Fluorescent Ballasts - Dimming - Mark 10 *Powerline*

Mark 10 *Powerline* Electronic Dimming Ballasts for Linear Fluorescent and 4-Pin Compact Fluorescent Lamps

For companies looking to make their fixed-output linear T8, 4-pin CFL, and T5/HO fluorescent systems more cost effective and sustainable, Mark 10 *Powerline* ballasts provide an easy solution without the need for additional control leads. Simply, replace the ballast, replace the switch, dim the lights, that is all it takes.

It's that easy to bring the convenience and flexibility of fluorescent dimming to conference rooms, private offices, auditoriums, architectural cove lighting – anywhere dimming is required.

Input voltage to dimmer	Control Voltage to Ballast (from Dimmer)	
	Max Light Output	Min Light Output
120V	120V	56V
277V	277V	129V

Available in linear T8, 4-pin CFL, and T5/HO models
Making this ideal for a variety of applications

Full range continuous dimming (100% light output down to 5% - T5/HO to 1%)
Provides task appropriate comfort only where necessary to increase potential energy savings while supporting LEED performance standards

Programmed start operation
Potentially extends lamp life in frequent switching applications such as occupancy sensors and daylight harvesting

NEMA Premium®

The following ballasts meet NEMA Premium®:
REZ-132-SC, REZ-2S32-SC, REZ-3S32-SC,
VEZ-132-SC, VEZ-2S32-SC, VEZ-3S32-SC

As a licensee in the NEMA Premium Ballast Program, Philips Lighting Electronics N.A. has determined that these products meet the NEMA Premium specification for premium energy efficiency.

For 17 - 32W Lamps

HIGH POWER FACTOR SOUND RATED A

Mark 10 Powerline *Electronic Dimming Ballast*

No. of Lamps	Input Volts	Lamp Starting Method	Ballast Family	Catalog Number	Max/Min Input Power ANSI (Watts)	Max/Min Ballast Factor	Full Light Output THD %	Full Light Output Line Current (Amps)	Min. Starting Temp. (°F/°C)	Dim.	Wiring Dia.
F17T8, FBO16T8 (17W)											
1	120	PS	Mark 10 *Powerline*	REZ-132-SC	24/7	1.05/0.05	10	0.20	50/10	B	152
	277			VEZ-132-SC				0.09			
2	120			REZ-2S32-SC	38/13			0.32			153
	277			VEZ-2S32-SC				0.14			
3	120			REZ-3S32-SC	56/18			0.47			155
	277			VEZ-3S32-SC				0.21			
F25T8, FBO24T8 (25W)											
1	120	PS	Mark 10 *Powerline*	REZ-132-SC	30/7	1.05/0.05	10	0.26	50/10	B	152
	277			VEZ-132-SC				0.11			
2	120			REZ-2S32-SC	55/13			0.46			153
	277			VEZ-2S32-SC				0.20			
3	120			REZ-3S32-SC	79/19			0.66			155
	277			VEZ-3S32-SC				0.29			
F32T8, FBO31T8, F32T8/U6 (32W)											
NEMA Premium 1	120	PS	Mark 10 *Powerline*	REZ-132-SC	35/9	1.00/0.05	10	0.29	50/10	B	152
	277			VEZ-132-SC				0.13			
NEMA Premium 2	120			REZ-2S32-SC	68/15			0.57			153
	277			VEZ-2S32-SC				0.25			
NEMA Premium 3	120			REZ-3S32-SC	96/20	0.97/0.05		0.80			155
	277			VEZ-3S32-SC				0.35			

Some lamp manufacturers recommend burning in new lamps 100 hours at full light output before dimming. Consult lamp manufacturer.

