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DEB 200 DC - PIC

Electronic Flicker Free Ballast

MOD. 2205.500

INSTRUCTION AND MAINTENANCE MANUAL

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INDEX

SECTION 1

1.1 - GENERAL

The new DEB 200W-DC electronic ballasts is designed to provide a compact, lightweight, flicker free power source for metal halide discharge lamps.
The new electronic circuit founded on the new MICROCHIP small microprocessors is very compact and with little components number. The input voltage is automatically switched from 24Vdc or 30Vdc the inverter frequency is generated from a 4MHz quartz oscillator. The output power is stabilized to compensate the lamp voltage variations due to the different maker or lamp aging.
Each ballast is contained within housing metal box comprising heat sink. The only one electronic board and power components are mounted on the heat sink, a top plate that contains all the control and the connectors.
Each ballast is given a unique serial number that can be found on the identification plate riveted to the ballast.
The casing finish is a gray, anti scratch epoxy powder paint, with a gray plastic covered top plate.

1.2 - CONTROLS

The controls for the ballast are all mounted on the gray top plate and comprise the on / off button and the dimmer potentiometer.

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SECTION 2

OPERATION & ROUTINE MAINTENANCE

2.1 - OPERATION

2.1.1 Ensure that a correctly sized connector has been fitted in relation to both the ballast output rating and the size of the battery supply.

BATTERY CONNECTORS: 24 - 30 Vdc 16A

2.1.3. Ensure that the lamp fixtures are fitted with an operational lamp.
2.1.4. Connect the lamp fixtures to the ballast using the cable supplied with the lamp fixtures, ensuring that the groove of the military specification connector along the inner body aligns with the pin on the internal face of the outer housing of the outlet, (on the face of the ballast) and push home. Take a grip of the outer sleeve of the cable connector and rotate clockwise. The twist lock will rotate through approximately 90° and then come positively to a stop.
2.1.5. Connect the ballast to the battery.
2.1.7. The system is now ready for use and operation can be initiated from the on switch on the lamp fixtures or ballast.
2.1.8. The lamp fixtures will ignite irrespective of the dimmer setting and will reach its stable position after approximately 1 - 2 minutes from cold when it will automatically revert to the dimmer setting dialed up. Full clockwise rotation gives maximum rated output while full contrary clockwise rotation will dim the light output by nominally 30% of its maximum rated value.

2.2 ROUTINE MAINTENANCE

2.2.2. Clean the ballast casing, removing all dust and grime.
2.2.3. Check the condition of the battery cable and connector for signs of visible damage .
2.2.4. Check the multipin output socket for signs of damage or deformation.
2.2.5. Check for the free rotation of the dimmer control.

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SECTION 3

BALLAST FAULT ANALYSIS

SYMPTOM	POSSIBLE CAUSE	REMEDY
• Lamp fixtures fails to light up and make one flash for a short time.	• Lamp not fitted or blown. • Connector not mated correctly or with oxidation in the contacts. • Ballast fails to operate	• Fit operational lamp • Re-make connection. • Clean the oxidation from the contacts .
• The lamp fails to light up and a noise is audible inside the housing of the lamp fixtures.	• Igniter in the lamp fixtures failed. • High voltage cable damaged. • Lamp holder damaged.	• Replace igniter. • Replace high voltage cables. • Replace lamp holder.
• The lamp turns on but it never reach full power and the ballast emits a high pitch noise. • The lamp turns on but shuts off after it has warmed up.	• Ballast fails to operate.	• Inverter circuit failure
• The lamp fails to light up and there is no noise audible inside the housing of the lamp fixtures.	• Ballast fails to operate	• Refer to dismantling, operate and test procedures: there may be some power components in short circuit inside the ballast on the chopper stage.

SECTION 4

SPECIFICATION & PRINCIPALS OF DESIGN AND OPERATION.

4.1 TECHNICAL SPECIFICATION.

4.1.1 Electrical Performance.

Input voltage	24Vdc– 30Vdc
Nominal effective input current	9 at 24 7at 30
Efficiency (Average)	90%
Dimmer range	40 %
On/Off control	local

4.1.2 Dimensions and Weight

Dimensions	Width 165 mm. Height 120 mm. Depth 67 mm.
Weight	1 kg.
Working position	Ballast with control panel facing top.
Max. Ambient temperature & Humidity allowed	-15 +40°C Not condensing

4.2 - GENERAL

4.2.1 Electronic ballasts have been designed to power Metal Halide Discharge and equivalent type discharge lamps.
4.2.2 Such lamps after the ignition and warm up period, work similarly to a bi-directional Zener diode, i.e. they fix the voltage at a constant value irrespective of the current they receive. Therefore to operate stability they require a current generator, a BALLAST.
4.2.3 The lamps steady (optimum) working voltage is lower than at the cold strike ignition and warm up period and is achieved approximately 2 minutes after a cold strike.
4.2.4 - A special igniter circuit is used to provide HIGH VOLTAGE (in the range of 15KV to 70KV dependent upon the lamp size) pulses for a few seconds to generate the arc between the lamps electrodes.

4.3 – BALLAST STRUCTURE

4.3.1 The structure of the DEB DC electronic ballasts can be sub-divided into two major elements, being :

(a) Power control circuit (Chopper circuit)

(b) DC - AC Converter (Inverter circuit) circuit) to provide the nominal 310V.

