4 X 10W     |    |      |      |    |     |    |          | 7  |    |    |    |    |      |     |          |    |          | 7  |
| 1 X 16W     | 3  | 2    |      |    |     | 2  |          |    |    |    | 15 | 2  | 3    | 2   |          | 2  |          |    |
| 2 X 16W     |    |      | 1    |    |     |    |          | 9  |    |    |    |    |      |     |          |    |          | 9  |
| 3 X 16W     |    |      |      |    |     |    |          | 8  |    |    |    |    |      |     |          |    |          | 8  |
| 4 X 16W     |    |      |      |    | 7   |    | 7        | 7  |    |    |    |    |      |     |          |    | 7        | 7  |
| 1 X 21W     |    | 2    |      |    |     | 2  |          |    |    |    |    |    |      | 2   |          | 2  |          |    |
| 2 X 21W     |    |      |      | 1  |     |    |          | 9  |    |    |    |    |      |     | 1        |    |          | 9  |
| 3 ¥ 21W     |    |      |      |    | 8   |    | 8        | 8  |    |    |    |    |      |     |          |    | 8        | 8  |
| 4 Y 21W     |    |      |      |    |     |    | 7        |    |    |    |    |    |      |     |          |    | 7        |    |
| 4 X 21W     |    | 3    | 2    | 2  |     | 2  | <i>'</i> | 14 |    |    |    | 3  |      | 2   | 2        | 2  | <u> </u> | 14 |
| 1 A 20W     |    | •    | -    | 1  | Q   | -  | Q        | 11 |    |    |    |    |      | 3   | 1        |    | 0        | 11 |
| 2 X 20W     |    |      |      |    | · · |    | י<br>ג   |    |    |    |    |    |      |     | <u> </u> |    | γ<br>Ω   |    |
| 3 X 28W     |    |      |      |    |     |    | 0        |    |    |    |    |    |      |     |          |    | 0        |    |
| 4 X 28W     |    |      |      | 0  | 14  | 0  | /        | 14 |    |    |    |    |      |     | 0        | 0  | /        | 14 |
| 1 X 38W     |    |      |      | 2  | 14  | 3  | 14       | 14 |    |    |    |    |      |     | 2        | 3  | 14       | 14 |
| 2 X 38W     |    |      |      |    |     |    | 9        |    | 7  |    |    |    |      |     |          |    | У        |    |
| 4 X 38W     |    |      |      |    | 10  |    | 10       |    | /  |    |    |    |      |     |          |    | 10       |    |
| 1 X 55W     |    |      |      |    | 12  |    | 12       |    | 14 |    |    |    |      |     |          |    | 12       |    |
| 2 X 55W     |    |      |      |    |     |    |          |    | 11 |    |    |    |      |     |          |    |          |    |
| T9 CIRCLINE |    |      |      |    |     |    |          |    |    |    |    |    |      |     |          |    |          |    |
| 1 X 20W     |    | 3    | 2    | 2  | 14  | 3  |          | 14 |    |    |    | 3  |      | 3   | 2        | 3  | 14       | 14 |
| 2 X 20W     |    |      |      |    | 9   |    | 9        | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 4 X 20W     |    |      |      |    |     |    |          |    | 7  |    |    |    |      |     |          |    |          |    |
| 1 X 22W     |    | 3    | 2    | 2  | 14  | 3  |          | 14 |    |    |    | 3  |      | 3   | 2        | 3  | 14       | 14 |
| 2 X 22W     |    |      |      |    | 9   |    | 9        | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 4 X 22W     |    |      |      |    |     |    |          |    | 7  |    |    |    |      |     |          |    |          |    |
| 1 X 32W     |    |      | 3    | 3  | 14  |    |          | 10 |    |    |    |    |      |     | 3        |    | 14       | 10 |
| 2 X 32W     |    |      |      |    | 11  |    | 9        |    |    |    |    |    |      |     |          |    | 11       |    |
| 3 X 32W     |    |      |      |    |     |    |          |    | 8  |    |    |    |      |     |          |    |          |    |
| 4 X 32W     |    |      |      |    |     |    |          |    | 7  |    |    |    |      |     |          |    |          |    |
| 1 X 40W     |    |      |      | 2  | 14  | 3  | 14       | 10 |    |    |    |    |      |     | 2        | 3  | 14       | 10 |
| 2 X 40W     |    |      |      |    |     |    | 9        | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 4 X 40W     |    |      |      |    |     |    |          |    | 7  |    |    |    |      |     |          |    |          |    |
| 1 X 22+32W  |    |      |      | 1  |     |    | 9        | 11 |    |    |    |    |      |     | 1        |    | 9        | 11 |
| 1 X 32+40W  |    |      |      |    |     |    | 11       |    |    |    |    |    |      |     |          |    | 11       |    |
| T5 CIRCLINE |    |      |      |    |     |    |          |    |    |    |    |    |      |     |          |    |          |    |
| 1 X 22W     |    | 3    | 2    | 2  | 14  | 3  |          | 14 |    |    |    | 3  |      | 3   | 2        | 3  |          | 14 |
| 2 X 22W     |    |      |      |    | 9   |    | 9        | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 3 X 22W     |    |      |      |    | 8   |    | 8        |    |    |    |    |    |      |     |          |    | 8        |    |
| 1 X 40W     |    |      |      | 2  | 14  | 3  |          | 14 |    |    |    |    |      |     | 2        | 3  | 14       | 14 |
| 2 X 40W     |    |      |      |    |     |    | 9        | 11 |    |    |    |    |      |     |          |    | 9        | 11 |
| 1 X 55W 0S  |    |      |      | 3  | 10  |    |          | 12 |    |    |    |    |      |     | 3        |    |          | 12 |

1. Find your lamp type.

- 2. Find the quantity and wattage of lamps.
- 3. Look across and find the ballast you need.
- 4. The colored number represents wiring diagram.



