CCI Microprocessor Controlled Ballast
- Application Notes -

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CCI Power Supplies

Chapter 1: Product Overview

CCI's latest generation of ballasts are electronic, microprocessor controlled, pulse start, metal halide lamp ballasts, utilizing the latest control and lamp drive technology.
They are hardware and software optimized to the lamp manufacturers' specifications to maximize lamp qualities and longevity.
Our ballasts maintain a constant power to the lamp for maximum efficiency and consistent light / color output, while automatically compensating for bulb aging.

All ballasts allow Remote ON/OFF, Dimming and Lamp Lit Monitoring using hardware controls.

Available Software Control

- allows the outputs of multiple fixtures to be synchronized to provide even wash effect despite bulb aging.
- permits remote control of the lamp On/Off and Power Levels.
- allows Remote Monitoring of Lamp Lit Status, Lamp Voltage and Lamp Current.
- reports Internal Temperature, Heatsink Temperature and Line Voltage.

All CCI ballasts utilize a small, separate ignitor that allows placement near the lamp and the freedom to mount the ballast wherever convenient.

CCI Microprocessor Controlled Ballast: a fifth generation design from a company who has been supplying reliable, Custom HID ballasts to OEM manufacturers for nearly two decades.

These notes are to encompass the CCI Microprocessor Controlled Ballast product line. Not all features or notes pertain to all ballasts. Please refer to the specification sheet for the applicable ballast.

Features

Custom designed or customized: To meet OEM needs.
Versatility: One ballast with multiple lamp profiles, customer selectable.
High Efficiency: >88% typical
20 millisecond holdup time: One cycle loss of power will not douse the lamp.
Remote Operations: Via hardware or software.
Software Controllable: RS485/RS422
Software Trimming: To minimize output variations between fixtures.
Dimming; Hardware and software.
Temperature Monitoring: For Micro safety features and customer monitoring.
Small Size and/or split systems: For increased flexibility.
Ballast Microprocessor controlled Ignitor Ignition profile.
Remote Ignitors: Allows flexibility to place close to lamp.
EMI: Designed to meet your needs. Integrated, external or no filters.
Safety: Designed to Standard UL 1029, EN61347-2-12

Safety Features

Over Temp Shut Down
Over Temp Power Reduction
Output Terminal to Terminal Latching
Run-Up Current Limited
Steady State Current Limit
Under Voltage Shut Down
Lamp Lit monitoring
Lamp Life window monitoring

Operational Conditions

The CCI Microprocessor Controlled Ballasts are extremely reliable, using only the highest quality components and extremely efficient thermal designs. This allows them to run at ambient temperatures anywhere between -20ºC and +60ºC.

Care should be taken, especially in regions with high humidity, to isolate ballast against condensation.

CCI designs its products to operate in the real world electrical environment.
However, every effort should be made to maintain a clean electrical power source within the ballast's operational range, in order to achieve optimal performance and reliability.

External filters and fusing should be installed for ballasts requiring them.

Chapter 2: Ballast Functions

Power Control

The CCI ballast continuously monitors output current and voltage to securely control lamp power. Typically <1%.

Output Squarewave Frequency is factory selected between 100Hz-400Hz. Typically 120Hz

(<80Hz flicker becomes an issue, > 400Hz acoustic resonances may be generated)

Open Circuit Voltage is Typically 380V *(>300V for improved lamp striking)*

Steady State Current Limit

The Steady State Current is set at the factory within the software to the lamp manufacturers' specifications. The Microcontroller compares this to the actual current and will reduce power if needed so as not to exceed the current limit. This is just one of the ballast's many safety features.

Run-Up Profile

The CCI ballast run-up is closely monitored, controlled and shaped by the microprocessor.

CCI, working with lamp manufacturers, has created a run-up profile that not only optimizes striking ability, but also is less harsh on the lamp. We start off at a very low frequency until the lamp is struck before shifting to the selected final frequency.

During run-up, the microprocessor is transitioning snubbers and filters in and out to aide in a clean lamp strike.

Ignitor Ignition Profile

Like the run-up profile, the ballast microprocessor controls and shapes the Ignitor's output until the lamp strikes. The profile is factory configurable should a lamp specification or customer call for something different.

CCI Standard is: Pulse for 10s, wait for 30s. Repeat six times.

If, after six complete cycles, lamp hasn't struck, ballast will hold off for five minutes, then repeat.

