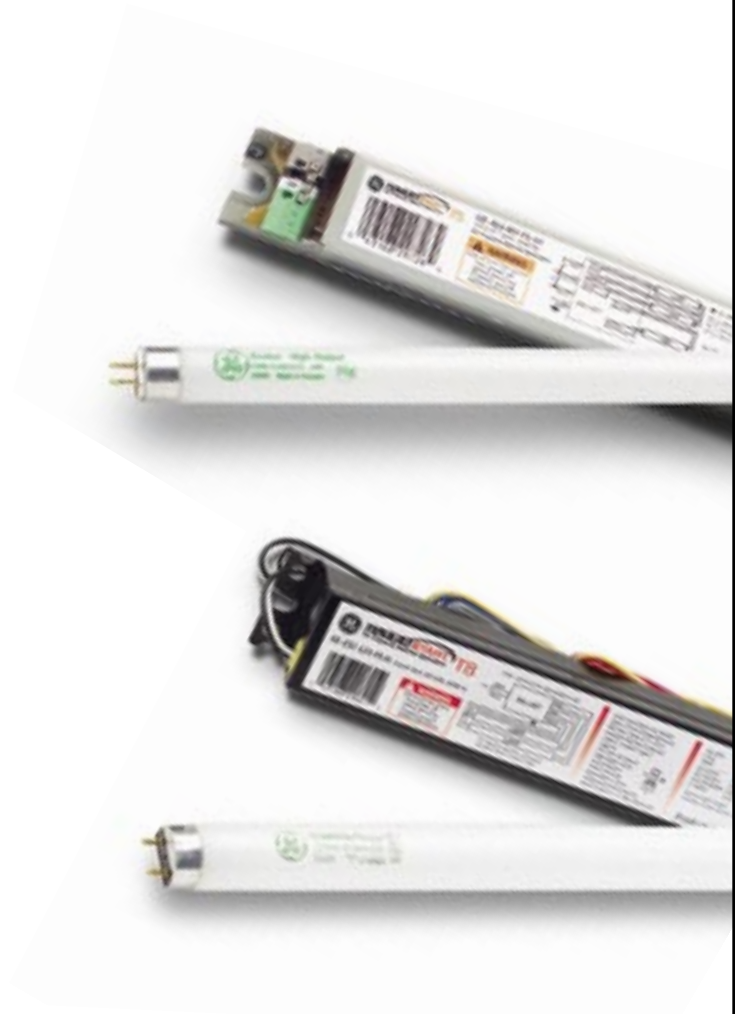


GE Consumer and Industrial Lighting

ULTRA START™
For Frequently Switched Applications

Programmed Start (PS) ballasts
for T5 and T8 fluorescent lamps.

A new generation
of ultra-efficient
Programmed Start
ballasts.



imagination at work

UltraStart™ Programmed Start Ballasts

GE UltraStart™ is a new generation of T8 and T5 Programmed Start (PS) ballasts that addresses the growing demand for energy-saving strategies incorporating occupancy sensors and other automated light controls to meet strict energy legislation. Switching lights off when an area is unoccupied or filled with daylight makes sense from an energy-savings viewpoint and it is also recommended or required now by several energy regulations.

However, on standard Instant Start (IS) ballasts, lamp life is significantly affected by frequent starting. Programmed Start (PS) ballasts provide a “soft start” and significantly reduce the cathode degradation occurring from each start.

PS ballasts have been available for some time but have suffered from several drawbacks: (1) they are less efficient

than IS ballasts (2) they operate lamps in series, which means if one lamp goes out the other lamps on that ballast will also go out (3) there is typically a starting delay of 1 to 1.5 seconds between the time the ballast is powered and the time the lamp comes on.

GE UltraStart™ PS ballasts overcome all these issues. These ballasts use a control circuit to apply very precise cathode heat to ensure that the cathodes have reached an optimum temperature during lamp starting. Precise starting significantly reduces the amount of cathode degradation associated with each start and increases lamp life significantly in frequently switched applications. GE has developed a line of PS ballasts that have the benefits of PS with the energy savings, fast starting and parallel operation convenience of instant start ballasts.