**T9 CIRCLINE** 



**T5 CIRCLINE** 



# **WORKHORSE • WHAM • LONGHORSE**





1/4" Diameter

# **T5 LINEAR**



5/8" Diameter





5/8" Diameter

| LAMPS            | WC      | RKH     | ORSE     | _       |          |         |         |         |         | _       | WH      | AM      | LO      | NGH     | IORS    | SE      |         |         |
|------------------|---------|---------|----------|---------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
|                  | WH<br>1 | WH<br>2 | WH<br>22 | WH<br>3 | WH<br>33 | WH<br>4 | WH<br>5 | WH<br>6 | WH<br>7 | WH<br>8 | WM<br>1 | WM<br>2 | LH<br>1 | LH<br>2 | LH<br>3 | LH<br>4 | LH<br>5 | LH<br>6 |
| 2 X 55W OS       |         |         |          |         |          |         | 11      |         | 9       |         |         | -       |         | -       |         |         | 11      |         |
| 1 X 22+40W       |         |         |          | 1       |          |         | 9       | 11      |         |         |         |         |         |         | 1       |         | 9       | 11      |
| T2 LINEAR        |         |         |          |         |          |         |         |         |         |         |         |         |         |         |         |         |         |         |
| 1 X F6           | 2       |         |          |         |          |         |         |         |         |         |         |         | 2       |         |         |         |         |         |
| 2 X F6           | 1       |         |          |         |          |         |         |         |         |         |         |         |         |         |         |         |         |         |
| 1 X F8           | 2       |         |          |         |          |         |         |         |         |         |         |         | 2       |         |         |         |         |         |
| 2 X F8           | 1       |         |          |         |          |         |         |         |         |         |         |         |         |         |         |         |         |         |
| 1 X F11          | 2       |         |          |         |          |         |         |         |         |         |         |         | 2       |         |         |         |         |         |
| 2 X F11          | 1       |         |          |         |          |         |         |         |         |         |         |         | 1       |         |         |         |         |         |
| 1 X F13          | 2       |         |          |         |          |         |         |         |         |         |         |         | 2       |         |         |         |         |         |
| 2 X F13          | 1       |         |          |         |          |         |         |         |         |         |         |         | 1       |         |         |         |         |         |
| <b>T5 LINEAR</b> |         |         |          |         |          |         |         |         |         |         |         |         |         |         |         |         |         |         |
| 1 X F4           | 3       | 2       |          |         |          |         |         |         |         |         | 15      | 2       | 3       | 2       |         |         |         |         |
| 2 X F4           |         | 1       |          |         |          | 1       |         |         |         |         |         | 1       |         | 1       |         | 1       |         |         |
| 3 X F4           |         |         |          |         |          |         |         | 8       |         |         |         |         |         |         |         |         |         | 8       |
| 4 X F4           |         |         |          |         |          |         |         | 7       |         |         |         |         |         |         |         |         |         | 7       |
| 1 X F6           | 3       | 2       |          |         |          |         |         |         |         |         | 15      | 2       | 3       | 2       |         |         |         |         |
| 2 X F6           |         | 1       |          |         |          | 1       |         |         |         |         |         | 1       |         | 1       |         | 1       |         |         |
| 3 X F6           |         |         |          |         |          |         |         | 8       |         |         |         |         |         |         |         |         |         | 8       |
| 4 X F6           |         |         |          |         |          |         |         | 1       |         |         |         |         |         |         |         |         |         | 7       |
| 1 X F8           | 2       | 2       |          |         |          |         |         |         |         |         | 15      | 2       | 2       | 2       |         |         |         |         |
| 2 X F8           |         |         |          |         |          |         |         |         |         |         |         |         |         | 1       |         | 1       |         |         |
| 4 X F8           |         |         |          |         |          |         |         | 7       |         |         |         |         |         |         |         |         |         | 7       |
| 1 X F13          | 3       | 2       |          |         |          |         |         |         |         |         | 15      | 2       | 3       | 2       |         |         |         |         |
| 2 X F13          |         |         |          |         |          |         |         |         |         |         |         | _       |         |         |         | 1       |         |         |
| 3 X F13          |         |         |          |         |          |         |         | 8       |         |         |         |         |         |         |         |         |         | 8       |
| 4 X F13          |         |         |          |         |          |         |         | 1       |         |         |         |         |         |         |         |         |         | 1       |
| 1 X F14          | 3       | 2       |          |         |          |         |         |         |         |         | 15      | 2       | 3       | 2       |         |         |         |         |
| 2 X F14          |         |         |          |         |          | -       |         |         |         |         |         | _       |         |         |         |         |         |         |
| 3 X F14          |         |         |          |         |          |         |         | 8       |         |         |         |         |         |         |         |         |         | 8       |
| 4 X F14          |         |         |          |         |          |         |         | /       |         |         |         |         |         |         |         |         |         | /       |
| 1 X F21          | 3       | 2       |          |         |          |         |         |         |         |         | 15      | 2       | 3       | 2       |         |         |         |         |
| 2 X F21          |         |         |          |         |          | _       |         |         |         |         |         |         |         |         |         | 1       |         |         |
| 3 X F21          |         |         |          |         |          |         |         | ð       |         |         |         |         |         |         |         |         |         | 8       |
| 4 X F21          | 0       | 0       |          |         |          |         |         | /       |         |         | 15      | •       | •       |         |         |         |         | /       |
| 1 X F28          | 3       | 2       |          |         |          |         |         |         |         |         | 15      | 2       | 3       | 2       |         |         |         |         |
| 2 X F28          |         |         |          |         |          |         |         | •       |         |         |         |         |         |         |         |         |         | 0       |
| 3 X F28          |         |         |          |         |          |         |         | 0       |         |         |         |         |         |         |         |         |         | ð<br>7  |
| 4 X F28          |         | 0       |          |         |          |         |         | /       |         |         | 10      |         |         | 0       |         |         |         | /       |
| 1 X F35          |         | 2       |          |         |          | 1       |         |         |         |         | 15      |         |         | 2       |         | 1       |         |         |
| 2 X F35          |         |         |          |         |          | -       |         | 0       |         |         |         |         |         |         |         |         | _       | 0       |
| 3 X F35          |         |         |          |         |          |         |         | 0       |         |         |         |         |         |         |         |         |         | 0<br>7  |
| 4 X F35          | _       |         |          |         |          |         |         | /       |         |         |         |         |         |         |         |         |         | /       |
|                  |         | 3       | 2        | 2       | 14       | 2       |         | 14      |         |         |         |         |         | 3       | 2       | 3       | _       | 14      |
|                  |         |         | 2        | 1       | 0        | J       | 0       | 11      |         |         |         |         |         | 5       | 2       | 5       | 0       | 11      |
| 2 X F24 H0       |         |         |          |         | <u> </u> |         | ,<br>8  |         |         |         |         |         |         |         |         |         | ,<br>8  |         |
|                  |         |         |          |         |          |         | 7       |         |         | 27      |         |         |         |         |         |         | 7       |         |
|                  |         |         |          |         |          |         | ,       |         |         | 28      |         |         |         |         |         |         |         |         |
|                  |         |         |          |         |          |         |         |         |         | 20      |         |         |         |         |         |         |         |         |
| 1 Y E20 LIA      |         |         |          | 2       | 14       | 3       |         | 14      |         | 27      |         |         |         |         | 2       | 3       | 14      | 14      |
| 2 Y E20 UA       |         |         |          |         |          |         | 9       | 11      |         |         |         |         |         |         | ĺ.      |         | 9       | 11      |
| 2 7 137 110      |         |         |          |         |          |         | 8       |         |         | 25      |         |         |         |         |         |         | 8       |         |
| 4 Y F30 H0       |         |         |          |         |          |         |         |         | 7_      | 27      |         |         |         |         |         |         |         |         |