Run-Up Current Limited

The Run-Up Current Limit is set at the factory within the software to the lamp manufacturers' specifications. The Microcontroller compares this to the actual current and holds the current at this value until the lamp voltage increases sufficiently to come out of run-up.

Hardware Control

CCI uses a three opto-coupler setup for its hardware control functions.

Lamp Enable pins: Applying 5V tells the microprocessor to initiate Lamp Run-Up Procedure. {CCI Standard Logic is No Lamp until Lamp Enable Opto is conducting (5V across the input pins). Logic is software reversible at factory}

Lamp Dim pins: Applying 5V tells the microprocessor to Reduce Power to the factory set Dim Level. This is settable between 50%-100%. Typically 60%. {CCI Standard Logic is Full Power until Lamp Dim Opto is conducting (5V across the input pins). Logic is software reversible at factory}

Lamp Status pins: Applying 5V through a pull-up resistor to the output of this opto will provide the status of the lamp. When the microprocessor determines that the lamp is lit, it waits five seconds before driving the opto to conduct, this causes the output to go low. (CCI Standard Logic is output is LOW when LAMP is LIT. Logic is reversible at factory)

PWM Dimming

When turned on (factory set), the DIM pins can be used to Linear Dim between full power and factory set dim level using a 1kHz 0-5V squarewave. (CCI Standard Logic is 0% duty cycle =100% power. 100% duty cycle = maximum dim. This logic is factory reversible, as is the dim level)

Software Control

The CCI ballasts have the ability to be controlled and monitored via RS485/RS422.

Actions:

- Turn Lamp Off
- Turn Lamp On
- Select Lamp
- Set Lamp Power in %
- Increment User Power Trim
- Decrement User Power Trim
- Save User Power Trim Permanently
- Reset User Power Trim to 0 Permanently
- Clear Last Problem Code

Queries

- Query Lamp Lit
- Query Active Lamp Number
- Query Lamp Current
- Query Lamp Voltage
- Query Line Voltage
- Query Heat Sink Temperature
- Query Internal Air Temperature
- Query Last Problem Code

Software Trimming

Using software control and Increment/Decrement User Power Trim commands above, ballast can be fine tuned so that the light output of numerous fixtures match.

Note: After trimming to the desired power, a “Save User Power Trim Permanently” command must be given or settings will not be saved when powered off.

Temperature Monitoring

The ballast continuously monitors heatsink temperatures for its integrated safeties. It also provides this and Internal Air Temperature to the customer using software control.

Over Temp Shut Down

The ballast continuously monitors heatsink temperature and at a factory set temperature (typically 105°C) the ballast will shut off lamp power. When heatsink temperature drops a predetermined amount (typically 9°C) the ballast will once again light the lamp.
Both the shut-off temperature and the hysteresis temperature are factory settable.

Over Temp Power Reduction

The ballast continuously monitors heatsink temperature and when the Power Reduction feature is factory activated, the ballast will reduce lamp power at a set temperature (typically 100°C) by a set percentage. (typically 80%). When heatsink temperatures drop below a set level (typically 90°C) the ballast will restore full lamp power.
Feature activation, temperature limit, % reduction and restore power level are all set in software at the factory.

Output Terminal to Terminal Latching

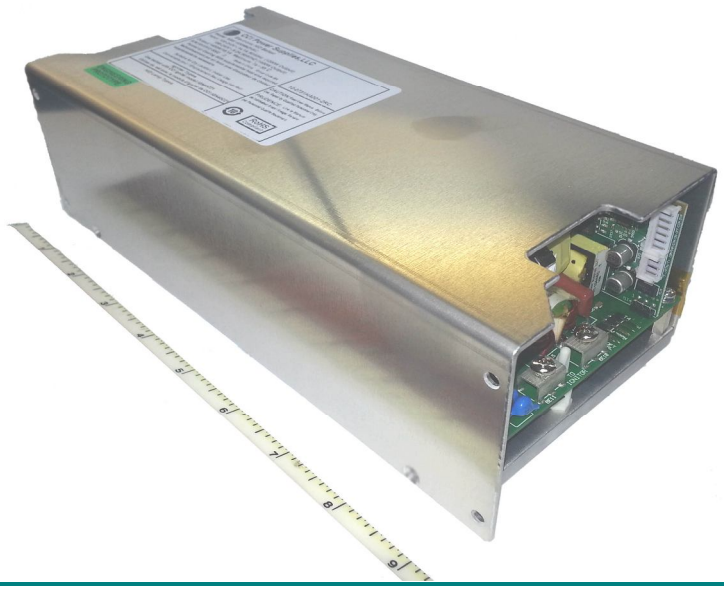
The ballast output latches off on terminal to terminal short. Reset is accomplished by toggling power off/on. There is no short circuit protection for a terminal to ground short. Damage to ballast may occur and is not warranted.