Features and Benefits

Longer Lamp Life in Frequently Switched Applications

- UltraStart™ extends lamp life by 18% to greater than 200% versus instant start ballasts in frequently switched applications, saving you money in maintenance costs and replacement lamps.

Same Energy Savings as High-Efficiency Instant Start Ballasts

- GE UltraStart™ ballasts operate at an industry high 90%+ efficiency. Traditional PS ballasts typically operate between 79–86%.

Simplify Installation with Multi-Voltage Technology

- The UltraStart™ T5 and UltraStart™ T8 XL and H ballasts incorporate Multi-Voltage technology. UltraStart™ can virtually “read” the incoming voltage and adapt automatically to any voltage from 108V to 305V. Fewer models handle more jobs with Multi-Voltage technology, and it eliminates guesswork at the job site. Multi-Voltage

Control (MVC) also compensates for incoming voltage fluctuations or variations from unreliable power.

Lower Maintenance Costs with Parallel Mode Operation

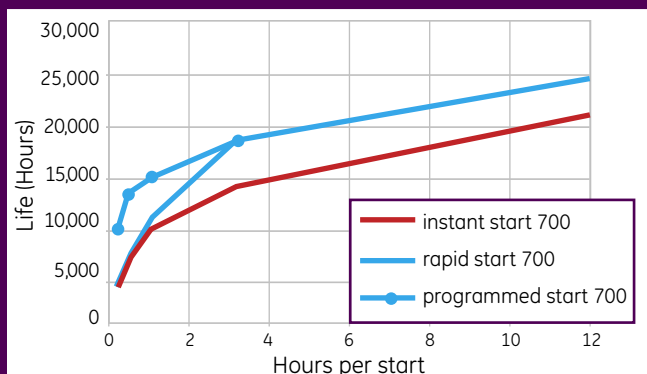
- Most PS ballasts operate in series mode, meaning if one bulb goes out, they all go out. GE UltraStart™ T8 ballasts operate in parallel mode, meaning if one bulb goes out, others stay on.

Fast Starting Time

- GE UltraStart™ T8 ballasts start in visually the same time as instant start ballasts (less than 0.7 seconds)—a significant improvement versus traditional PS ballasts. An important feature when using sensors and the annoying delay of waiting for the lights to turn on with traditional PS ballasts.

Complies with (RoHS) Restrictions of Hazardous Materials Standards.

NEMA Document: T8 Lamp Life versus Starting Method*



Independent studies by the National Electrical Manufacturers Association (NEMA) and GE have shown that Programmed Start ballasts provide the best lamp starting and longest lamp life in frequently switched applications. This chart is from the NEMA study “Compatibility of Fluorescent Lamps and Electronic Ballasts in Frequently Switched Applications” and demonstrates the significant improvement in lamp life when using programmed start ballasts versus instant start ballasts.

The NEMA study recommends PS ballasts in applications with frequent starts where extended lamp life is a primary concern. NEMA defines frequently switched applications and recommends the use of PS ballasts in applications of 5 or more starts per day. Applications with greater than 8 starts per day may void lamp manufacturers’ warranties when used on an instant start ballast. GE UltraStart™ maximizes lamp life in frequently switched applications and provides the GE Total System Limited Warranty.

*A NEMA lighting systems division document — “Compatibility of Fluorescent Lamps and Electronic Ballasts in Frequently Switched Applications,” August 18, 2003 (V1.7B)
Note: 700 is the most common color rendering index rating for T8 lamps.

UltraStart™ Saves Energy

Energy Savings by Turning the Lights Off

Using occupancy sensors in unoccupied spaces or using daylight harvesters in partial daylight areas is one of the most cost-effective, energy-saving solutions today. Extensive studies on energy savings while using lighting controls are available. One of the more credible studies performed by the Lighting Research Center and sponsored by the US EPA ENERGY STAR® Buildings Program shows the impact of energy consumption with and without occupancy sensors.* The results are shown on the table below. Occupancy sensors showed an average annual energy consumption savings of 12% to 42% depending on the application. GE UltraStart™ provides the proper lamp starting and energy savings to take advantage of this technology without sacrificing lamp life or incurring high maintenance costs.

