
Secretariat:

National Electrical Manufacturers Association

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<table>
<thead>
<tr>
<th>CONTENTS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Scope</td>
<td>1</td>
</tr>
<tr>
<td>2  Safety</td>
<td>1</td>
</tr>
<tr>
<td>3  Summary of Possible Actions (Assuming Daylight Troubleshooting)</td>
<td>1</td>
</tr>
<tr>
<td>4  Detailed Report on Possible Actions</td>
<td>4</td>
</tr>
<tr>
<td>5  Other Maintenance Aids</td>
<td>6</td>
</tr>
</tbody>
</table>
Foreword

At the time this Standard was approved, the ANSI C136 committee was composed of the following Members:

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American Electric Power
Amphenol Canada Corp.
Atlas Lighting Products, Inc.
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1 Scope

This troubleshooting guide is intended to help the service person quickly diagnose an HID luminaire with magnetic ballast and also ensure that the problem is fixed on the first attempt. This guide addresses the four commonly encountered problems in two manners: 1) Summary of possible actions for those needing only a checklist; and 2) A detailed report on possible actions for those needing additional information.

The commonly encountered problems are:
   a. Lamp on continuously
   b. Lamp cycles on and off
   c. Lamp will not start
   d. Lamp burns dimly

2 Safety

Personal safety and the safety of the public should be the troubleshooter’s first consideration. Personal protective equipment should be worn at all times while servicing HID luminaires, including but not limited to electrical gloves properly rated for the voltage expected to be encountered and eye protection. Extreme care must be taken regarding the surroundings as well since many luminaires are mounted close to energized electrical distribution equipment and in high vehicular traffic areas. One should follow all applicable work zone protection guidance.

3 Summary of Possible Actions (Assuming Daylight Troubleshooting)

When troubleshooting, it is advisable to use components such as lamps, starters, and photocontrols that have been previously tested and are known to be in working order. Occasionally, new, out-of-the-box components will be defective. Using tested components will prevent the introduction of a second problem into a system that already contains at least one problem.

a. Lamp on continuously (“day burner”)
   1. Replace photocontrol with a new one of correct ANSI type and voltage and leave uncovered. If lamp continues to burn, then:
   2. Check for loose or broken neutral from luminaire supply to photocontrol socket.

b. Lamp cycles on and off
   1. Replace lamp with new lamp of correct ANSI type and wattage. If lamp continues to cycle, then:
   2. Check for loose connections, including “seating” the lamp in the socket. If lamp continues to cycle, then:
   3. Check that the photocontrol is correctly wired and that load and line are not reversed. Then:
   4. Check for line voltage fluctuations. Then:
   5. Ensure that photocontrol photo cell is not aimed at a highly reflective surface or another light source. Follow-up inspection at night may be necessary to ensure proper photocontrol aiming.

c. Lamp will not start
   1. Check that supply voltage matches the ballast installed. Then:
   2. Check for proper photocontrol operation. If lamp does not start, then:
   3. Visually inspect the ballast for burned windings. If ballast appears undamaged, then:
   4. Replace lamp with known good lamp of proper ANSI type and wattage. If lamp does not start, then:
5. Check supply voltage at the luminaire terminal strip and at the luminaire control receptacle. If lamp does not start, then:
6. Check the luminaire wiring for loose or broken wires. If lamp does not start, then:
7. Check lamp socket voltage with lamp removed and photocontrol covered and compare to voltages listed in Table 1.

CAUTION—IF LUMINAIRE IS EQUIPPED WITH IGNITER, DISCONNECT IGNITER BEFORE TESTING VOLTAGE WITH VOLTMETER TO AVOID DAMAGE TO METER.