# LAMP COMPATIBILITY

# WORKHORSE • WHAM • LONGHORSE

| LAMPS                     | WO       | RKH     | ORSE     | -       |          |         |         |         |          |         | WH       | AM      | LOI     | NGH     | IORS    | SE      |         |         |
|---------------------------|----------|---------|----------|---------|----------|---------|---------|---------|----------|---------|----------|---------|---------|---------|---------|---------|---------|---------|
|                           | WH       | WH<br>2 | WH<br>22 | WH<br>3 | WH<br>33 | WH<br>4 | WH<br>5 | WH<br>6 | WH<br>7  | WH<br>8 | WM<br>1  | WM<br>2 | LH<br>1 | LH<br>2 | LH<br>3 | LH<br>4 | LH<br>5 | LH<br>6 |
| 5 X F39 H0                |          | 2       | 22       | 3       | 33       | -       | ,       | 0       | 1        | 28      | <u>'</u> | 2       |         | 2       | J       |         | ,       | 0       |
| 1 X F54 H0                |          |         |          | 3       | 14       |         | 14      | 12      |          | 16      |          |         |         |         | 3       |         | 14      | 12      |
| 2 X F54 H0                |          |         |          |         |          |         | 11      |         |          | 22      |          |         |         |         |         |         | 11      |         |
| 2 X F54 H0                |          | -       |          |         |          |         |         |         | 8        |         |          |         |         |         |         |         |         |         |
| 1 X E54 HO                |          |         |          |         |          |         |         |         | 7        |         |          |         |         |         |         |         |         |         |
|                           |          |         |          |         |          |         |         | 12      | <i>'</i> | 16      |          |         |         |         |         |         | 10      | 12      |
|                           |          |         |          |         |          |         |         | 12      | 0        | 10      |          |         |         |         |         |         | 10      | 12      |
| Z X F8U HU                | \        | -       |          |         |          |         |         |         | 7        |         |          |         |         |         |         |         |         |         |
|                           |          |         |          |         |          |         | 12      |         |          |         |          |         |         |         |         |         |         |         |
| 1 X 110W                  |          |         |          |         |          |         | 12      |         |          |         |          |         |         |         |         |         |         |         |
| TA HUW<br>TA HUW (LINEAR) | <b>\</b> | _       | _        |         |          |         | 12      |         |          |         |          |         |         |         |         |         | _       |         |
|                           | /        |         |          |         |          |         | 10      |         |          |         |          |         |         |         | _       |         | _       |         |
| 1 X 38W                   |          |         | _        |         |          |         | 12      |         |          |         |          |         |         |         |         |         |         |         |
|                           |          |         |          |         |          |         | 12      |         |          |         |          |         |         |         |         |         |         |         |
| 1 X 55W                   |          |         |          |         |          |         | 12      |         | 10       |         |          |         |         |         |         |         |         |         |
| 1 X 90W                   |          | _       |          |         |          |         |         |         | 10       |         |          |         |         |         |         |         |         |         |
| 1 X 120W                  |          |         |          |         |          |         |         |         | 10       |         |          |         |         |         |         |         |         |         |
| 1 X 150W                  |          |         |          |         |          |         |         |         | 10       |         |          |         |         |         |         |         |         |         |
| <b>T6 LINEAR</b>          |          |         |          |         |          |         |         |         |          |         |          |         |         |         |         |         |         |         |
| 1 X F42                   | 3        | 2       |          |         |          | 2       |         |         |          |         |          |         | 3       | 2       |         | 2       |         |         |
| 2 X F42                   |          |         |          |         |          |         |         | 9       |          |         |          |         |         |         |         |         |         | 9       |
| 3 X F42                   |          |         |          |         |          |         |         | 8       |          |         |          |         |         |         |         |         |         | 8       |
| 4 X F42                   |          |         |          |         |          |         |         | 7       |          |         |          |         |         |         |         |         |         | 7       |
| 1 X F64                   |          |         |          |         |          | 2       |         |         |          |         |          |         |         |         |         | 2       |         |         |
| 2 X F64                   |          |         |          |         |          |         |         | 9       |          |         |          |         |         |         |         | 1       |         | 9       |
| 3 X F64                   |          |         |          |         |          |         |         | 8       |          |         |          |         |         |         |         |         |         | 8       |
| <b>T8 LINEAR</b>          |          |         |          |         |          |         |         |         |          |         |          |         |         |         |         |         |         |         |
| 1 X F13                   |          | 3       | 2        | 2       | 14       | 3       |         | 14      |          |         |          | 3       |         | 3       | 2       | 3       |         | 14      |
| 2 X F13                   |          |         |          | 1       | 9        |         |         | 11      |          |         |          |         |         |         | 1       |         | 9       | 11      |
| 3 X F13                   |          |         |          |         | 8        |         | 8       |         |          |         |          |         |         |         |         |         | 8       |         |
| 4 X F13                   |          |         |          |         |          |         | 7       |         | 7        | 27      |          |         |         |         |         |         |         |         |
| 5 X F13                   |          |         |          |         |          |         |         |         |          | 28      |          |         |         |         |         |         |         |         |
| 6 X F13                   |          |         |          |         |          |         |         |         |          | 29      |          |         |         |         |         |         |         |         |
| 1 X F14                   |          | 3       | 2        | 2       | 14       | 3       |         | 14      |          |         |          | 3       |         | 3       | 2       | 3       | 14      | 14      |
| 2 X F14                   |          |         |          |         | 9        |         |         | 11      |          |         |          |         |         |         |         |         | 9       | 11      |
| 2 X E1 A                  |          |         | -        |         |          |         | 8       |         |          | 25      |          |         |         |         |         |         | 8       |         |
| <u> </u>                  |          |         |          |         |          |         | 7       |         | 7        | 27      |          |         |         |         |         |         |         |         |
| 5 V E1 /                  |          |         |          |         |          |         | '       |         |          |         |          |         |         |         |         |         |         |         |
| 6 Y F1/                   |          |         |          |         |          |         |         |         |          | 29      |          |         |         |         |         |         |         |         |
| 1 V E1 5                  |          | 3       | 2        | 2       |          | 3       |         | 14      |          | -/      |          | 3       |         | 2       | 2       | 3       |         | 14      |
| 1 A FID                   |          | 3       | 1        | 1       | 0        | 5       |         | 11      |          |         |          |         |         | 3       | 2       | 5       | 0       | 11      |
| 2 1 1 2                   |          |         |          |         | 9        |         | 0       |         |          |         |          |         |         |         |         |         | 9       | -11     |
| 3 % 113                   |          |         |          |         | 0        |         | 0       |         |          |         |          |         |         |         |         |         | 0       |         |
| 4 % 115                   |          |         |          |         | 1        |         | /       |         |          | 20      |          |         |         |         |         |         | 1       |         |
| 5 % F15                   |          |         |          |         |          |         |         |         |          | 28      |          |         |         |         |         |         |         |         |
| 6 X F15                   |          |         |          |         |          |         |         |         |          | 29      |          | 0       |         |         |         |         |         |         |
| 1 X F17                   |          | 3       |          | 2       |          | 2       |         |         |          |         |          | 3       |         | 3       | 2       | 2       |         |         |
| 2 X F17                   |          |         |          |         |          |         |         | 9       |          |         |          |         |         |         | 1       |         |         | 9       |
| 3 X F17                   |          |         |          |         | 8        |         | 8       |         |          |         |          |         |         |         |         |         | 8       |         |
| 4 X F17                   |          |         |          |         | 7        |         | 7       |         |          |         |          |         |         |         |         |         | 7       |         |
| 6 X F17                   |          |         |          |         |          |         |         |         |          | 29      |          |         |         |         |         |         |         |         |
| 1 X F18                   |          | 3       | 2        | 2       | 14       | 3       |         | 14      |          |         |          | 3       |         | 3       | 2       | 3       |         | 14      |
| 2 X F18                   |          |         |          |         | 9        |         | 9       | 11      |          |         |          |         |         |         |         |         | 9       | 11      |
| 3 X F18                   |          |         |          |         |          |         | 8       |         |          | 25      |          |         |         |         |         |         | 8       |         |
| 4 X F18                   |          |         |          |         |          |         | 7       |         |          | 27      |          |         |         |         |         |         |         |         |
| 5 X F18                   |          |         |          |         |          |         |         |         |          | 28      |          |         |         |         |         |         |         |         |

