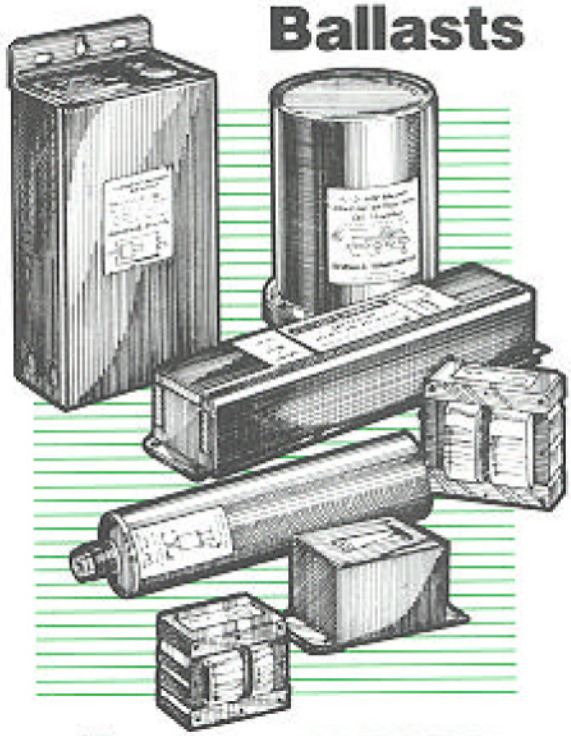
ADVANCE®
Pocket Guide to High Intensity Discharge Lamp Ballasts



ADVANCE™

TROUBLESHOOTING

At times when an HID Lighting System becomes inoperative, a complex, thorough, trouble-shooting procedure may prove overly time consuming. In these instances, a simple check of the power switches, when a bank of fixtures becomes inoperative, or a visual check of the lamp, when a singular fixture becomes inoperative, may provide the quickest response to the problem. At other times, where individual isolated fixtures are involved, it may be necessary to systematically isolate the problem and perform complete electrical tests in order to properly restore the lighting.

The four basic trouble-shooting methods outlined in this booklet offer procedures which can be applied to cover virtually all situations:

1. Visual Inspection Check List
Quick visual checks for normal end-of-lamp life and application irregularities not requiring electrical testing (Page 45).

2. Quick Fix For Restoring Lighting
Where lighting must be immediately restored (Page 47).

3. Troubleshooting Flow Charts
Simplified diagrams to quickly locate the problem in any given lighting fixture based on the lamp characteristics (Page 48).

A. Lamp will not start (Pages 48-50)
B. Lamp cycles (Page 51)
C. Lamp too bright or dim (Page 52)

4. Electrical Tests-In-depth check of system by performing electrical tests (Page 53).

TROUBLESHOOTING

1. VISUAL INSPECTION CHECK LIST
NORMAL END OF LAMP LIFE

Mercury and Metal Halide Lamps
These lamps at end-of-life are characterized by low light output and/or intermittent starting. Visual signs include blackening at the ends of the arc tube and electrode tip deterioration.

High Pressure Sodium Lamps
Aged HPS lamps will tend to cycle at end-of-life. After start-up, they will cycle off and on as the aged lamp requires more voltage to stabilize and operate
the arc than the ballast is capable of providing.

Visual signs include a general blackening at the ends of the arc tube. The lamp may also exhibit a brownish tinge (sodium deposit) on the outer glass envelope.

Low Pressure Sodium Lamps
At end-of-life these lamps retain their light output but starting first becomes intermittent and then impossible. Visual signs include some blackening of the ends of the arc tube.

TROUBLESHOOTING

1. VISUAL INSPECTION CHECKLIST
ADDITIONAL CHECKS

LAMPS
Broken arc tube or outer lamp jacket.
Lamp broken where glass meets the base.
Broken or loose components in lamp envelope.
Arc tube end blackening.
Deposits inside outer glass envelope.
Lamp type (H,M,S, or L number) and wattage must correspond to that required by ballast label.
Lamp orientation designation (BU or BD) incorrect for application (base up, base down, etc.).

LIGHTING SYSTEM COMPONENTS
Charred ballast coils.
Damaged insulation or coils on ballast.
Evidence of moisture or excessive heat.
Loose, disconnected, pinched or frayed leads.
Incorrect wiring.
Swollen or ruptured capacitor.
Damaged ignitor.

