HIGH FREQUENCY ELECTRONIC BALLASTS

Introduction

High efficiency, high frequency electronic ballasts offer enhanced lighting performance and energy savings. The Electric Power Research Institute estimates that lighting consumes 20-25% of all electric power and that lighting energy accounts for 40% of the average commercial electric bill. The retrofit of existing facilities with modern lighting systems increases productivity and can save over one-half the energy of the original system.

This potential for savings has prompted the EPA (Environmental Protection Agency) to create the Green Lights program. U.S. Corporations, in this voluntary program, retrofit their lighting systems with energy efficient lamps and ballasts whenever economically feasible. The economics of lighting retrofits have never been better. Investment payback is often accelerated by "Demand Side Management" programs from electric utilities that offer incentives in the form of rebates for energy efficient measures.

Ballast Basics

Modern electronic ballasts operate at a frequency above 20,000 Hz. This high frequency operates lamps more efficiently (10-15% more light output) and eliminates the 60 cycle hum and visible flicker normally associated with electromagnetic ballasts. Modern solid-state circuitry makes the electronic ballast practical, reliable and cooler running.

LAMP/BALLAST COMPATIBILITY

Standards and Regulations

Typical lamp specifications include starting voltage, operating current, cathode voltage, crest factor, etc. Electronic ballasts from Advance Transformer are designed to meet the lamp manufacturers specifications and the requirements of:

ANSI/IEEE C62.41 (American National Standards Institute)
ANSI C82.11 (American National Standards Institute)
FCC Part 18 (RFI and EMI)
UL (Underwriter Laboratories)
Public Law No. 100-357 (minimum efficiency standards)
NAECA (National Appliance Energy Conservation Amendments)
CSA (Canadian Standards Association) where applicable
The National Electrical Code and all Municipal Electrical Codes.

No fluorescent lighting system will meet expectations unless the lamp and ballasts are properly matched. Proper (electronic ballast/fluorescent lamp/fixture) combinations result in applications with the correct light levels for the task at hand, lamps that provide rated lamp life, and a safe and aesthetically pleasing installation. Advance® electronic ballasts are tested by independent laboratories to ensure compatibility with lamps from all major manufacturers.

Instant Start

Instant start electronic ballasts are the most popular type of electronic ballast today because they provide maximum energy savings and they start lamps without delay or flashing. Since they do not provide lamp electrode heating, instant start ballasts consume less energy than comparable rapid start, program rapid start or programmed start ballasts. As a result, they provide the most energy efficient solution to fluorescent lamp ballasting. The instant start ballast uses 1.5 to 2 watts less energy per lamp than the rapid start alternative.

Instant Start (cont'd)

Instant start electronic ballasts provide a high initial voltage (typically 600V for F32T8 lamps) to start the lamp. This high voltage is required to initiate discharge between the unheated electrodes of the lamp. However, the cold electrodes of lamps operated by an instant start ballast may deteriorate more quickly than the warmed electrodes of lamps operated by a rapid start, program rapid start or programmed start ballast. Lamps operated by instant start ballasts will typically withstand 10-15K switch cycles. Instant start ballasts are typically wired in *parallel*. This means that if one lamp fails, the other lamps in the circuit will remain lit.

Rapid Start

Rapid start ballasts have a separate set of windings which provide a low voltage (approx. 3.5 volts) to the electrodes for one second prior to lamp ignition. A starting voltage somewhat lower than that of instant start ballast (typically 450-550V for F32T8 lamps) is applied, striking an electrical arc inside the lamp. Most rapid start electronic ballasts continue to heat the electrode even after the lamp has started, which results in a power loss of 1.5 to 2 watts per lamp. Lamps operated by a rapid start electronic ballast will typically withstand15-20K switch cycles. Rapid start ballasts are typically wired in *series*. This means that is one lamp fails, all other lamps in the circuit will extinguish.

Program Rapid Start

The Advance *Centium*® Program Rapid Start (PRS) electronic ballasts have been designed for use with occupancy switches by providing up to 30,000 lamp starts. PRS electronic ballasts precisely heat the lamp cathodes to 650°C with virtually no glow current before applying arc voltage to the lamp. Program rapid start ballasts are typically wired in *series*. However, The Advance *Centium*® PRS ballasts also feature series-parallel lamp operation for the 3 and 4 lamp units. This means that 1 or 2 lamps will continue to operate normally in the event of a single lamp failure.

Programmed Start

Programmed start (PS) electronic ballasts provide maximum lamp life in frequent starting conditions (up to 50,000 starts). PS ballasts like the Advance Smartmate, Mark 5™, Mark 7® *0-10V,* Mark 10® *Powerline,* and ROVR use a custom integrated circuit (IC) which monitors lamp and ballast conditions to ensure optimal system lighting performance. Like Program rapid start ballasts, PS ballasts also precisely heat the lamp cathodes. However, PS ballasts heat the lamp cathodes to 700°C prior to lamp ignition. This puts the least amount of stress on the lamp electrodes, resulting in maximum lamp life regardless of the number of lamp starts. Programmed start ballasts are typically wired in *series*.

Ballast Factor

Light output ratings published by lamp manufacturers are based on powering the lamp with a "reference ballast" as specified by ANSI standards. The ballast factor of a particular ballast provides a measure of expected light output.