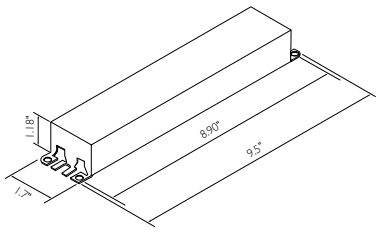
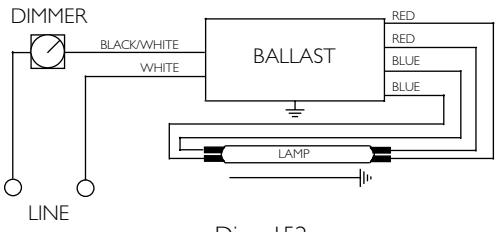
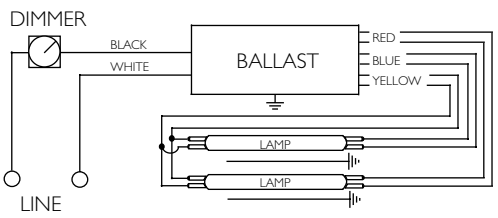


Fig. B



Diag. 152



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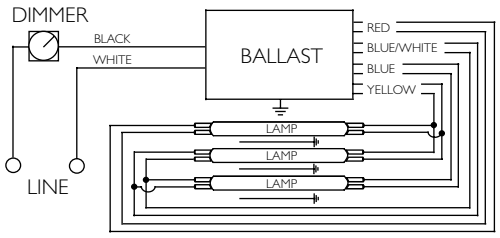

Diag. 155

ONLY USE RAPID-START SOCKETS

Refer to pages 1-15 to 1-19 for information on remote/tandem wiring and lead length extension
Refer to pages 2-32 & 2-33 for compatible Mark 10 Powerline controls
Refer to pages 9-23 to 9-27 for lead lengths and shipping data

Total Harmonic Current

Non-Dimming Applications

When selecting a ballast for a lighting application, the Total Harmonic Current (THC) rating of the ballast is more significant than Total Harmonic Distortion (THD). This is because the absolute value of harmonic current, not the percentage, affects the electrical power distribution system. As can been seen in the table below, the THC rating of our Standard 2-lamp electronic T8 lamp ballast (REL-2P32-SC) is well below that of both the conventional (RQM-2S40-TP) and energy-saving magnetic T12 lamp ballasts (R-2S40-TP) it replaces. Moreover, the THC rating of our Centium electronic ballast is even lower.

Dimming Applications

Mark 7 0-10V and ROVR

Traditional low voltage controlled ballasts and ROVR typically produce less than 10% THD at full light output and less than 20% THD throughout the entire dimming range, but require extra wires for the control circuit. THC is lower than that of the conventional or energy-saving magnetic system.

Mark 10 Powerline

Mark 10 *Powerline* electronic dimming ballasts are controlled by 2-wire modified powerline phase-cut style line voltage dimmers. Whenever the ballast is dimmed, the input voltage is cut or "chopped", causing the THD to increase and the Power Factor to decrease.

Mark 10 *Powerline* electronic dimming systems (ballast and controller) have similar THD and Power Factor levels as the conventional lighting systems they replace. Since a much smaller load is required by the Mark 10 *Powerline* electronic dimming system to achieve the same illumination level as a magnetic ballast system (20-30% less), the total input current will be considerably less. As a result, the magnitude of the total harmonic current will be less.

For example, a typical Mark 10 *Powerline* electronic ballast and dimmer control might draw a line current of 0.58A at 15% THD at full light output. If the light level is reduced to 5% of the maximum, the input power is decreased to 0.19A at 95% THD. While the THD level may seem high at the 5% maximum light output setting, the total harmonic current is still lower (0.13A) than the conventional T12 magnetic system (0.20A). Moreover, the overall heating effect on the wires and the distribution transformer is not higher than the existing conventional or energy saving T12 magnetic systems.[1]

Conclusions

A simple ballast retrofit to electronic ballasts should not cause harmonic problems if none existed before the retrofit. Also, in new fixture applications, total harmonic distortion should not be a concern when specifying electronic ballasts. Finally, it is important to remember that electronic ballasts are not the greatest source of THD in an electrical distribution system. Other electronic devices such as computers, laser printers, and other electronic equipment can draw current with more than 100% THD in some cases.