Lamp Replacement and Maintenance Costs

Increased calendar lamp life and reduced maintenance

costs are other significant benefits. The less time that lamps are left on increases overall calendar lamp life. UltraStart™ lasts over 100,000 switching cycles in occupancy sensor and other building control system applications resulting in significant lamp replacement and maintenance cost savings. UltraStart's™ parallel lamp operation also avoids unnecessary lamp replacement costs when only one lamp fails.

Energy Savings When the Lights Are On

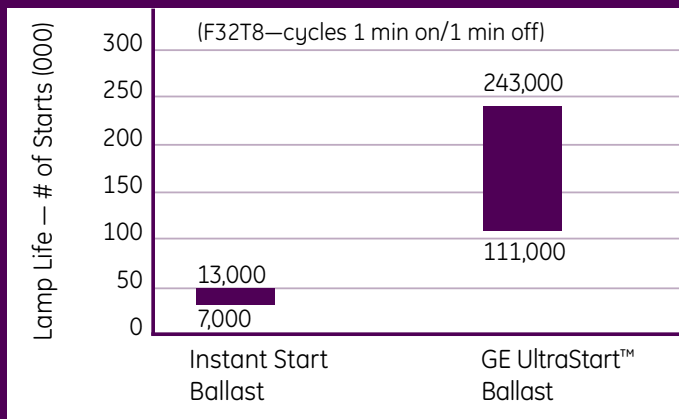
The UltraStart™ ballast saves as much energy as high-efficiency (>90%) T8 instant start ballasts like GE UltraMax™ instant start. Systems combining UltraStart™ electronic ballasts and GE T8 energy-saving lamps can deliver over 40% energy savings over standard T12 electromagnetic ballast systems not including the incremental savings from the use of occupancy sensors or daylight harvesters.

Energy-Saving Impact of Using Occupancy Sensors by Application*

	Average % Occupied	No sensors, control left to occupant		Occupancy sensors with 20-minute timeout setting		Annual Savings %
		Average Annual Operating Hours	Total Annual Energy Cost (\$)	Average Annual Operating Hours	Total Annual Energy Cost (\$)	
Break Room	24%	3,092	\$ 4,821	2,576	\$ 4,249	12%
Classroom	15%	2,732	\$ 94,488	1,424	\$ 54,864	42%
Conference Room	11%	1,778	\$ 3,724	1,113	\$ 3,006	19%
Private Office	18%	2,925	\$ 41,125	1,961	\$ 32,156	22%
Restroom	20%	5,866	\$ 2,054	3,097	\$ 1,322	36%

*"The Effects of Changing Occupancy Sensor Timeout Setting on Energy Savings, Lamp Cycling, and Maintenance Costs." LRC School of Architecture/US EPA ENERGY STAR Buildings Program, IES paper #42, August 2000. Electric rate \$.08/kw hour.

GE Lamp Life Range—Instant Start vs. Programmed Start**



GE lamp life studies have shown that lamp life is up to 20 times longer in rapid cycle testing. Lamp life tests have demonstrated 111,000 to 243,000 starts on F32T8 lamps with GE UltraStart™ ballasts as opposed to only 7,000 to 13,000 starts with standard instant start ballasts.

UltraStart™ maximizes lamp life in frequently switched applications and where lamp life is a primary concern. GE UltraStart™ ballasts and lamps provide guaranteed performance with the GE Total System Limited Warranty.