Advance Transformer offers electronic ballasts with several different ballast factors. This enables the lighting system designer to adjust the lighting level to meet the requirements of a particular application. The lighting system designer can trade watts for lumens by selecting the appropriate ballast.

$$\text{Ballast Factor} = \frac{\text{Lumen output of lamp operated by rated ballast}}{\text{Lumen output of lamp operated by "reference ballast"}}$$

ORDERING INFORMATION

How to Order

Advance Transformer has developed the industry's broadest distribution system for electronic ballasts. More than 3000 stocking distributors nationwide. For information on the distributor best able to serve your needs, please call 800-372-3331.

Electronic Ballast Part Number Breakdown

I	CF	–	2	S	26	–	H1	–	LD

CFL Mounting/Connector Options

BS = Bottom mounting studs with single entry color coded connectors
LD = Length mounting feet with SmartMate™ dual entry color coded connectors
LS = Length mounting feet with single entry color coded connectors
QS = QuikStart

Linear Fluorescent Mounting/Connector Options

TP* = Thermal Protected
2LS = 2 Level Switching

CFL Can Desription

H1 = Hybrid metal / plastic case, size 1
L2 = Linear
M1 = Metal case, size 1
M2 = Metal case, size 2
M3 = Metal case, size 3
M4 = Metal case, size 4
M5 = Metal case, size 5
S1 = Square, style 1
S2 = Square, style 2
SC = Small can

Linear Fluorescent Can Desription

90C = 90˚C maximum case temperature rating
HL = High light output
LW = Low watt
MC = Micro can
RH* = Reduced harmonics
S = Slimline
SC = Small can

Lamp Watts (Primary lamp)

Wiring Configuration

D = 2D, series
M = Modified parallel**
P = Parallel
Q = Quad CFL, series
S = Series
T = Triple CFL, series
TTS = Long twin tube, series
TTP = Long twin tube, parallel

Maximum Number of Lamps

Family Name

CF = Compact Fluorescent
CN = Centium
DA = ROVR
DA & DL = ROVR
EL = Standard
EZ = Mark 10® *Powerline*
IC = Mark 5®
MB = Matchbox
OP = Optanium
ZT = Mark 7® *0-10V*

Input Voltage

G = 347V
H = IntelliVolt-Hi (347V through 480V, 50/60 Hz)
I = IntelliVolt™ (120V through 277V, 50/60 Hz)
R = 120V
V = 277V
X = 220V

Corporate Offices
(800) 322-2086

Press 1
To reach Customer Service
Press 2
If you know the last name and you will reach the spell by name directory
Press 0
Or stay on the line to be connected to the operator

You may dial the four digit extension of the person you want to reach at any time

Visit our web site at
www.advancetransformer.com

Customer Support/
Technical Service
(800) 372-3331
+1 (847) 390-5000 (International)

Dial the four digit extension of the person you want to reach

Press 1
For customer support
Press 2
For technical applications, or warranty information
Press 4
To dial by name

- Plan your lighting installation carefully; consider using the services of a qualified lighting designer
- Consult your local electric utility regarding demand side management rebate programs.
- Select the Advance electronic ballast which best matches the requirements of your application. The technical specifications in this catalog (located on pages 8-14 to 8-30) will be useful in obtaining bids from electrical contractors.
- Contact your local Advance distributor. You will find them to be a helpful supplier of both products and information.

* Many current and all future electronic ballast part numbers will not use the "RH-TP" suffixes even though these ballasts will be thermally protected.
** Parallel Wiring Configuration. However, if one lamp fails, all other lamps in the circuit will extinguish.

REMOTE OR TANDEM WIRING DISTANCES

REMOTE MOUNTING OF ELECTRONIC BALLASTS

Unlike magnetic ballasts, electronic ballasts are limited in remote mounting distance from the lamps they operate. The factors limiting the distance from the electronic ballasts to the lamps are: open circuit voltage as opposed to operating voltage, operating frequency and the lamp operating current.

As the distance from the high frequency electronic ballasts to the lamp increases, so does the capacitance across the lead wire to the lamp. This increase in capacitance is important for two reasons. First, if the capacitance is too high, there will not be sufficient open circuit voltage across the lamp for proper lamp ignition.

Second, if the lamp is capable of ignition, the increased capacitance will cause a loss in the current to the lamp. The added capacitance creates what is known as a "shunt" around the lamp; in other words the current will leak from the red wire (or blue) to the yellow, completely bypassing the lamp. The current through the lamp will be reduced, resulting in lower lumens, with the possibility that the lamp will not be capable of sustained operation.

The Mark *7® 0-10V,* Mark *10® Powerline*, and ROVR dimming ballasts are particularly sensitive to high capacitance associated with long lead wires. The dimming ballast is capable of very low dim levels because constant filament heat is provided to the lamp. If there is any loss of current, the filament current will be reduced and the lamp will begin to flicker, or it will be completely extinguished. It is also important that the red and blue leads not be twisted together. Twisting the red and blue leads will add capacitance, causing the lamp to flicker at the lower dimming levels.