Table 1: Comparison of THD and THC Levels

Philips Advance Part No.	Ballast Type	Light Output Setting	Lamp Type	Input Current	% THD	THC[2]
RQM-2S40-TP	Conventional Magnetic	100% (Ballast Factor is 0.98)	(2) F40T12	0.84A	<25%	0.20A
R2S40-TP	Energy Saving Magnetic	100% (Ballast Factor is 0.95)	(2) F34T12	0.63A	<20%	0.12A
REL-2P32-SC	*Standard* Electronic	100% (Ballast Factor is 0.88)	(2) F32T8	0.49A	<20%	0.10A
ICN-2P32-N	*Centium* Electronic	100% (Ballast Factor is 0.88)	(2) F32T8	0.49A	<10%	0.05A
IZT-2S32-SC + Dimming Control	*Mark 7 0-10V* Electronic	100% (Ballast Factor is 1.0)	(2) F32T8	0.57A	<10%	0.05A
IZT-2S32-SC + Dimming Control	*Mark 7 0-10V* Electronic	5% (Ballast Factor is 0.05)	(2) F32T8	0.12A	<20%	0.02A
REZ-2S32-SC (Ballast Only)	*Mark 10 Powerline* Electronic	100% (Ballast Factor is 1.0)	(2) F32T8	0.58A	<10%	0.06A
REZ-2S32-SC + Dimming Control	*Mark 10 Powerline* Ballast + Dimmer	100% (Ballast Factor is 1.0)	(2) F32T8	0.58A	<15%	0.09A
REZ-2S32-SC + Dimming Control	*Mark 10 Powerline* Ballast + Dimmer	5% (Ballast Factor is 0.05)	(2) F32T8	0.19A	<95%	0.13A

[1] For a more technical study comparing the a Mark 10 *Powerline* electronic dimming system to an energy saving magnetic system that it replaces, see the article Total Harmonic Distortion in Philips Advance Mark 10 *Powerline* Electronic Dimming Systems by O.C. Morse.

[2] The Total Harmonic Current (THC) of a ballast is calculated by the following equation: An approximation of THC may be obtained by simply multiplying the ballast input current by %THD.

$$\frac{\text{Ballast Input Current}}{\text{Square Root of } (1 + 1/\text{THD}^2)}$$

Ordering Information

How to Order

Philips Lighting Systems and Controls 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 - HI - LD

CFL Mounting/Connector Options

BL = Bottom leads
BLS = Bottom leads with mounting studs
BS = Bottom mounting studs with single entry color coded connectors
EL = End leads
LD = Length mounting feet with SmartMate® dual entry color coded connectors
QS = QuikStart

Linear Fluorescent Mounting/Connector Options

2LS = 2 Level Switching

CFL Can Desription
HI = Hybrid metal / plastic case, size 1
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
M6 = Metal case, size 6

Linear Fluorescent Can Desription
90C = 90°C maximum case temperature rating
A = 'A' can
D = 'D' can
G = 'G' can
HL = High light output
L = 'L' can
LW = Low watt
MC = Micro can
N = 'N' can
SC = Small can

Lamp Watts (Primary lamp)

Wiring Configuration

D = 2D, series
M = Modified parallel**
P = Parallel
PSP = Programmed Start 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
DA = ROVR
EB = AmbiStar
EZ = Mark 10® *Powerline*
MB = AmbiStar
TR = EssentiaLine *Powerline*
ZT = Mark 7® *0-10V*
CN = Centium
DL = ROVR
ELB = AmbiStar
LV = EssentiaLine *0-10V*
OP = Optanium
UV = PureVolt

Input Voltage

G = 347V
H = IntelliVolt 347V to 480V 50/60 Hz
I = IntelliVolt 120V to 277V 50/60 Hz
R = 120V
V = 277V

Corporate Offices
(800) 322-2086

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

Visit our web site at www.philips.com/advance

- 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 Philips Advance electronic ballast which best matches the requirements of your application. The technical specifications in this catalog (located on pages 9-6 to 9-13) will be useful in obtaining bids from electrical contractors.
- Contact your local Philips Lighting 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.