Find your lamp type.

- . Find the quantity and wattage of lamps.
- . Look across and find the ballast you need.
- . The colored number represents wiring diagram.

# **T5 UV LINEAR**





#### **T6 UV LINEAR**



3/4" Diameter



3/4" Diameter



1" Diameter

# WORKHORSE • WHAM • LONGHORSE

| LAMPS              | WO  | RKH     | ORSE     | _       |          |          |         |         |         |         | WH      | AM      | LO      | NGH     | IORS    | 3E       |         |          |
|--------------------|---|---------|----------|---------|----------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|----------|
|                    | WH<br>1   | WH<br>2 | WH<br>22 | WH<br>3 | WH<br>33 | WH<br>4  | WH<br>5 | WH<br>6 | WH<br>7 | WH<br>8 | WM<br>1 | WM<br>2 | LH<br>1 | LH<br>2 | LH<br>3 | LH<br>4  | LH<br>5 | LH<br>6  |
| 6 X F18            | n de la composition<br>de la composition<br>de la composition |         |          |         |          |          |         |         |         | 29      |         |         |         |         |         |          |         |          |
| 1 X F25            |   | 3       |          | 2       |          | 2        |         |         |         |         |         | 3       |         | 3       | 2       | 2        |         |          |
| 2 X F25            |   |         |          | 1       |          |          |         | 9       |         |         |         |         |         |         | 1       |          |         | 9        |
| 3 X F25            |   |         |          |         |          |          | 8       |         |         |         |         |         |         |         |         |          | 8       |          |
| 4 X F25            |   |         |          |         |          |          | 7       |         |         |         |         |         |         |         |         |          | 7       |          |
| 6 X F25            |   |         |          |         |          |          |         |         |         | 29      |         |         |         |         |         |          |         |          |
| 1 X F30            |   | 3       | 2        | 2       | 14       | 3        |         | 14      |         |         |         |         |         | 3       | 2       | 3        |         | 14       |
| 2 X F30            |   |         |          |         | 9        |          | 9       | 11      |         |         |         |         |         |         |         |          | 9       | 11       |
| 3 X F30            |   |         |          |         |          |          | 8       |         |         | 25      |         |         |         |         |         |          | 8       |          |
| 4 X F30            |   |         |          |         |          |          | 7       |         | 7       | 27      |         |         |         | -       |         |          | -       |          |
| 5 X E30            |   |         |          |         |          |          |         |         |         | 28      |         |         |         |         |         |          | _       |          |
| 4 V E20            |   |         |          |         |          |          |         |         |         | 29      |         |         |         |         |         |          |         |          |
| 1 V E22            |   | 2       |          | 2       |          | 2        |         |         |         | 27      |         |         |         | 3       | 2       | 2        | _       |          |
| 1 X F32            |   | -       |          | 1       |          | 2        |         | 0       |         |         |         |         |         |         | 1       | -        |         | 0        |
| 2 X F32            |   |         |          |         |          |          | Q       |         |         |         |         |         |         |         |         |          | Q       | <i>'</i> |
| 3 X F32            |   |         |          |         |          |          | 0       |         |         |         |         |         |         |         |         |          | 0       | <u> </u> |
| 4 X F32            |   |         |          |         |          |          | /       |         |         | 20      |         |         |         |         |         |          |         |          |
| 6 X F32            |   |         |          | 0       |          | 0        |         |         |         | 29      |         |         |         |         | 0       | 0        |         |          |
| 1 X F40<br>2 X F40 |   |         |          | 2       |          |          |         | 9       |         |         |         |         |         |         | 2       | 2        |         | 9        |
| 3 ¥ F40            |   |         |          |         |          |          |         |         |         |         |         |         |         |         |         |          | 8       |          |
| 1 V ESO            |   | _       |          |         |          |          |         | 10      | _       |         |         |         |         |         |         |          |         | 10       |
|                    |   | -       |          |         |          |          | 11      | 10      |         | 22      |         |         |         | -       | _       |          | 11      |          |
|                    |   |         |          |         |          |          |         |         | 8       | ~~~     |         |         |         |         |         |          |         |          |
| 3 X F38            |   | _       |          |         |          |          |         | 10      | 0       |         |         |         |         | _       | _       |          |         | 10       |
| 1 X F/U            |   |         |          |         |          |          |         | 10      |         | 00      |         |         |         |         |         | _        | 11      | 10       |
| 2 X F/0            |   | _       |          |         |          | 0        |         |         |         | 22      |         |         |         | _       |         | 0        |         |          |