**GE 2004–2005 lamp testing @ industry standard B50 rapid cycle testing.

Two Models, Many Applications



A. GE Edison Award for Sustainable Design. Photography by James Benya.



B. GE Edison Award Winner. Photography by Michael Northrop.

T5 UltraStart™

- Fast startup (less than 0.7 seconds)
- Greater than 100,000 on/off cycles**
- High-ballast efficiency (>90%)
- Multi-volt 120-277V
- Parallel-series lamp connection
- Bi-level switching (dim from 4 lamps to 2 lamps)
- 54-watt 4 lamp (operates 1-4 lamps)
- Low-profile, lightweight housing
- End of lamp life protection
- Ultra system warranty
- <10% THD, >0.98 PF

T8 UltraStart™

- Fast startup (less than 0.7 seconds)
- Greater than 100,000 on/off cycles**
- High-ballast efficiency (>90%)
- Multi-volt 120-277V (XL & H), Discrete (N)
- Parallel lamp connection
- Ballast factors: Ultra-Low Watts (.60), Normal (.89) & High Light Output (1.15)
- Ultra system warranty
- <10% THD, >0.98 PF



.60 (XL) Ultra Low Watt Ballast Factor 120-277 Multi-Volt

Best used for low light level areas—bathrooms and hallways, partial daylight areas.

The Ultra Low XL ballast offers facilities the ability to maximize energy savings with 4 ft. T8 lamps. Many facilities maintain one lamp in inventory with F32T8 high lumen lamp and change light levels throughout the facility with ballast factor.



C. GE Edison Award of Merit and Award for Sustainable Design. Photography by: Earl F. Levin & Robert L. Smith.

.89 (N) Normal Ballast Factor 120V & 277V

Best used in applications incorporating occupancy sensors, daylight harvesting strategies and other frequently switched applications (>5 on/off per day) — general office lighting, retail, schools.



1.15 (H) High Light Level Ballast Factor 120-277V Multi-Volt

Best used in high light output areas such as high bay fixtures — warehouses manufacturing, retail.

*UltraStart T8 XL <90% efficient.

** GE 2004–2005 lamp testing @ industry standard B50 rapid cycle testing.

A. **Lighting Designers:** James R. Benya, PE, FIES, IALD, LC of Benya Lighting Design & Jon H. Wiener of Soderstrom Architects PC. **Project:** Paul L. Boley Law Library, Lewis & Clark Law School.

B. **Lighting Designer:** Joseph M. Good III, LC, IESNA, IALD of Spectrum Engineers. **Project:** St. John the Baptist Catholic Church at Skaggs Catholic Center.

C. **Lighting Designers:** Mark S. Godfrey, LC; Earl F. Levin, LC, IALD; & Robert L. Smith, LC (all of) PACIFIC LIGHTWORKS, LLC. **Project:** University of Oregon Football Weight Room.

UltraStart™ and Energy Codes

Turning the lights off and using automatic light controls not only makes good sense from an energy-savings strategy but, it is now required by federal and local energy codes throughout the U.S. These codes require new buildings, and those undergoing major renovation, to meet stringent watts-per-square-foot requirements or use automated shutoff controls. GE UltraStart™ is your best solution to maintain the energy savings and conveniences of instant start ballasts and also maintain your long life lamps. Below are highlights of the three major programs driving these requirements:

ASHRAE/IESNA Standard 90.1

The Department of Energy (DOE) selected ANSI/IESNA Standard 90.1-1999 as the commercial building reference standard for state building energy codes by its authority. States were required to adopt an energy code at least as stringent as 90.1-1999 by July 1, 2004. New control requirements include the following:

- Buildings larger than 5,000 sq. ft. must use an automatic control device to turn off lighting in all spaces.
- Each space that's enclosed by ceiling-height partitions must have at least one control device that independently controls the general lighting in the space. Each control device shall be activated either by an automatic motion sensor, or manually by an occupant.
- Lighting for all exterior applications shall be controlled by a photocell or astronomical time clock.