In summary, there is a wide range and varying types of electronic ballast architectures that are capable of being remote mounted for an equally wide range of distances. If you are uncertain of the remote mounting restrictions for a particular electronic ballast please consult Technical Services.

TABLE NOTES

NOTE: Use 18 AWG wire or larger for Remote or Tandem wiring where applicable.

1 = No Remote or Tandem wiring allowed.

2 = Remote or Tandem wiring allowed to a maximum of 20 feet between ballast and lamp holder. For Tandem wiring, only RED lamp can be remoted. BLUE lamp must be in same fixture as ballast.

3 = Remote or Tandem wiring allowed to a maximum of 6 feet for 2-lamp or 15 feet for 1-lamp between ballast and lamp holder. For Tandem wiring, only RED lamp can be remoted. BLUE lamp must be in same fixture as ballast.

4 = Remote or Tandem wiring allowed to a maximum of 6 feet between ballast and lamp holder. For Tandem wiring, any lamp can be remote mounted.

5 = Remote or Tandem wiring allowed to a maximum of 12 feet for (2) F96T8/HO or 20 feet for all other T8/HO between ballast and lamp holder. For Tandem wiring, only BLUE lamp can be remoted. RED lamp must be in same fixture as ballast.

6 = Remote or Tandem wiring allowed to a maximum of 20 feet between ballast and lamp holder. For Tandem wiring, any lamp can be remote mounted.

FAMILY	EXISTING MODEL	NOTE
Standard	GEL-2S40-RH-TP	2
Standard	GEL-2P32-LW-RH-TP	6
Standard	GEL-2P32-SC	6
Standard	GEL-2P59	6
Standard	GEL-2S32-RH-TP	2
Standard	GEL-3P32-RH-TP	6
Standard	GEL-4P32-LW-RH-TP	6
Standard	GEL-4P32-RH-TP	6
Standard	REL- /VEL-1P32-HL-SC	6
Standard	REL- /VEL-1P32-LW-SC	6
Standard	REL- /VEL-1P32-SC	6
Standard	REL- /VEL-1S40-SC	6
Standard	REL- /VEL-1TTS39	1
Standard	REL- /VEL-1TTS40	1
Standard	REL- /VEL-1TTS50	1
Standard	REL- /VEL-2P17-RH-TP	6
Standard	REL- /VEL-2P32-HL-SC	6
Standard	REL- /VEL-2P32-LW-SC	6
Standard	REL- /VEL-2P32-SC	6
Standard	REL- /VEL-2P59-HL	6
Standard	REL- /VEL-2P59-S-RH-TP	6
Standard	REL- /VEL-2S110	2
Standard	REL- /VEL-2S40-SC	6
Standard	REL- /VEL-2S86	2
Standard	REL- /VEL-2TTS39	1
Standard	REL- /VEL-2TTS40	1
Standard	REL- /VEL-2TTS50	1
Standard	REL- /VEL-3P32-HL-SC	6
Standard	REL- /VEL-3P32-LW-SC	6
Standard	REL- /VEL-3P32-SC	6
Standard	REL- /VEL-3S40-RH-TP	1
Standard	REL- /VEL-4P32-2LS	6
Standard	REL- /VEL-4P32-LW-SC	6
Standard	REL- /VEL-4P32-SC	6
Standard	REL-2P60-S	6
Standard	VEL-2P75-S	6
Centium	GCN-2S32	2
Centium	GCN-1S32	6
Centium	GCN-2P32	6
Centium	GCN-3S32	1
Centium	HCN-2S54-90C	6
Centium	ICN-132-MC	6
Centium	ICN-1P32-SC	6
Centium	ICN-1S80	6
Centium	ICN-2M32-MC	6
Centium	ICN-2P32-SC	6
Centium	ICN-2S24	6
Centium	ICN-2S28	6
Centium	ICN-2S39	6
Centium	ICN-2S54	6
Centium	ICN-2S54-90C	6
Centium	ICN-2S86	6
Centium	ICN-3P32-SC	6
Centium	ICN-4P32-SC	6
Centium	ICN-4S54-90C-2LS	6
Centium	RCN- /VCN-132-MC	6
Centium	RCN- /VCN-1P32-SC	6
Centium	RCN- /VCN-1S32-SC	6
Centium	RCN- /VCN-1S40-SC	6
Centium	RCN- /VCN-1TTP40-SC	6
Centium	RCN- /VCN-2M32-MC	6
Centium	RCN- /VCN-2P32-LW	6
Centium	RCN- /VCN-2P32-SC	6