| 1 X F/2            |   | _       |          |         |          | 2        |         | 0       |         |         |         |         |         |         | _       | 2        |         | 0        |
| 2 X F72            |   | _       |          |         |          | <u> </u> |         | 9       |         |         |         |         |         |         |         | <u> </u> |         | 9        |
| 3 X F72            |   |         |          |         |          |          |         | 8       |         |         |         |         |         | _       |         |          |         | 8        |
| 4 X F72            |   |         |          |         |          |          |         | /       |         |         |         |         |         |         |         |          |         | /        |
| тв но              |   |         |          |         |          |          |         |         |         |         |         |         |         |         |         |          |         |          |
| 1 X F48 H0         |   |         |          | 3       | 14       |          | 14      | 10      |         |         |         |         |         |         | 3       |          | 14      | 10       |
| 2 X F48 H0         |   |         |          |         |          |          |         |         |         | 22      |         |         |         |         |         |          | 11      |          |
| 3 X F48 H0         |   |         |          |         |          |          |         |         | 8       | 25      |         |         |         |         |         |          |         |          |
| 4 X F48 H0         |   |         |          |         |          |          |         |         | 7       | 27      |         |         |         |         |         |          |         |          |
| 1 X F60 HO         |   |         |          | 3       | 14       |          | 14      | 10      |         |         |         |         |         |         | 3       |          | 14      | 10       |
| 2 X F60 H0         |   |         |          |         |          |          |         |         |         | 22      |         |         |         |         |         |          | 11      |          |
| 3 X F60 H0         |   |         |          |         |          |          |         |         | 8       | 25      |         |         |         |         |         |          |         |          |
| 4 X F60 H0         |   |         |          |         |          |          |         |         | 7       | 27      |         |         |         |         |         |          |         |          |
| 1 X F72 H0         |   |         |          | 3       | 14       |          | 14      | 10      |         |         |         |         |         |         | 3       |          | 14      | 10       |
| 2 X F72 H0         |   |         |          |         |          |          |         |         |         | 22      |         |         |         |         |         |          |         |          |
| 3 X F72 H0         |   |         |          |         |          |          |         |         | 8       | 25      |         |         |         |         |         |          |         |          |
| T10 LINEAR         |   |         |          |         |          |          |         |         |         |         |         |         |         |         |         |          |         |          |
| 1 X F40            |   |         |          | 3       | 14       | 3        |         | 10      |         |         |         |         |         |         | 3       | 3        | 14      | 10       |
| 2 X F40            |   |         |          |         |          |          |         | 11      |         | 22      |         |         |         |         |         |          | 11      | 11       |
| 3 X F40            |   |         |          |         |          |          |         |         | 8       | 25      |         |         |         |         |         |          |         |          |
| 4 X F40            |   |         |          |         |          |          |         |         | 7       | 27      |         | _       |         |         |         |          |         |          |
| 5 X F40            |   |         |          |         |          |          |         |         |         | 28      |         |         |         |         |         |          |         |          |
| <b>Т10 VHO</b>     |   |         |          |         |          |          |         |         |         |         |         |         |         |         |         |          |         |          |
| 1 X F48 VHO        |   |         |          |         |          |          |         |         | 12      | 19      |         |         |         |         |         |          |         |          |
| 1 X F60 VH0        |   |         |          |         |          |          |         |         | 12      | 19      |         |         |         |         |         |          |         |          |
| 1 X F72 VH0        |   |         |          |         |          |          |         |         | 12      | 19      |         |         |         |         |         |          |         |          |
| 1 X F96 VH0        |   |         |          |         |          |          |         |         | 12      | 19      |         |         |         |         |         |          |         |          |
| T12 LINEAR         |   |         |          |         |          |          |         |         |         |         |         |         |         |         |         |          |         |          |
| 1 X F14            |   | 3       | 2        | 2       | 14       | 3        | 14      | 10      |         |         |         | 3       |         | 3       | 2       | 3        | 14      | 10       |
|                    |   |         |          |         |          |          |         |         |         |         |         |         |         |         |         |          |         |          |