4.5 – SUMMARY CHOPPER CIRCUIT DESCRIPTION

4.5.1 The chopper is the circuit regulating the power supplied to the lamp. It works at high frequency and uses as a switch, a power Mosfet.

4.6 – SUMMARY INVERTER CIRCUIT DESCRIPTION

4.6.1 The DC - AC converter is a square wave inverter working at 100 Hz. The frequency is generated from a 4 MHz quarz oscillator and the final frequency of 100 Hz Like power switch are used last generation and power IGBT.

4.7 – FLICKER FREE

4.7.1 Compared with conventional wire wound magnetic ballasts, electronic ballasts offer considerable advantages :
4.7.2 Flicker Free performance, lamp power and frequency stabilization (the lamp is properly supplied independent from mains fluctuations).
4.7.3 The possibility to regulate (dim) the light intensity by approximately 30% from its maximum value.
4.7.4 The size and weight of these units is considerably less than those of conventional units.
4.7.5 The same electronic ballast will operate from different mains voltages.

SECTION 5

DISMANTLING & TEST PROCEDURES

1. countered and components replaced.

5.1 - DISMANTLING

5.1.1 Remove the rear plate secured by screws.
5.1.2 Remove the top panel screws .
5.1.3 Remove all the faston and connectors from the pcb board to can separate it from the panel.
5.1.4 Unscrew not completely the mosfet and igbt fixing screws, take off the board from the heat sink doing slide out the iron stick with the screws.

5.1.4 EB200DC-PIC ACCEPTANCE TEST

With the board not fixed to the heat sink and with MOSFETs and IGBT:

5.1.5 Test in voltage supply

Feed power through the in+/- terminal with the power supply 30V 15A. Slowly increase the voltage starting from zero to about 24 V. Check if there are 15 V in 7815 out and 5 V in 7805 out.

5.1.6 Test inverter

With the board still disconnected from the heat sink. Verify that there is a square wave with an amplitude of about 15 V 100 Hz, on the igbt Q15,Q16,Q17,Q18 gate. In the Out terminal should be a square wave +/- 30 V – 100 Hz.

5.1.7 Test on/off

Connect the panel connector JP2. Observe pin 6 of U12 with the oscilloscope. There should be a low level. Press the ON button. At pin 6 of U12 should show the pilot pulses of the MOSFETs at maximum duty cycle, a frequency of about 50 KHz and amplitude of 15 V. By pushing the button again, the signal should return to zero. Between each powering up and each powering down and vice versa, the command should be locked for about 2 seconds.

5.1.8 Final test

Insert the iron stick in the heat sink and doing slide the stick and the board in the correct position now tighten the igbt and mosfet screws. Connect the Power faston and the panel connectors. Supply with 24 or 30 Vdc. Check the output with oscilloscope without load if when you press the on there is a square wave about +/-300V and 100 Hz for one second.
Connect a cold lamp. Insert a wattmeter in output. Adjust P1 in half position and the dimmer in max. Switch on, wait about two or tree minutes for stabilize the lamp voltage around 70 V and adjust P1for 185 W.
The R10 resistor work only when the lamp voltage is between 20 and 35 V (lamp cold) and limit the lamp current when the chopper step-up doesn't work correctly (Vin higher than Vout). The microprocessor check the lamp voltage and if it's over 35 V switch on the triac Q3 by opto OP1.
The ballast can recognize if the battery voltage is 24 or 30 V. The battery check is done one time at every switch on. The threshold for the red led blink is different between 24 ad 30 V. For 24 V the low frequency blink start at 19V, for 30 V start at 24 V. When the battery voltage is 17 V (for both the voltage) the blink frequency increase and after 60 sec the ballast switch off.

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SECTION 6

LIST OF DIAGRAMS

Please identify the board version, it is indicated with a serigraphy on the board itself and chose the proper diagram related to that version.

Document Number	Rev. #	Date	DESCRIPTION OF THE SCHEMATICS
EB200DC-PIC ASS			Front panel and overall layout
EB200DC-PIC			PCB detailed circuit diagram

SECTION 7

TEST EQUIPMENT REQUIRED.

In order to perform a proper maintenance and service job on the DEB products, it is necessary to have available the tools and instruments that permit a detailed, reliable and safe inspection. Most of the test equipment required are electronic instruments, nevertheless there are included in the following list some custom tools that are normally available at De Sisti, please contact our service center:

Pos.	Qty.	Description
1	1	Dual track Oscilloscope, min. 20 MHz.
2	1	Power Supply 24-30Vdc-15A
3	1	Digital Watt Meter A.C. , Clamp Type, True RMS
4	1	Digital Multi-meter, True RMS values reading.
5	1	Analogue Multi-meter

NOTES: *Please consider the following when selecting the instruments necessary for service job extended to the full range of DEB ballasts.*
Ref. 4 The Variac could be rated to 1 kW for the majority of the tests, we suggest a 2 kW rating in order to be able to feed all the A.C. ballasts up to the 1,2 kW version from the Variac at any voltage.
Ref. 5 The P.S.U. could be rated for minimum 3 A. D.C. to test all the ballasts logic and D.C. parts, but we suggest the 15 A. rating in order to be able and use it to feed the 200W D.C. DEB ballast, rather than using a battery for the laboratory tests.