If open-circuit voltage is in range for the type ballast as listed in Table 1, replace the igniter (if so equipped), then:
8. If the lamp fails to start, replace the luminaire.

d. Lamp burns dimly

1. Check for low supply line voltage. If voltage is correct and lamp continues to burn dimly, then:
2. Ensure that the luminaire voltage rating and supply line voltage match. If lamp continues to burn dimly, then:
3. Ensure that correct wattage lamp is installed. If lamp continues to burn dimly, then:
4. Check condition (swollen or damaged case) and verify the value (µF) of capacitor matches the manufacturer’s data label, if luminaire is so equipped. If lamp continues to burn dimly, then:
5. Check luminaire for loose or broken wiring. If lamp continues to burn dimly, then:
6. Check for correct voltage tap if luminaire is equipped with multi-tap ballast. If lamp continues to burn dimly, then:
7. Replace the luminaire.

Table 1
OPEN-CIRCUIT VOLTAGE RANGES

<table>
<thead>
<tr>
<th>Wattage</th>
<th>ANSI #</th>
<th>Voltage</th>
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<tbody>
<tr>
<td>50</td>
<td>H46</td>
<td>215-270</td>
</tr>
<tr>
<td>75</td>
<td>H43</td>
<td>220-275</td>
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<td>100</td>
<td>H38</td>
<td>225-285</td>
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<tr>
<td>125</td>
<td>H42</td>
<td>230-290</td>
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<tr>
<td>175</td>
<td>H39</td>
<td>200-290</td>
</tr>
<tr>
<td>250</td>
<td>H37</td>
<td>210-290</td>
</tr>
<tr>
<td>400</td>
<td>H33</td>
<td>210-285</td>
</tr>
<tr>
<td>2-400 (Series)</td>
<td>2-H33</td>
<td>445-545</td>
</tr>
<tr>
<td>1000</td>
<td>H36</td>
<td>385-465</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Wattage</th>
<th>ANSI #</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>35/39</td>
<td>M130</td>
<td>205-290</td>
</tr>
<tr>
<td>50</td>
<td>M110 or M148</td>
<td>235-300</td>
</tr>
<tr>
<td>70</td>
<td>M85</td>
<td>200-270</td>
</tr>
<tr>
<td>70</td>
<td>M98 or M143</td>
<td>205-290</td>
</tr>
<tr>
<td>70</td>
<td>M139</td>
<td>220-280</td>
</tr>
<tr>
<td>100</td>
<td>M90 or M140</td>
<td>210-315</td>
</tr>
<tr>
<td>150</td>
<td>M81</td>
<td>215-265</td>
</tr>
<tr>
<td>150</td>
<td>M102 or M142</td>
<td>180-300</td>
</tr>
<tr>
<td>Voltage (V)</td>
<td>Lamp Type</td>
<td>Voltage Range</td>
</tr>
<tr>
<td>------------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td>175</td>
<td>M57 or M107</td>
<td>275-355</td>
</tr>
<tr>
<td>250</td>
<td>M58</td>
<td>270-345</td>
</tr>
<tr>
<td>250</td>
<td>M80</td>
<td>215-265</td>
</tr>
<tr>
<td>400</td>
<td>M59</td>
<td>250-360</td>
</tr>
<tr>
<td>2-400 (ILO)</td>
<td>2-M59</td>
<td>300-360</td>
</tr>
<tr>
<td>1000</td>
<td>M47</td>
<td>385-485</td>
</tr>
<tr>
<td>1500</td>
<td>M48</td>
<td>405-530</td>
</tr>
<tr>
<td>1650</td>
<td>M112</td>
<td>420-510</td>
</tr>
<tr>
<td>2000</td>
<td>M134</td>
<td>405-495</td>
</tr>
</tbody>
</table>

**Metal Halide—Pulse Start**

*CAUTION—DISCONNECT IGNITER BEFORE TESTING WITH VOLTMETER!