California Title 24

California's Title 24 standards for lighting controls are tougher than ASHRAE/IESNA 90.1, and some local energy codes are going beyond the 90.1 requirements and establishing standards

similar to Title 24. Here are some of the lighting control requirements found in Title 24:

- Controls for daylight areas greater than 250 sq. ft. that can receive effective light from daylight must switch or dim to reduce lighting by at least 50%.
- Light level reduction controls are required for spaces greater than 100 sq. ft. with a lighting load greater than 0.8 watts per square foot and more than one luminaire.
- All interior lighting systems must have an occupancy sensor, automatic time switch, or other device that automatically shuts off lighting.
- All permanently installed exterior lighting must use a photocell or time switch.

US Green Building Council's Leadership in Energy & Environmental Design (LEED) Program

The LEED rating and certification system is a voluntary standard through which existing commercial buildings obtain points towards certification to a set of energy and environmental performance criteria. Some states offer tax incentives for meeting certain standards established by the LEED standard. Lighting controls and GE UltraStart™ Programmed Start ballasts play three primary roles in helping a building achieve LEED certification:

- 1) Controls are required for enabling code compliance, which is a major LEED prerequisite
- 2) LEED strongly encourages designing buildings using daylight as a primary light source
- 3) Lighting controls can be used for further lighting energy reductions

Environmental Awareness

UltraStart™ is one of GE's ways to create products that help our customers improve their environmental and operating performance. GE UltraStart™ are high-efficiency, energy-saving and RoHS-compliant ballasts.

GE UltraStart™ PS and UltraMax™ Instant Start ballasts are among the highest energy-efficient ballasts available and contribute to significant reductions in energy consumption and greenhouse gas emissions. In addition to energy savings, UltraStart™ ballasts are RoHS-compliant. The RoHS (European Directive 2002/95EC on the Restriction of Hazardous Substances) states that (beyond certain limited exemptions) electrical and electronic products shall not contain lead,

cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), or polybrominated diphenyl ethers (PBDEs). GE's UltraStart™ ballasts will use lead-free solder and other environmentally preferable materials that meet the RoHS directive. RoHS-compliant ballasts are GE's commitment to helping our customers meet their disposal needs now and in the future if RoHS becomes a global requirement.

GE expects to be the first RoHS-compliant product segment among our competitors. GE hopes to encourage customer awareness on the importance of reducing hazardous materials and complying with future environmental trends. Look for the RoHS-compliant mark on all UltraStart™ and other GE ballasts.