FAMILY	EXISTING MODEL	NOTE
Centium	RCN- /VCN-2P59	6
Centium	RCN- /VCN-2S32-SC	6
Centium	RCN- /VCN-2S40	2
Centium	RCN- /VCN-2S40-SC	6
Centium	RCN- /VCN-2S86	5
Centium	RCN- /VCN-2TTP40-SC	6
Centium	RCN- /VCN-3P32-LW	6
Centium	RCN- /VCN-3P32-SC	6
Centium	RCN- /VCN-3S32-SC	6
Centium	RCN- /VCN-3TTP40-SC	6
Centium	RCN- /VCN-4P32-LW	6
Centium	RCN- /VCN-4P32-SC	6
Centium	RCN- /VCN-4S32-SC	6
Smartmate	ICF-1D38-XX-XX	3
Smartmate	ICF-1H120-XX-XX	3
Smartmate	ICF-2S13-XX-XX	3
Smartmate	ICF-2S18-XX-XX	3
Smartmate	ICF-2S26-XX-XX	3
Smartmate	ICF-2S42-XX-XX	3
Matchbox	RMB-1P13-L2	6
Matchbox	RMB-1P13-S1	6
Matchbox	RMB-1P26-S2	6
Matchbox	RMB-2P13-L2	6
Matchbox	RMB-2P13-S2	6
Optanium	IOP-2S32-SC	6
Optanium	ROP- /VOP-2P32-LW-SC	6
Optanium	ROP- /VOP-2P32-SC	6
Optanium	ROP- /VOP-3P32-LW-SC	6
Optanium	ROP- /VOP-3P32-SC	6
Optanium	ROP- /VOP-4P32-LW-SC	6
Optanium	ROP- /VOP-4P32-SC	6
Mark 5	RIC- /VIC-132	6
Mark 5	RIC- /VIC-2S32	2
Mark 5	RIC- /VIC-3S32	1
Mark 7 0-10V	IZT-132-SC	4
Mark 7 0-10V	IZT-1T42-M2-XX-XX	1
Mark 7 0-10V	IZT-2Q26-M2-XX-XX	1
Mark 7 0-10V	IZT-2S32-SC	4
Mark 7 0-10V	IZT-2T42-M3-XX-XX	1
Mark 7 0-10V	RZT- /VZT-132	4
Mark 7 0-10V	RZT- /VZT-154	1
Mark 7 0-10V	RZT- /VZT-1TTS40	4
Mark 7 0-10V	RZT- /VZT-2S32	4
Mark 7 0-10V	RZT- /VZT-2S54	1
Mark 7 0-10V	RZT- /VZT-2TTS40	1
Mark 7 0-10V	RZT- /VZT-3S32	1
Mark 7 0-10V	RZT- /VZT-3S32-SC	1
Mark 7 0-10V	VZT-180	1
Mark 7 0-10V	VZT-4S32-4/ -8	1
Mark 10 Powerline	REZ- /VEZ-132-SC	4
Mark 10 Powerline	REZ- /VEZ-154	1
Mark 10 Powerline	REZ- /VEZ-1Q18-XX-XX	1
Mark 10 Powerline	REZ- /VEZ-1T42-XX-XX	1
Mark 10 Powerline	REZ- /VEZ-1TTS40	4
Mark 10 Powerline	REZ- /VEZ-2Q18-XX-XX	1
Mark 10 Powerline	REZ- /VEZ-2Q26-XX-XX	1
Mark 10 Powerline	REZ- /VEZ-2S32-SC	4
Mark 10 Powerline	REZ- /VEZ-2S54	1
Mark 10 Powerline	REZ- /VEZ-2T42-XX-XX	1
Mark 10 Powerline	REZ- /VEZ-2TTS40	1
Mark 10 Powerline	REZ- /VEZ-3S32-SC	1
ROVR	IDA-2S54	1

Lamp Data		Min. Starting Temp. (°F/°C)	Input Volts	Catalog Number	Certifications		Line Current (Amps)	Input Power ANSI (Watts)	Ballast Factor	Max. THD %	Power Factor	Dim./ Wiring Diagram
Number	Watts				UL	CSA						
F17T8, FBO16T8												
1	17	0/-18	120	RCN-1P32-SC	✓	✓	0.18	20	0.92	20	0.93	Fig. B/63
			277	VCN-1P32-SC	✓	✓	0.08					
		0/-18	120	ICN-1P32-SC	✓	✓	0.16	19	0.93	15	0.96	Fig. B/63
			230		✓	✓	0.08					
			277		✓	✓	0.07					
		0/-18	120	ICN-2P32-SC	✓	✓	0.18	22	1.07	15	0.95	Fig. B/*64
			230		✓	✓	0.10					
			277		✓	✓	0.09					
2	17	0/-18	120	RCN-2P32-SC	✓	✓	0.32	35	0.87	20	0.92	Fig. B/64
			277	VCN-2P32-SC	✓	✓	0.14					
			347	GCN-2P32		✓	0.11	36	1.01	25	0.95	Fig. A/64
		0/-18	120	ICN-2P32-SC	✓	✓	0.28	33	0.93	15	0.97	Fig. B/64
			230		✓	✓	0.14					
			277		✓	✓	0.13					
		0/-18	120	ICN-3P32-SC	✓	✓	0.32	38	1.07	15	0.96	Fig. B/*65
			230		✓	✓	0.17					
			277		✓	✓	0.14					
3	17	0/-18	120	RCN-3P32-SC	✓	✓	0.39	47	0.99	10	0.99	Fig. B/65
			277	VCN-3P32-SC	✓	✓	0.17					
		0/-18	120	ICN-3P32-SC	✓	✓	0.39	48	0.92	15	0.97	Fig. B/65
			230		✓	✓	0.21					
			277		✓	✓	0.17					
		0/-18	120	ICN-4P32-SC	✓	✓	0.45	53	1.04	15	0.97	Fig. B/*66
			230		✓	✓	0.23					
			277		✓	✓	0.20					
4	17	0/-18	120	RCN-4P32-SC	✓	✓	0.51	61	0.96	10	0.99	Fig. B/66
			277	VCN-4P32-SC	✓	✓	0.22					
		0/-18	120	ICN-4P32-SC	✓	✓	0.54	64	0.93	10	0.98	Fig. B/66
			230		✓	✓	0.28					
			277		✓	✓	0.23					