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Lamp Type</th>
<th>Voltage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>M90</td>
<td>210-257*</td>
</tr>
<tr>
<td>150</td>
<td>M102</td>
<td>235-290*</td>
</tr>
<tr>
<td>175</td>
<td>M137 or M152</td>
<td>250-340*</td>
</tr>
<tr>
<td>200</td>
<td>M136</td>
<td>215-330*</td>
</tr>
<tr>
<td>250</td>
<td>M138 or M153</td>
<td>245-330*</td>
</tr>
<tr>
<td>320</td>
<td>M132 or M154</td>
<td>240-310*</td>
</tr>
<tr>
<td>350</td>
<td>M131</td>
<td>240-315*</td>
</tr>
<tr>
<td>400</td>
<td>M135 or M155</td>
<td>235-340*</td>
</tr>
<tr>
<td>400</td>
<td>M128</td>
<td>285-345*</td>
</tr>
<tr>
<td>450</td>
<td>M144</td>
<td>235-340*</td>
</tr>
<tr>
<td>750</td>
<td>M149</td>
<td>305-390*</td>
</tr>
<tr>
<td>875</td>
<td>M166</td>
<td>375-455*</td>
</tr>
<tr>
<td>1000</td>
<td>M141</td>
<td>370-475*</td>
</tr>
</tbody>
</table>

**High Pressure Sodium**

*CAUTION—DISCONNECT IGNITER BEFORE TESTING WITH VOLTMETER!

<table>
<thead>
<tr>
<th>Voltage (V)</th>
<th>Lamp Type</th>
<th>Voltage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>S76</td>
<td>114-126*</td>
</tr>
<tr>
<td>50</td>
<td>S68</td>
<td>114-140*</td>
</tr>
<tr>
<td>70</td>
<td>S62</td>
<td>100-135*</td>
</tr>
<tr>
<td>100</td>
<td>S54</td>
<td>95-135*</td>
</tr>
<tr>
<td>150</td>
<td>S55</td>
<td>100-135*</td>
</tr>
<tr>
<td>150</td>
<td>S56</td>
<td>165-250*</td>
</tr>
<tr>
<td>200</td>
<td>S66</td>
<td>205-260*</td>
</tr>
<tr>
<td>250</td>
<td>S50</td>
<td>170-255*</td>
</tr>
<tr>
<td>310</td>
<td>S67</td>
<td>155-255*</td>
</tr>
<tr>
<td>400</td>
<td>S51</td>
<td>170-255*</td>
</tr>
<tr>
<td>430</td>
<td>SonAgro S145</td>
<td>180-220*</td>
</tr>
<tr>
<td>600</td>
<td>S106</td>
<td>200-265*</td>
</tr>
<tr>
<td>750</td>
<td>S111</td>
<td>200-245*</td>
</tr>
</tbody>
</table>
4 Detailed Report on Possible Actions

a. Lamp on continuously (day burner)

1. This is the most common photocontrol failure mode. Replace the photocontrol with a known good one, but do not cover. If, after allowing time for any built-in time delay to reset (usually 3–5 seconds), the lamp continues to burn, then:

2. Check for a bad neutral connection or loose neutral wire between the luminaire supply and the photocontrol receptacle. The most common wiring problems are the loss of the neutral or the disconnection of the white wire from the photocontrol receptacle. In some cases, a photocontrol is replaced not because it is defective, but because it was not making good contact in the receptacle on the luminaire (neutral blade on the photocontrol). There are times when the photocontrol receptacle contacts have lost their tension because of overheating and a good connection between the photocontrol blades and the receptacle contacts cannot be made. This can be determined by a visual inspection of the receptacle. In this case, the photocontrol and receptacle must be replaced. If a replacement receptacle is unavailable, then the luminaire should be replaced.

b. Lamp cycles on and off

1. This is the most common complaint regarding an HID system and can usually be corrected by replacing the lamp with a new one of the proper ANSI type and wattage. Lamp cycling is a good indication that the lamp has reached end of life. If a new lamp does not solve the problem, then:

2. Check for loose or intermittent connections in the electrical system. One should check all of the following: supply connections, luminaire internal wiring, that the lamp is properly “seated” in the socket, the photocontrol receptacle and loose connections in the lamp such as broken welds, loose screw base broken arc tube mount or broken electrodes. Loose connections will typically show up when the fixture is vibrated or shaken.

3. Line voltage fluctuations such as those produced when a motor that is connected to the same power supply as the luminaire starts can cause the lamp to cycle. This can be corrected by connecting the luminaire to a power supply that does not have a motor load connected to it. Regulated luminaire ballasts can also help to reduce lamp drop-out that is due to line voltage fluctuations.