**Т8 НО** 



1" Diameter

## **T10 LINEAR**



1 1/4" Diameter



1 1/4" Diameter



1 1/2" Diameter

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# LAMP COMPATIBILITY

# WORKHORSE • WHAM • LONGHORSE

| LAMPS   | WO      | RKH     | ORS      | E       |          |         |         |         |         |          | WH      | AM      | LO      | NGH     | ORS     | E       |         |         |
|---------|---------|---------|----------|---------|----------|---------|---------|---------|---------|----------|---------|---------|---------|---------|---------|---------|---------|---------|
|         | WH<br>1 | WH<br>2 | WH<br>22 | WH<br>3 | WH<br>33 | WH<br>4 | WH<br>5 | WH<br>6 | WH<br>7 | WH<br>8  | WM<br>1 | WM<br>2 | LH<br>1 | LH<br>2 | LH<br>3 | LH<br>4 | LH<br>5 | LH<br>6 |
| 2 X F14 |         | -       |          |         | 9        |         | 9       | 11      |         |          |         | -       |         | -       |         |         | 9       | 11      |
| 2 7 514 |         |         |          |         |          |         |         |         |         | 25       |         |         |         |         |         |         |         |         |
| 4 X F14 |         |         |          |         |          |         |         |         | 7       | 27       |         |         |         |         |         |         |         |         |
| 5 X F14 |         |         |          |         |          |         |         |         |         | 28       |         |         |         |         |         |         |         |         |
| 6 X F14 |         |         |          |         |          |         |         |         |         | 29       |         |         |         |         |         |         | _       |         |
| 1 X F15 |         | 3       | 2        | 2       |          | 3       |         | 14      |         |          |         | 3       |         | 3       | 2       | 3       |         | 14      |
| 2 X F15 |         |         | -        | 1       | 9        |         | 9       | 11      |         |          |         |         |         |         | 1       |         | 9       | 11      |
| 3 X F15 |         |         |          |         | 8        |         | 8       |         |         |          |         |         |         |         |         |         | 8       |         |
| 4 X F15 |         |         |          |         |          |         | 7       |         |         | 27       |         |         |         |         |         |         | 7       |         |
| 5 X F15 |         |         |          |         |          |         |         |         |         | 28       |         |         |         |         |         |         |         |         |
| 6 X F15 |         |         |          |         |          |         |         |         |         | 29       |         |         |         |         |         |         |         |         |
| 1 X F20 |         | 3       | 2        | 2       | 14       | 3       |         | 14      |         |          |         | 3       |         | 3       | 2       | 3       | 14      | 14      |
| 2 X F20 |         |         |          |         | 9        |         | 9       | 11      |         |          |         |         |         |         |         |         | 9       | 11      |
| 3 X F20 |         |         |          |         |          |         | 8       |         |         | 25       |         |         |         |         |         |         |         |         |
| 4 X F20 |         |         |          |         |          |         | 7       |         | 7       | 27       |         |         |         |         |         |         |         |         |
| 5 X F20 |         |         |          |         |          |         |         |         |         | 28       |         |         |         |         |         |         |         |         |
| 6 X F20 |         |         |          |         |          |         |         |         |         | 29       |         |         |         |         |         |         |         |         |
| 1 X F25 |         |         | 3        | 3       | 14       |         | 14      | 10      |         |          |         |         |         |         | 3       |         | 14      | 10      |
| 2 X F25 |         |         |          |         | 11       |         | 9       |         |         | 22       |         |         |         |         |         |         | 11      |         |
| 3 X F25 |         |         |          |         |          |         |         |         | 8       | 25       |         |         |         |         |         |         | النو    |         |
| 4 ¥ F25 |         |         |          |         |          |         |         |         | 7_      | 27       |         |         |         |         |         |         |         |         |
| 4 X F23 |         |         | 3        | 3       | 14       | 3       | 14      | 10      | ,       | 21       |         |         |         |         | 3       | 3       | 14      | 10      |
| 2 X E20 |         |         | , ,      | Ů       | 11       | Ŭ       | 9<br>9  | 11      |         | 22       |         |         |         |         | Ŭ       |         | 11      | 11      |
| 2 X F30 |         |         |          |         |          |         | '       | ••      | 8       | 25       |         |         |         |         |         |         |         |         |
| 3 X F30 |         |         |          |         |          |         |         |         | 7       | 25       |         |         |         |         |         |         |         |         |
| 4 X F30 |         |         |          |         |          |         |         |         |         | 27       |         |         |         |         |         |         |         |         |
| 2 X F30 |         |         |          | 3       | 14       | 2       | 14      | 10      |         | 20       |         |         |         |         | 3       | 3       | 14      | 10      |
| 2 V E40 |         |         |          | Ů       |          | ч<br>С  | 9       | 11      |         | 22       |         |         |         |         | J.      |         | 11      | 11      |
| 2 X F40 |         |         |          |         |          |         | '       |         | Q       | 22       |         |         |         |         |         |         |         |         |
| 3 X F40 |         |         |          |         |          |         |         |         | 7       | 25       |         |         |         |         |         |         |         |         |
| 4 X F40 |         | -       |          |         |          |         |         |         |         | 27<br>28 |         |         |         |         |         |         |         |         |
|         |         |         |          |         |          |         |         |         |         | 20       |         |         |         |         |         |         |         |         |
| 1 X F24 |         |         | 3        |         | 14       | 3       | 14      | 10      |         |          |         | 3       |         |         |         | 3       | 14      | 10      |
| 2 X F24 |         |         |          |         | 11       |         | 9       | 11      |         | 22       |         |         |         |         |         |         | 11      | 11      |
| 3 X F24 |         |         |          |         |          |         |         |         | 8       | 25       |         |         |         |         |         |         |         |         |
| 4 X F24 |         |         |          |         |          |         |         |         | 7       | 27       |         |         |         |         |         |         |         |         |
| 5 X F24 |         |         |          |         |          |         |         |         |         | 28       |         |         |         |         |         |         |         |         |
| 1 X F36 |         |         |          | 3       | 14       | 3       | 14      | 10      |         |          |         |         |         |         | 3       | 3       | 14      | 10      |
| 2 X F36 |         |         |          |         | 11       |         | 9       | 11      |         | 22       |         |         |         |         |         |         | 11      | 11      |
| 3 X F36 |         |         |          |         |          |         |         |         | 8       | 25       |         |         |         |         |         |         |         |         |
| 4 X F36 |         |         |          |         |          |         |         |         | 7       | 27       |         |         |         |         |         |         |         |         |
| 5 X F36 |         |         |          |         |          |         |         |         |         | 28       |         |         |         |         |         |         |         |         |
| 1 X F42 |         |         |          | 3       | 14       | 3       |         | 10      |         |          |         |         |         |         | 3       | 3       | 14      | 10      |
| 2 X F42 |         |         |          |         |          |         |         | 11      |         | 22       |         |         |         |         |         |         | 11      | 11      |
| 3 X F49 |         |         |          |         |          |         |         |         | 8       | 25       |         |         |         |         |         |         |         |         |
| 4 X F49 |         |         |          |         |          |         |         |         | 7       | 27       |         |         |         |         |         |         |         |         |
| 5 Y F49 |         |         |          |         |          |         |         |         |         | 28       |         |         |         |         |         |         |         |         |
| 1 Y F/8 |         |         |          | 3       | 14       | 3       | 14      | 10      |         | 20       |         |         |         |         | 3       | 3       | 14      | 10      |
| 2 Y F49 |         |         |          |         |          |         | 9       | 11_     |         | 22       |         |         |         |         |         | 0       | 11      | 11      |
| 2 X F40 |         |         |          |         |          |         |         |         | 8       | 22       |         |         |         |         |         |         |         |         |
| J X F40 |         |         |          |         |          |         |         |         | 7       | 25       |         |         |         |         |         |         |         |         |
| 4 X F40 |         |         |          |         |          |         |         |         | /       | 21<br>20 |         |         |         |         |         |         |         |         |
| 5 λ F4δ |         |         |          | 2       | 14       | 2       | 14      | 10      |         | 20       |         |         |         |         | 2       | 2       | 14      | 10      |
| 1 % 160 |         |         |          | 7       | 14       | 3       | 14      | TU      |         |          |         |         |         |         | - 2     |         | 14      | 10      |

1. Find your lamp type.

- 2. Find the quantity and wattage of lamps.
- 3. Look across and find the ballast you need.
- 4. The colored number represents wiring diagram.