Refer to pages 8-32 to 8-41 for lead lengths and shipping data

See page 1-31 for Dimensions and Wiring Diagrams

Lamp Data		Min. Starting Temp. (°F/°C)	Input Volts	Catalog Number	Certifications		Line Current (Amps)	Input Power ANSI (Watts)	Ballast Factor	Max. THD %	Power Factor	Dim./ Wiring Diagram
Number	Watts				UL	CSA						
F25T8, FBO24T8												
1	25	0/-18	120	RCN-1P32-SC	✓	✓	0.22	27	0.92	10	0.98	Fig. B/63
			277	VCN-1P32-SC	✓	✓	0.10					
		0/-18	120	ICN-1P32-SC	✓	✓	0.22	26	0.91	10	0.98	Fig. B/63
			230		✓	✓	0.11					
			277		✓	✓	0.10					
			347	GCN-2P32		✓	0.10	32	1.17	25	0.92	Fig. A/*64
		0/-18	120	ICN-2P32-SC	✓	✓	0.24	29	1.06	15	0.97	Fig. B/*64
			230		✓	✓	0.13					
			277		✓	✓	0.11					
2	25	0/-18	120	RCN-2P32-SC	✓	✓	0.42	49	0.90	20	0.98	Fig. B/64
			277	VCN-2P32-SC	✓	✓	0.18					
			347	GCN-2P32		✓	0.14	47	0.92	15	0.98	Fig. A/64
		0/-18	120	ICN-2P32-SC	✓	✓	0.40	48	0.91	10	0.98	Fig. B/64
			230		✓	✓	0.21					
			277		✓	✓	0.18					
		0/-18	120	RCN-3P32-SC	✓	✓	0.42	51	1.06	10	0.99	Fig. B/*65
			277	VCN-3P32-SC	✓	✓	0.19					
		0/-18	120	ICN-3P32-SC	✓	✓	0.43	51	1.03	15	0.97	Fig. B/*65
			230		✓	✓	0.22					
			277		✓	✓	0.19					
3	25	0/-18	120	RCN-3P32-SC	✓	✓	0.55	66	0.93	10	0.99	Fig. B/65
			277	VCN-3P32-SC	✓	✓	0.24					
		0/-18	120	ICN-3P32-SC	✓	✓	0.56	67	0.90	10	0.98	Fig. B/65
			230		✓	✓	0.29					
			277		✓	✓	0.24					
		0/-18	120	RCN-4P32-SC	✓	✓	0.62	74	1.04	10	0.99	Fig. B/*66
			277	VCN-4P32-SC	✓	✓	0.27					
		0/-18	120	ICN-4P32-SC	✓	✓	0.62	74	1.01	10	0.99	Fig. B/*66
			230		✓	✓	0.32					
			277		✓	✓	0.27					
4	25	0/-18	120	RCN-4P32-SC	✓	✓	0.74	89	0.94	10	0.99	Fig. B/66
			277	VCN-4P32-SC	✓	✓	0.32					
		0/-18	120	ICN-4P32-SC	✓	✓	0.74	89	0.91	10	0.99	Fig. B/66
			230		✓	✓	0.39					
			277		✓	✓	0.32					