ELECTRONIC FLUORESCENT BALLASTS

	Allowed Wiring Configuration			Maximum Lead Length (Feet) for Tandem or Through Wiring (Total length of all wires between ballast and lamp sockets)						Application Note
	Remote (max length)	Tandem	Through	Blue	Red	Yellow	Blue/White	Brown	Orange	
REB-4P32-SC	20"	Yes	Yes	20'	20'	20'				1
REB-2S13-M6-EL	No	No	No							5
REB-2S18-M6-EL	No	No	No							5
REB-2S26-M6-EL	No	No	No							5
RELB-1S40-SC	20"	NA	NA							4
RELB-2S40-N	20"	Yes	Yes	4'	10'	10'				2
REZ-132-SC	6'	NA	NA							4
REZ-154	No	NA	NA							5
REZ-1Q18-M2-BS REZ-1Q18-M2-LD	No	NA	NA							5
REZ-1T42-M2-BS REZ-1T42-M2-LD	No	NA	NA							5
REZ-1TTS40-SC	6'	NA	NA							4
REZ-2Q18-M2-BS REZ-2Q18-M2-LD	No	No	No							5
REZ-2Q26-M2-BS REZ-2Q26-M2-LD	No	No	No							5
REZ-2S32-SC	6'	Yes	Yes	6'	6'	6'				1
REZ-2S54	No	No	Yes	5'	4'	4'				3
REZ-2T42-M3-BS REZ-2T42-M3-LD	No	No	No							5
REZ-2TTS40-SC	6'	No	No							5
REZ-3S32-SC	No	No	No							5
RK-2S32-TP	20'	Yes	Yes	4'	20'	20'				2 (a)
RTR-2S32-SC	6'	Yes	Yes	6'	6'	6'				1
RZT-154	No	NA	NA							5
RZT-2S54	No	No	Yes	5'	4'	4'				3
VEZ-132-SC	6'	NA	NA							4
VEZ-154	No	NA	NA							5
VEZ-1Q18-M2-BS VEZ-1Q18-M2-LD	No	NA	NA							5
VEZ-1T42-M2-BS VEZ-1T42-M2-LD	No	NA	NA							5
VEZ-1TTS40-SC	6'	NA	NA							4
VEZ-2Q18-M2-BS VEZ-2Q18-M2-LD	No	No	No							5
VEZ-2Q26-M2-BS VEZ-2Q26-M2-LD	No	No	No							5
VEZ-2S32-SC	6'	Yes	Yes	6'	6'	6'				1
VEZ-2S54	No	No	Yes	5'	4'	4'				5
VEZ-2T42-M3-BS VEZ-2T42-M3-LD	No	No	No							5
VEZ-2TTS40-SC	6'	No	No							4
VEZ-3S32-SC	No	No	No							5
VK-2S32-TP	20'	Yes	Yes	4'	20'	20'				2 (a)
VTR-2S32-SC	6'	Yes	Yes	6'	6'	6'				1
VZT-154	No	NA	NA							5
VZT-2S54	No	No	Yes	5'	4'	4'				3
VZT-4S32-HL	No	No	Yes	1'	1.25'	5.2'	1.25'	4.2'		3
VZT-4PSP32-G	No	No	Yes	5'	5'	1'	5'	R/W=5'		3
VZT-4S32-G	No	No	Yes	1'	1.25'	5.2'	1.25'	4.2'		3

For nominal input voltage and 25°C ambient temperature. See all notes on page 1-19.