Under Voltage shut down

The microprocessor reads the line voltage at power-on, then at a 1s rate thereafter and compares it to the factory set value. If the voltage is under the programmed value, the ballast will not supply lamp power.

End of Lamp Life window monitoring

As another safety feature, CCI ballasts measures the lamp voltage after approximately a 12 minute settling time and compares it against the manufacturers' specification. If the lamp voltage is Above or Below the programmed window, then the ballast will turn off lamp power. This is intended to prevent passive lamp failures.



Chapter 3: Design Considerations

Lamp Compatibility

CCI ballast are optimized to the lamp manufacturers' specifications of a specific lamp, this is to maximize lamp qualities and longevity. Please refer to the specification sheet for the applicable ballast to verify lamp compatibility.

Additional lamps may also be compatible, or it may require customized software to work properly with your desired lamp. Please consult CCI.

Multiple Lamp Ballast

The CCI Microprocessor Controlled Ballast has the ability to be programmed for multiple lamps. This allows our customers to use the same ballast in more than one fixture by moving just one jumper or software control.

Cold plate size and mounting

Most CCI ballasts have heatsinks designed to be mounted to a cold plate in conjunction with airflow. Always mount the Ballast on a flat surface with good heat conductivity, away from any avoidable sources of heat and with sufficient airflow.

If the ballast is not correctly mounted, it will overheat. Overheating reduces the performance of the ballast and will trigger the ballast to shut down or power reduction.

Please refer to the ballast specific specification sheet for mounting and sizing requirements.

Cooling fan

All CCI ballasts require some amount of airflow across the heatsinks and components.

Inadequate airflow will cause the ballast to overheat. Overheating reduces the performance of the ballast and will trigger the ballast to shut down or power reduction.

Please refer to the ballast specific specification sheet for fan sizing requirements.

Amb temp considerations (operating Conditions)

A ballast, like any other electrical device, generates heat during normal operation.

Planning for maximum heat dissipation with proper fixture design and ballast installation will minimize the possibility of a heat-related problem.

Our ballast are designed and tested to work within an environmental operating range as specified in the ballast's specific specification sheet. These specification sheets are usually created in conjunction with customer's requirements.

Please ensure your fixture can be maintained within this range.

Input power requirements (Power Quality)

CCI offers ballasts designed to operate from 90-264Vac, 47-63Hz.

Please refer to the ballast specific specification sheet for input power requirements.

CCI designs its products to operate in the real world electrical environment.

However, every effort should be made to maintain a clean electrical power source within the ballast's operational range, in order to achieve optimal performance and reliability.

Input filter, use and type

CCI ballasts are designed to meet our customers EMI needs whether it is with the use of internal or external filters.

For those ballasts without integrated filters, we design and manufacture external filters that can be mounted independently to meet your needs.

Please refer to the ballast specific specification sheet for available filter options.

Input Fusing

Not all CCI ballasts contain internal AC fuse protection. Refer to ballast specific specification sheet on external fuse rating guidance.

Ignitor

CCI designs and manufactures Ignitors for all applications.

Our igniters are typically smaller and enclosed, which allows placement near the lamp and freedom to mount the ballast in a more convenient location.

> *Warning: Ignitors produce starting voltages in excess of 4kVpk, which is hazardous to personnel and equipment. Do not touch any conductive parts during operation.*
> *Use appropriate insulation for the voltage potential involved.*

Ignitor cables

Use High Voltage Silicone (>15kV rating) wire of sufficient gauge to handle maximum current rating of your application.

Cables should be kept as short as possible for your applications

Emi noise from cables

Great care should be observed in cable routing within the fixture. Ballast outputs are typically very high in voltage and current and will cause noise if routed together with low voltage logic lines. Attention to proper shielding and spacing techniques up front will alleviate many issues and rerouting in the final product.