See page 1-31 for Dimensions and Wiring Diagrams

Refer to pages 8-32 to 8-41 for lead lengths and shipping data

Lamp Data		Min. Starting Temp. (°F/°C)	Input Volts	Catalog Number	Certifications		Line Current (Amps)	Input Power ANSI (Watts)	Ballast Factor	Max. THD %	Power Factor	Dim./ Wiring Diagram
Number	Watts				UL	CSA						
F28T8 (48") - Consult www.advancetransformer.com for operating characteristics of these ballasts.												
F32T8/ES (30W)												
1	30	60/15	120	RCN-1P32-SC	✓	✓	0.24	29	0.92	10	0.99	Fig. B/63
			277	VCN-1P32-SC	✓	✓	0.10					
		60/15	120	ICN-1P32-SC	✓	✓	0.24	29	0.90	10	0.98	Fig. B/63
			230		✓	✓	0.13					
			277		✓	✓	0.11					
		60/15	120	RCN-2P32-SC	✓	✓	0.31	35	1.10	15	0.92	Fig. B/*64
			277	VCN-2P32-SC	✓	✓	0.13					
			347	GCN-2P32		✓	0.11	35	1.10	20	0.96	Fig. A/*64
		60/15	120	ICN-2P32-SC	✓	✓	0.28	33	1.03	15	0.97	Fig. B/*64
			230		✓	✓	0.15					
			277		✓	✓	0.12					
2	30	60/15	120	RCN-2P32-SC	✓	✓	0.45	54	0.87	10	0.99	Fig. B/64
			277	VCN-2P32-SC	✓	✓	0.20					
			347	GCN-2P32		✓	0.16	55	0.90	10	0.98	Fig. A/64
		60/15	120	ICN-2P32-SC	✓	✓	0.45	54	0.88	10	0.98	Fig. B/64
			230		✓	✓	0.24					
			277		✓	✓	0.20					
		60/15	120	RCN-3P32-SC	✓	✓	0.51	61	1.03	10	0.99	Fig. B/*65
			277	VCN-3P32-SC	✓	✓	0.22					
		60/15	120	ICN-3P32-SC	✓	✓	0.51	61	1.01	10	0.98	Fig. B/*65
			230		✓	✓	0.27					
			277		✓	✓	0.22					
3	30	60/15	120	RCN-3P32-SC	✓	✓	0.66	79	0.88	10	0.99	Fig. B/65
			277	VCN-3P32-SC	✓	✓	0.29					
		60/15	120	ICN-3P32-SC	✓	✓	0.66	79	0.88	10	0.99	Fig. B/65
			230		✓	✓	0.35					
			277		✓	✓	0.29					
		60/15	120	RCN-4P32-SC	✓	✓	0.73	87	1.00	10	0.99	Fig. B/*66
			277	VCN-4P32-SC	✓	✓	0.32					
		60/15	120	ICN-4P32-SC	✓	✓	0.73	87	1.00	10	0.99	Fig. B/*66
			230		✓	✓	0.38					
			277		✓	✓	0.32					
4	30	60/15	120	RCN-4P32-SC	✓	✓	0.87	104	0.88	10	0.99	Fig. B/66
			277	VCN-4P32-SC	✓	✓	0.38					
		60/15	120	ICN-4P32-SC	✓	✓	0.88	105	0.88	10	0.99	Fig. B/66
			230		✓	✓	0.46					
			277		✓	✓	0.38					

Refer to pages 8-32 to 8-41 for lead lengths and shipping data

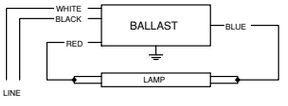
See page 1-31 for Dimensions and Wiring Diagrams

Lamp Data		Min. Starting Temp. (°F/°C)	Input Volts	Catalog Number	Certifications		Line Current (Amps)	Input Power ANSI (Watts)	Ballast Factor	Max. THD %	Power Factor	Dim./ Wiring Diagram
Number	Watts				UL	CSA						
F32T8, FBO31T8, F32T8/U6												
1	32	0/-18	120	RCN-1P32-SC	✓	✓	0.27	32	0.92	10	0.99	Fig. B/63
			277	VCN-1P32-SC	✓	✓	0.12					
		0/-18	120	ICN-1P32-SC	✓	✓	0.26	31	0.90	10	0.98	Fig. B/63
			230		✓	✓	0.13					
			277		✓	✓	0.12					
		0/-18	120	RCN-2P32-SC	✓	✓	0.34	38	1.10	20	0.98	Fig. B/*64
			277	VCN-2P32-SC	✓	✓	0.15					
			347	GCN-2P32		✓	0.12	39	1.12	20	0.96	Fig. A/*64
		0/-18	120	ICN-2P32-SC	✓	✓	0.30	36	1.03	15	0.97	Fig. B/*64
			230		✓	✓	0.16					
			277		✓	✓	0.14					
2	32	0/-18	120	RCN-2P32-SC	✓	✓	0.51	59	0.87	10	0.99	Fig. B/64
			277	VCN-2P32-SC	✓	✓	0.22					
			347	GCN-2P32		✓	0.17	59	0.90	10	0.98	Fig. A/64
		0/-18	120	ICN-2P32-SC	✓	✓	0.49	59	0.88	10	0.98	Fig. B/64
			230		✓	✓	0.26					
			277		✓	✓	0.22					
		0/-18	120	RCN-3P32-SC	✓	✓	0.54	65	1.03	10	0.99	Fig. B/*65
			277	VCN-3P32-SC	✓	✓	0.24					
		0/-18	120	ICN-3P32-SC	✓	✓	0.54	65	1.01	10	0.98	Fig. B/*65
			230		✓	✓	0.28					
			277		✓	✓	0.24					
3	32	0/-18	120	RCN-3P32-SC	✓	✓	0.71	85	0.88	10	0.99	Fig. B/65
			277	VCN-3P32-SC	✓	✓	0.31					
		0/-18	120	ICN-3P32-SC	✓	✓	0.71	85	0.88	10	0.99	Fig. B/65
			230		✓	✓	0.37					
			277		✓	✓	0.31					
		0/-18	120	RCN-4P32-SC	✓	✓	0.79	94	1.00	10	0.99	Fig. B/*66
			277	VCN-4P32-SC	✓	✓	0.34					
		0/-18	120	ICN-4P32-SC	✓	✓	0.78	93	1.00	10	0.99	Fig. B/*66
			230		✓	✓	0.40					
			277		✓	✓	0.33					
4	32	0/-18	120	RCN-4P32-SC	✓	✓	0.94	112	0.88	10	0.99	Fig. B/66
			277	VCN-4P32-SC	✓	✓	0.41					
		0/-18	120	ICN-4P32-SC	✓	✓	0.94	112	0.88	10	0.99	Fig. B/66
			230		✓	✓	0.49					
			277		✓	✓	0.41					