**T12 SLIMLINE** 

1 1/2" Diameter

| LAMPS              | WC   | RKH | ORSE | -  |    |    |         |      |          |            | WH | AM | LO | NGH | IORS | SE |         |         |
|--------------------|------|-----|------|----|----|----|---------|------|----------|------------|----|----|----|-----|------|----|---------|---------|
|                    | WH   | WH  | WH   | WH | WH | WH | WH      | WH   | WH       | WH         | WM | WM | LH | LH  | LH   | LH | LH      | LH      |
| 2 X E40            |      | 2   | 22   | 3  | 33 | 4  | ر<br>9  | 11   | /        | 0<br>22    | 1  | 2  |    | 2   | 3    | 4  | )<br>11 | 0<br>11 |
| 2 X F00            |      |     |      |    |    |    |         |      | 8        | 25         |    |    |    |     |      |    |         | ••      |
| 3 X F00            |      |     |      |    |    |    |         |      | 7        | 25         |    |    |    |     |      |    |         |         |
| 4 X FOU            |      |     |      | 2  | 14 | 3  | 14      | 10   | <i>'</i> | 21         |    |    |    |     | 2    | 3  | 14      | 10      |
| 1 A F04            |      |     |      | 2  | 17 |    | 9       | 11   |          | 22         |    |    |    |     | 2    |    | 11      | 11      |
| 2 X F04            |      |     |      |    |    |    | '       |      | Q        | 22         |    |    |    |     |      |    |         |         |
| 3 X F04            |      |     |      |    |    |    |         |      | 0        | 23<br>97   |    |    |    |     |      |    |         |         |
| 4 X F04            |      |     |      | 2  | 14 | 2  | 1/      | 10   |          | 21         |    |    |    |     | 2    | 3  | 14      | 10      |
| 1 X F/Z            |      |     |      | 2  | 14 | 3  | ۲۱<br>Q | 11   |          | 22         |    |    |    |     | 2    | 5  | 11      | 11      |
| 2 X F/2            |      |     |      |    |    |    | '       |      | Q        | 22         |    |    |    |     |      |    |         |         |
| 3 X F/Z            |      |     |      |    |    |    |         |      | 0        | 23<br>97   |    |    |    |     |      |    | _       |         |
| 4 X F/Z            |      |     |      | 2  |    | 2  | 14      | 10   |          | 21         |    |    |    |     | 2    | 2  | 14      | 10      |
| 1 X F84            |      |     |      | 2  |    | J  | 0       | 10   |          | 22         |    |    |    |     | 2    | 2  | 14      | 10      |
| 2 X F84            |      |     |      |    |    |    | 7       |      | 0        | 22         |    |    |    |     |      |    |         |         |
| 3 X F84            |      |     |      |    |    |    | 14      | 10   | 0        | 25         |    |    |    |     |      |    | 14      | 10      |
| 1 X F96 (60W Only) |      |     |      |    |    |    | 14      | 10   |          | <b>n</b> n |    |    |    |     |      |    | 14      | 10      |
| 2 X F96 (60W Unly) |      |     |      |    |    |    | 9       | - 11 | 0        | 22         |    |    |    |     |      |    | 7       |         |
| 3 X F96 (60W Only) |      |     |      |    |    |    |         |      | 0        |            |    |    |    |     |      |    |         |         |
| T12 HO             |      |     |      |    | 12 |    | 19      | 12   | 14       |            |    |    |    |     |      |    | 10      | 12      |
| 1 X F18 H0         |      |     |      |    | 12 |    | 12      | 13   | 14       | 00         |    |    |    |     |      |    | 12      | 13      |
| 2 X F18 H0         |      |     |      |    |    |    |         |      |          | 23         |    |    |    |     |      |    |         |         |
| 3 X F18 H0         |      |     |      |    | 10 |    | 10      | 10   | 14       | 20         |    |    |    |     |      |    | 10      | 10      |
| 1 X F24 H0         |      |     |      |    | 12 |    | 12      | 13   | 14       | 00         |    |    |    |     |      |    | 12      | 13      |
| 2 X F24 H0         |      |     |      |    |    |    |         |      |          | 23         |    |    |    |     |      |    |         |         |
| 3 X F24 H0         |      |     |      |    | 10 |    | 10      | 10   | 14       | 26         |    |    |    |     |      |    | 10      | 10      |
| 1 X F30 H0         |      |     |      |    | 12 |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F30 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 3 X F30 H0         |      |     |      |    |    |    |         |      |          | 26         |    |    |    |     |      |    |         |         |
| 1 X F36 H0         |      |     |      |    | 12 |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F36 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 3 X F36 H0         |      |     |      |    |    |    |         |      |          | 26         |    |    |    |     |      |    |         |         |
| 1 X F42 H0         | 5.11 |     |      |    | 12 |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F42 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 3 X F42 H0         |      |     |      |    |    |    |         |      |          | 26         |    |    |    |     |      |    |         |         |
| 1 X F48 H0         |      |     |      |    | 12 |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F48 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 3 X F48 H0         |      |     |      |    |    |    |         |      |          | 26         |    |    |    |     |      |    |         |         |
| 1 X F60 H0         |      |     |      |    |    |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F60 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 3 X F60 H0         |      |     |      |    |    |    |         |      |          | 26         |    |    |    |     |      |    |         |         |
| 1 X F64 H0         |      |     |      |    |    |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F64 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 1 X F72 H0         |      |     |      |    |    |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F72 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 1 X F84 H0         |      |     |      |    |    |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F84 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| 1 X F96 HO         |      |     |      |    |    |    | 12      | 13   | 14       |            |    |    |    |     |      |    | 12      | 13      |
| 2 X F96 H0         |      |     |      |    |    |    |         |      | 11       | 23         |    |    |    |     |      |    |         |         |
| <b>T12 VHO</b>     |      |     |      |    |    |    |         | 5)   |          |            |    |    |    |     |      |    |         |         |
| 1 X F48 VHO        |      |     |      |    |    |    |         |      | 12       | 19         |    |    |    |     |      |    |         |         |
| 1 X F60 VH0        |      |     |      |    |    |    |         |      | 12       | 19         |    |    |    |     |      |    |         |         |
| 1 X F72 VHO        |      |     |      |    |    |    |         |      | 12       | 19         |    |    |    |     |      |    |         |         |
| 1 X F96 VHO        |      |     |      |    |    |    |         |      | 12       | 19         |    |    |    |     |      |    |         |         |