UltraStart™ System Information

Preliminary	Lamps		10-packs	420 unit pallet packs	Input Volts	Line Current	Input Watts	Ballast Factor	(Initial) System Lumens	Lumens/Watt
	Type	#								
GE-232-120-PS-N	F32T8	2	29621	29630	120	0.49	57	.89	5251	92
	F32T8/HL	2	29621	29630	120	0.49	57	.89	5518	97
GE-232-277-PS-N	F32T8	2	29622	29632	277	0.21	57	.89	5251	92
	F32T8/HL	2	29622	29632	277	0.21	57	.89	5518	97
GE-332-120-PS-N	F32T8	3	29623	29633	120	0.71	84	.89	7877	94
	F32T8/HL	3	29623	29633	120	0.71	84	.89	8277	99
GE-332-277-PS-N	F32T8	3	29624	29634	277	0.31	85	.89	7877	93
	F32T8/HL	3	29624	29634	277	0.31	85	.89	8277	97
GE-432-120-PS-N	F32T8	4	29625	29635	120	0.93	112	.89	10502	94
	F32T8/HL	4	29625	29635	120	0.93	112	.89	11036	98
GE-432-277-PS-N	F32T8	4	29627	29650	277	0.41	112	.89	10502	94
	F32T8/HL	4	29627	29650	277	0.41	112	.89	11036	99
GE-232-MV-PS-H	F32T8	2	29675	29651	120	0.62	75	1.15	6785	90
	F32T8/HL	2	29675	29651	120	0.62	75	1.15	7130	95
	F32T8	2	29675	29651	277	0.28	74	1.15	6785	92
	F32T8/HL	2	29675	29651	277	0.28	74	1.15	7130	96
GE-332-MV-PS-H	F32T8	3	29676	29656	120	0.92	110	1.15	10178	93
	F32T8/HL	3	29676	29656	120	0.92	110	1.15	10695	97
	F32T8	3	29676	29656	277	0.4	108	1.15	10178	94
	F32T8/HL	3	29676	29656	277	0.4	108	1.15	10695	99
GE-432-MV-PS-H	F32T8	4	29678**	29657	120	1.23	147	1.15	13570	92
	F32T8/HL	4	29678	29657	120	1.23	147	1.15	14260	97
	F32T8	4	29678	29657	277	0.53	144	1.15	13570	94
	F32T8/HL	4	29678	29657	277	0.53	144	1.15	14260	99
GE-232-MV-PS-XL	F32T8	2	29671	29665	120	0.38	45	.60	3540	79
	F32T8/HL	2	29671	29665	120	0.38	45	.60	3720	83
	F32T8	2	29671	29665	277	0.18	44	.60	3540	80
	F32T8/HL	2	29671	29665	277	0.18	44	.60	3720	85
GE-332-MV-PS-XL	F32T8	3	29672	29666	120	0.56	67	.60	5310	79
	F32T8/HL	3	29672	29666	120	0.56	67	.60	5580	83
	F32T8	3	29672	29666	277	0.25	66	.60	5310	80
	F32T8/HL	3	29672	29666	277	0.25	66	.60	5580	85
GE-454-MV-PS-N1	F54T5HO	4	29726	29717	120	2.00	238	1.00	20000	84
	F54T5HO	4	29726	29717	277	0.86	233	1.00	20000	86
	F54T5HO	3	29726	29717	120	1.52	185	-		
	F54T5HO	3	29726	29717	277	0.66	182	-		
	F54T5HO	2	29726	29717	120	0.99	122	-		
	F54T5HO	2	29726	29717	277	0.43	120	-		
	F54T5HO	1	29726	29717	120	0.52	64	-		
	F54T5HO	1	29726	29717	277	0.24	65	-		

*Power Factor >.98, THD <10%, [see application data sheet on GELighting.com for PF and THD with specific voltage and lamp applications]

All UltraStart™ T8 ballasts have N-1 lamp rating

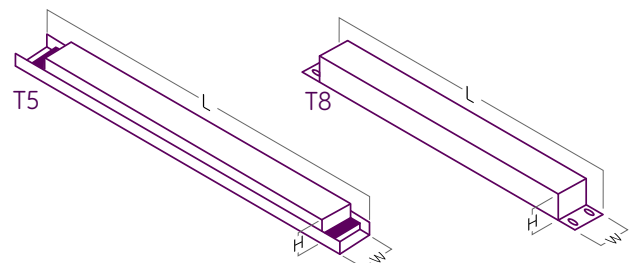
**29678 as an 8-pack

UltraStart™ T8 also UL-Listed for F17T8, F25T8, F28T8, and F32/WM lamps. F28T8 and F32/WM lamps currently warranted as Instant Start lamps only.

Electrical testing completed to ANSI requirements in open fixture at 25C

Total System Limited Warranty

UltraStart™ ballasts are designed by GE's expert engineers and custom manufactured to our Six Sigma specifications, all backed by a full 5-year warranty. When used with GE T8 lamps, you get our Total Performance System Limited Warranty covering lamps and ballasts. With today's complicated system of ballasts, lamps, sensors and frequently switching lights, you need a system that is designed for these applications and backed with the GE Total System Limited Warranty. Contact your GE representative for details. 1-888-GEBALLAST.



	UltraStart™ T8 N & XL	UltraStart™ T8 2H & 3H	UltraStart™ T8 4H	UltraStart™ T5 54W
Length	9.5"	9.5"	11.75"	24.02"
Mount Length	8.89"	8.89"	11.13"	-
Width	1.7"	2.4"	2.4"	1.18"
Mount Width	1.69"	1.69"	1.69"	-
Height	1.2"	1.55"	1.55"	1.18"