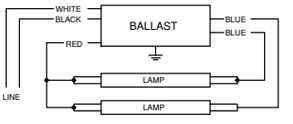
See page 1-31 for Dimensions and Wiring Diagrams

Refer to pages 8-32 to 8-41 for lead lengths and shipping data

Lamp Data		Min. Starting Temp. (°F/°C)	Input Volts	Catalog Number	Certifications		Line Current (Amps)	Input Power ANSI (Watts)	Ballast Factor	Max. THD %	Min. Power Factor	Dim./ Wiring Diagram
Number	Watts				UL							
F40T8												
1	40	32/0	120	ICN-2P32-SC	✓	✓	0.35	42	1.00	10	0.98	Fig. B/*64
			230		✓	✓	0.18					
			277		✓	✓	0.15					
2	40	32/0	120	RCN-3P32-SC	✓	✓	0.66	79	1.01	10	0.99	Fig. B/*65
			277	VCN-3P32-SC	✓	✓	0.31					
		32/0	120	ICN-3P32-SC	✓	✓	0.65	77	1.00	10	0.98	Fig. B/*65
			230		✓	✓	0.33					
			277		✓	✓	0.28					
3	40	32/0	120	RCN-4P32-SC	✓	✓	0.94	112	0.88	10	0.99	Fig. B/*66
			277	VCN-4P32-SC	✓	✓	0.41					
		32/0	120	ICN-4P32-SC	✓	✓	0.94	112	0.97	10	0.99	Fig. B/*66
			230		✓	✓	0.49					
			277		✓	✓	0.40					

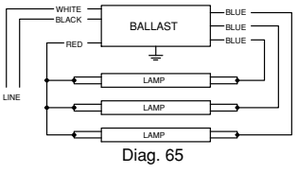


Diag. 63



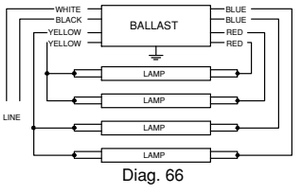
Diag. 64

* For Single Lamp Operation, insulate unused blue lead for 600 volts



Diag. 65

* For Two Lamp Operation, insulate unused blue lead for 600 volts



Diag. 66

* For Three Lamp Operation, insulate unused blue lead for 600 volts

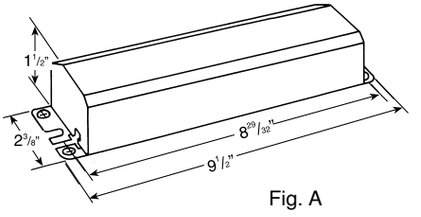


Fig. A

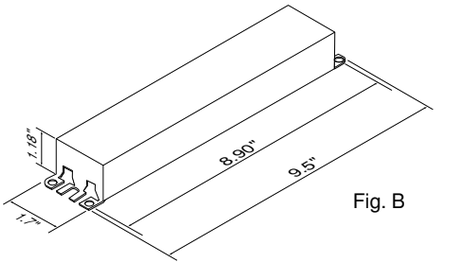


Fig. B

Refer to pages 8-32 to 8-41 for lead lengths and shipping data

T8

HIGH FREQUENCY ELECTRONIC BALLASTS

Instant Start, Normal Light Output
Parallel

HIGH POWER FACTOR SOUND RATED A

Centium® with IntelliVolt®

Lamp Data		Min. Starting Temp. (°F/°C)	Input Volts	Hz	Catalog Number	Certifications				Line Current (Amps)	Input Power ANSI (Watts)	Ballast Factor	Max. THD %	Min. Power Factor	Dim./ Wiring Diagram
Number	Watts					UL	CSA	CE	NOM						
F17T8, FBO16T8															
1	17	0/-18	120	50-60	ICN-1P32-SC	✓	✓		✓	0.16	19	0.93	15	0.96	Fig. B/63
			230							0.08					
			277							0.07					
		0/-18	120	50-60	ICN-2P32-SC	✓	✓		✓	0.18	22	1.07	15	0.95	Fig. B/*64
			230							0.10					
			277							0.09					
2	17	0/-18	120	50-60	ICN-2P32-SC	✓	✓		✓	0.28	33	0.93	15	0.97	Fig. B/64
			230							0.14					
			277							0.13					
		0/-18	120	50-60	ICN-3P32-SC	✓	✓		✓	0.32	38	1.07	15	0.96	Fig. B/*65
			230							0.17					
			277							0.14					
3	17	0/-18	120	50-60	ICN-3P32-SC	✓	✓		✓	0.39	48	0.92	15	0.97	Fig. B/65
			230							0.21					
			277							0.17					
		0/-18	120	50-60	ICN-4P32-SC	✓	✓		✓	0.45	53	1.04	15	0.97	Fig. B/*66
			230							0.23					
			277							0.20					
4	17	0/-18	120	50-60	ICN-4P32-SC	✓	✓		✓	0.54	64	0.93	10	0.98	Fig. B/66
			230							0.28					
			277							0.23					
F25T8, FBO24T8															
1	25	0/-18	120	50-60	ICN-1P32-SC	✓	✓		✓	0.22	26	0.91	10	0.98	Fig. B/63
			230							0.11					
			277							0.10					
		0/-18	120	50-60	ICN-2P32-SC	✓	✓		✓	0.24	29	1.06	15	0.97	Fig. B/*64
			230							0.13					
			277							0.11					
2	25	0/-18	120	50-60	ICN-2P32-SC	✓	✓		✓	0.40	48	0.91	10	0.98	Fig. B/64
			230							0.21					
			277							0.18					
		0/-18	120	50-60	ICN-3P32-SC	✓	✓		✓	0.43	51	1.03	15	0.97	Fig. B/*65
			230							0.22					
			277							0.19					
3	25	0/-18	120	50-60	ICN-3P32-SC	✓	✓		✓	0.56	67	0.90	10	0.98	Fig. B/65
			230							0.29					
			277							0.24					
		0/-18	120	50-60	ICN-4P32-SC	✓	✓		✓	0.62	74	1.01	10	0.99	Fig. B/*66
			230							0.32					
			277							0.27					
4	25	0/-18	120	50-60	ICN-4P32-SC	✓	✓		✓	0.74	89	0.91	10	0.99	Fig. B/66
			230							0.39					
			277							0.32					