# **T12 HO**



1 1/2" Diameter

**T12 VHO** 

#### WIRING DIAGRAMS

### WORKHORSE • WHAM • LONGHORSE

Refer to pages 18-21 for specifications on WorkHorse, WHAM & LongHorse Ballasts

#### **OPERATION & INSTALLATION TIPS**

- 1. Connect both pin sets of the socket before connecting "RED" & "YELLOW" wires.
- 2. Ground case in accordance with the "National Electric Code."
- 3. With Linear lamp use a starting aid.

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- 4. Ballast case temperature can not exceed 70°C.
- 5. Remote mounting distance varies with lamp type. Contact customer service. 6. Ballast can not be used with dimmer switch but can be used with occupancy
- sensor. (Note: Sensor will shorten lamp life.)
- 7. Cap and insulate any unused red power wire.  $\longrightarrow$ = Cap
- 8. When connecting two red power wires, they must be joined to make one wire before attaching to the socket.
- 9. BLS (Back Leads with Studs) Dimensions: Stud Length: 5/8", Stud Size: 8/32, Center to Center: 2"
- 10. Running lamps in series will reduce the turn-on cycles of both lamps. (Configuration diagrams 4, 5, 6)



WORKHORSE • WHAM • LONGHORSE Refer to pages 18-21 for specifications on WorkHorse, WHAM & LongHorse Ballasts



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# CUSTOM PRODUCTS

Fulham is your technology partner when it comes to custom applications and solutions to your lighting needs.

We can design and build:

#### **Custom LED Modules**

Unique shapes and sizes can be created to customer specifications.

#### **Custom Ballasts**

Built to customer specifications, available in different sizes and shapes and can operate custom compact and linear lamps. (CCFL thru T12)

#### **Electrical Control Systems**

Custom Controls built to customer specifications.

#### **Custom Assemblies**

Wiring Harnesses, custom ballast lead lengths, Kits including ballasts with lampholders and lamps. All made to customer specifications.

### Length of Warranty and Coverage

Warranty period will be determined from the date of manufacture as indicated by the date code stamped on each product and will be covered as follows: WorkHorse Electronic Fluorescent Ballast - 5 Years HighHorse Electronic HID Ballast - 3 Years HighHorse Magnetic HID Ballast - 2 Years LongHorse Electronic Remote Fluorescent Ballast - 5 Years PONY Electronic Ballast - 2 Years PONY Electronic SugarCube - 2 Years PONY Electronic Transformer - 2 Years RaceHorse Electronic Ballast - 70°C 5 Years, 90°C 3 Years FireHorse - 2 to 5 Years IceHorse - 3 Years SunHorse - 3 Years SineHorse - 3 Years ThoroLED Lamps and Light Engines - 2 Years ThoroLED Drivers - 2 to 5 Years ThoroLED Modules - 1 Year Induction - 5 Years (If installed per instructions)

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#### **Warranty Conditions**

Fulham extends this express limited warranty only to the original purchaser or to the first user. This constitutes the complete warranty for the ballast.

Fulham is not responsible for any auxiliary equipment not furnished by Fulham, which is used in connection with or attached to the ballast, or for operation of the ballast with any auxiliary equipment. Damage to all such equipment is expressly excluded from this warranty. In addition, Fulham is not responsible for any damage to the ballast resulting from the use of auxiliary equipment not supplied by Fulham.

#### **Warranty Conditions Not Covered**

This warranty is not applicable to any ballast manufactured by Fulham not installed and operated in accordance with:

- \* Underwriters Laboratories Inc. (UL)
- \* National Electrical Code (NEC)
- \* Applicable international federal, state and local codes
- \* Remote applications beyond specifications WorkHorse - Length of the leads HighHorse - 9 feet
- Long Horse 20 feet
- \* Fulham specific, most recent instructions and application guidelines provided for installation of the ballast

Additionally, this warranty is not applicable to Fulham manufactured ballasts that have been subjected to excessive stress including, but not limited to, operating temperatures exceeding the recommended maximum temperature on any part of the ballast.

#### **Obtaining Warranty Service**

If within the warranty period it appears that the installed ballast does not meet the warranty conditions specified, the purchaser must notify Fulham Co., Inc. at 323-599-5000 of its warranty claim. Fulham or its authorized service company will provide warranty service directly to you.

#### **General Provisions**

All responsibilities regarding the ballast are set forth by this warranty. Replacement or repairs of the ballast is your exclusive remedy. This warranty is given in lieu of all other express warranties. Implied warranties, including those without limitation, warranties of merchant ability and fitness for a particular purpose, are limited to the duration of this limited warranty. Fulham shall in no event be liable for damages in excess of the purchase price of the ballast, for any loss of use, loss of time, inconvenience, commercial loss, lost profits or savings or other incidental, special or consequential damages arising out of the use or inability to use such product, to the full extent such may be claimed by law.

#### **State Law Exceptions**

Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, therefore the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and purchasers may have other rights that vary from state to state.

#### **Returned Goods Authorizations (RGA)**

Customers shall contact Fulham directly at 323-599-5000 for all RGA's.

After receiving the RGA, the user shall promptly return the product at the user's expense to Fulham Co., Inc. after receiving instructions as to when and where to ship product. Failure to follow this procedure shall void this warranty.

Should the number of pieces received by Fulham differ from the RGA either +/-, the customer will be notified and adjustments will be made at that time.

Fulham Co. Inc. reserves the right to examine all failed ballasts and reserves the right to be the sole judge as to whether any ballasts are defective and covered under this warranty.

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