4. High vibration installations such as those found in bridges or tall poles can cause the lamp to cycle. The best solution for this type of cycling is to identify the source of vibration and apply some dampening device to the pole. Cycling may be the first symptom of a vibration problem and should be corrected as soon as possible in order to avoid lamp and fixture damage.
5. High ambient light levels or a photocontrol aimed at a high light level source can cause lamp cycling. In some cases, the “eye” of the photocontrol aimed at a highly reflective surface such as a light-colored wall or nearby foliage can trigger the photocontrol and cause the lamp to cycle. To solve this type of problem, it is recommended that a night inspection be made and the photocontrol be aimed away from other light sources and/or reflective surfaces. Foliage becomes more reflective at night as dew forms and may not be apparent during daylight hours. In severe cases, a shield may need to be installed on the photocontrol.

c. Lamp will not start

1. If the lamp will not start, first ensure that power is available at the fixture’s terminal strip. If power is available and the lamp will not start, then:

2. Check voltage in the lamp socket with photocontrol covered or a shorting cap installed. Proper voltage for the type and wattage ballast is located in Table 1.

   a. CAUTION—DISCONNECT IGNITER IF SO EQUIPPED BEFORE TESTING LAMP SOCKET VOLTAGE TO PREVENT DAMAGE TO THE METER.

3. An alternate method for testing the lamp socket voltage if the starter is difficult to disconnect is: for 52–55 volt HPS, insert a low wattage incandescent lamp into the socket; a similar wattage mercury lamp may be used for 200–400 watt luminaires or an incandescent lamp may be used provided it is rated for 250 volts. If the voltage is within the indicated range or if a test lamp is used and it lights, it is a good indication that the ballast and associated wiring is functioning properly and the igniter is faulty. Replace the igniter with a known good one and reinstall the correct lamp.

4. Visually inspect the ballast, capacitor, photocontrol receptacle, and internal wiring for burned windings and wiring or loose wires. If the ballast, capacitor, receptacle, and wiring appear undamaged, then:

5. Remove and inspect the photocontrol. If the photocontrol legs or receptacle show signs of burning or arcing, replace both the control and the receptacle. If the lamp will not start, then:

6. Install and cover a known good photocontrol or install a shorting cap. Check that line voltage is present on the red lead from the photocontrol receptacle.

7. If the above checks fail to solve the problem, then replace the luminaire.

d. Lamp burns dimly

1. Check for low supply line voltage. This will nearly always be caused by a high resistance connection on either the line or the neutral coming into the luminaire. The voltage should be checked with the photocontrol covered or a shorting cap installed because a high resistance connection may show proper voltage if no load is applied. If the line voltage is proper and the lamp is still dim, then:

2. Ensure that the luminaire voltage rating and the line voltage match and that the supply line is connected to the proper ballast tap if ballast is multi-tap. This can be done by reading the voltage rating of the luminaire on the manufacturer’s label inside the luminaire. If the luminaire is properly rated for the supply voltage and lamp still burns dimly, then:

3. Ensure that the correct wattage and type lamp is installed. Again, this information can be observed on the manufacturer’s label found inside the luminaire. The ANSI lamp type and wattage is stamped on the lamp envelope. A higher wattage lamp installed in a lower wattage
fixture such as a 150-watt lamp installed in a 100-watt luminaire will cause a dim lamp condition. If the lamp and ballast are correct, then:

4. Check the internal parts of the luminaire. A capacitor that is open internally, sized incorrectly, or one with a lead loose can cause a dim lamp condition.

5. If the service person has the means to correct the above possible problems, then the luminaire can be returned to service rather quickly. If these methods do not result in a serviceable luminaire, then it should be replaced with a new one.

5 Other Maintenance Aids

There are a number of commercially available luminaire testers that can aid in identifying failed components. In addition, troubleshooting materials, such as manuals, videos, and checklists are available from most luminaire, photocontrol, and lamp manufacturers.

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