NOM approved ballast require special ordering, contact your local salesperson.

See page 6-11 for dimensions and wiring diagrams

INTERNATIONAL ELECTRONIC

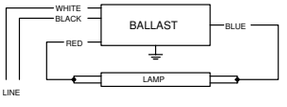
Instant Start, Normal Light Output
Parallel

HIGH POWER FACTOR SOUND RATED A

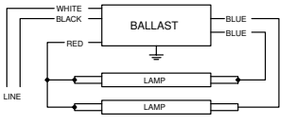
Centium® with IntelliVolt®

Lamp Data		Min. Starting Temp. (°F/°C)	Input Volts	Hz	Catalog Number	Certifications				Line Current (Amps)	Input Power ANSI (Watts)	Ballast Factor	Max. THD %	Min. Power Factor	Dim./ Wiring Diagram
Number	Watts					UL	CSA	CE	NOM						
F32T8, FBO31T8, F32T8/U6															
1	32	0/-18	120	50-60	ICN-1P32-SC	✓	✓		✓	0.26	31	0.90	10	0.98	Fig. B/63
			230							0.13					
			277							0.12					
		0/-18	120	50-60	ICN-2P32-SC	✓	✓		✓	0.30	36	1.03	15	0.97	Fig. B/*64
			230							0.16					
			277							0.14					
2	32	0/-18	120	50-60	ICN-2P32-SC	✓	✓		✓	0.49	59	0.88	10	0.98	Fig. B/64
			230							0.26					
			277							0.22					
		0/-18	120	50-60	ICN-3P32-SC	✓	✓		✓	0.54	65	1.01	10	0.98	Fig. B/*65
			230							0.28					
			277							0.24					
3	32	0/-18	120	50-60	ICN-3P32-SC	✓	✓		✓	0.71	85	0.88	10	0.99	Fig. B/65
			230							0.37					
			277							0.31					
		0/-18	120	50-60	ICN-4P32-SC	✓	✓		✓	0.78	93	1.00	10	0.99	Fig. B/*66
			230							0.40					
			277							0.33					
4	32	0/-18	120	50-60	ICN-4P32-SC	✓	✓		✓	0.94	112	0.88	10	0.99	Fig. B/66
			230							0.49					
			277							0.41					
F40T8															
1	40	32/0	120	50-60	ICN-2P32-SC	✓	✓		✓	0.35	42	1.00	10	0.98	Fig. B/*64
			230							0.18					
			277							0.15					
2	40	32/0	120	50-60	ICN-3P32-SC	✓	✓		✓	0.65	77	1.00	10	0.98	Fig. B/*65
			230							0.33					
			277							0.28					
3	40	32/0	120	50-60	ICN-4P32-SC	✓	✓		✓	0.94	112	0.97	10	0.99	Fig. B/*66
			230							0.49					
			277							0.40					

NOM approved ballast require special ordering, contact your local salesperson.

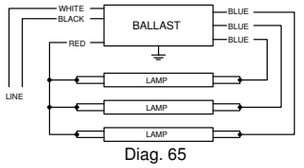


Diag. 63



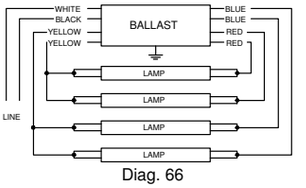
Diag. 64

* For Single Lamp Operation, insulate unused blue lead for 600 volts



Diag. 65

* For Two Lamp Operation, insulate unused blue lead for 600 volts



Diag. 66

* For Three Lamp Operation, insulate unused blue lead for 600 volts

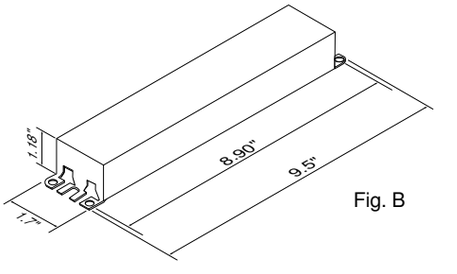


Fig. B