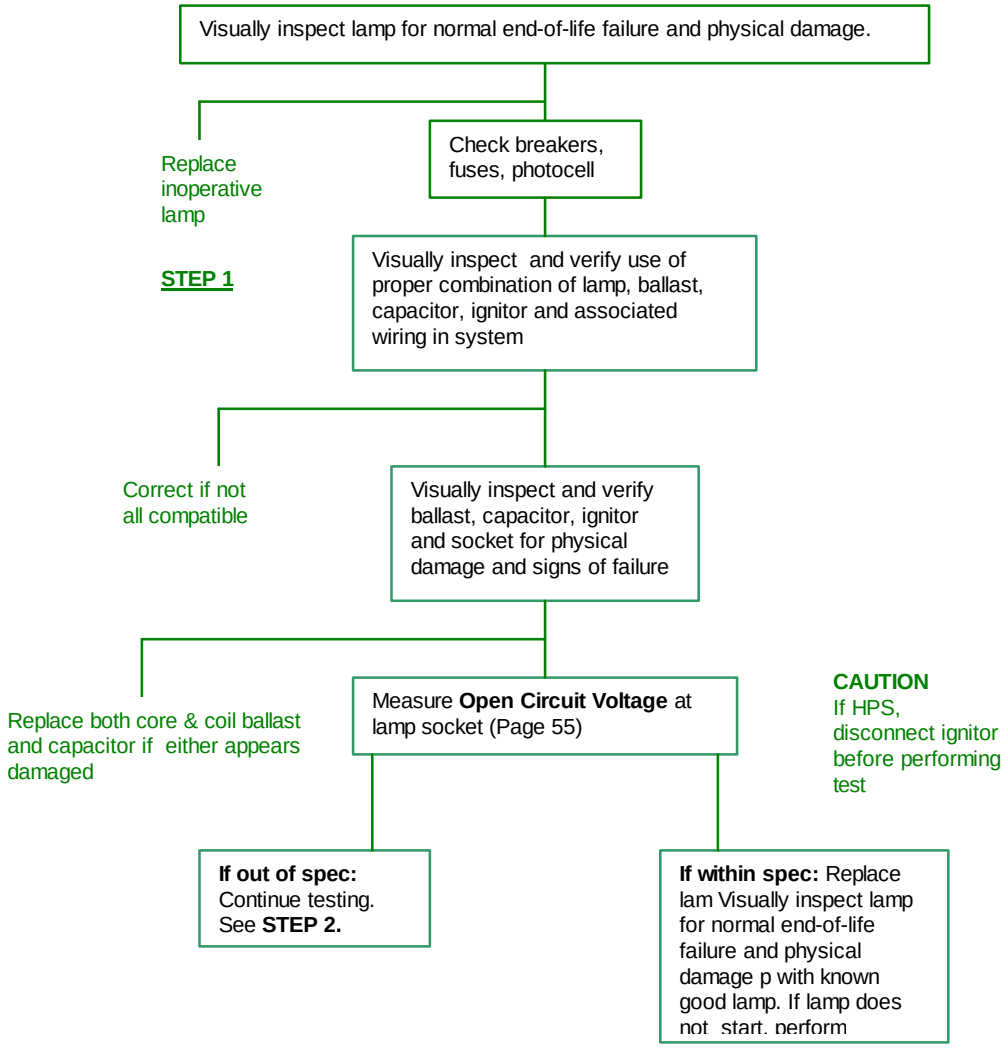
2. QUICK FIX FOR RESTORING LIGHTING

Visual Inspection
Visually inspect lamp, ballast, capacitor and ignitor (where used) for physical signs of failure, replacing any apparently defective components.
If either core & coil ballast or capacitor appear abnormal, replace both.

Component Replacement Where No Visual Defects Appear
Verify that the correct fine voltage is being supplied to the fixture.
Check power switches, circuit breakers, fuses, photo control, etc.
Replace lamp.
Replace ignitor (where used).
Replace both ballast and capacitor.

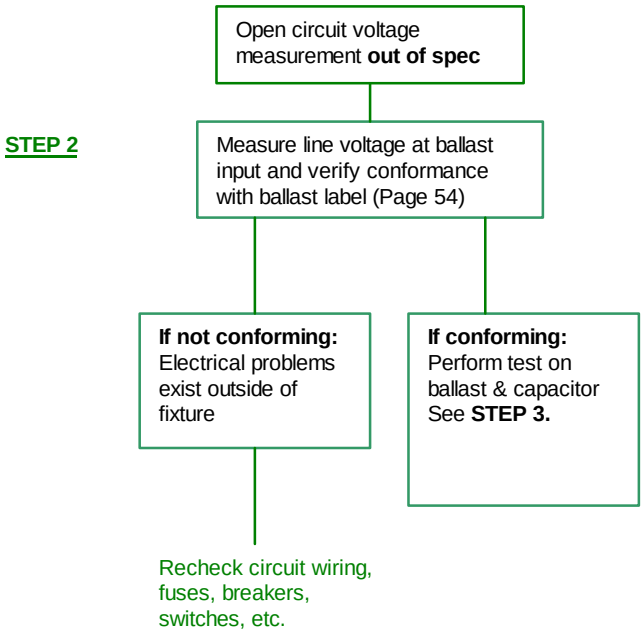
3. FLOW CHARTS

A. Lamp Will Not Start (STEP 1)

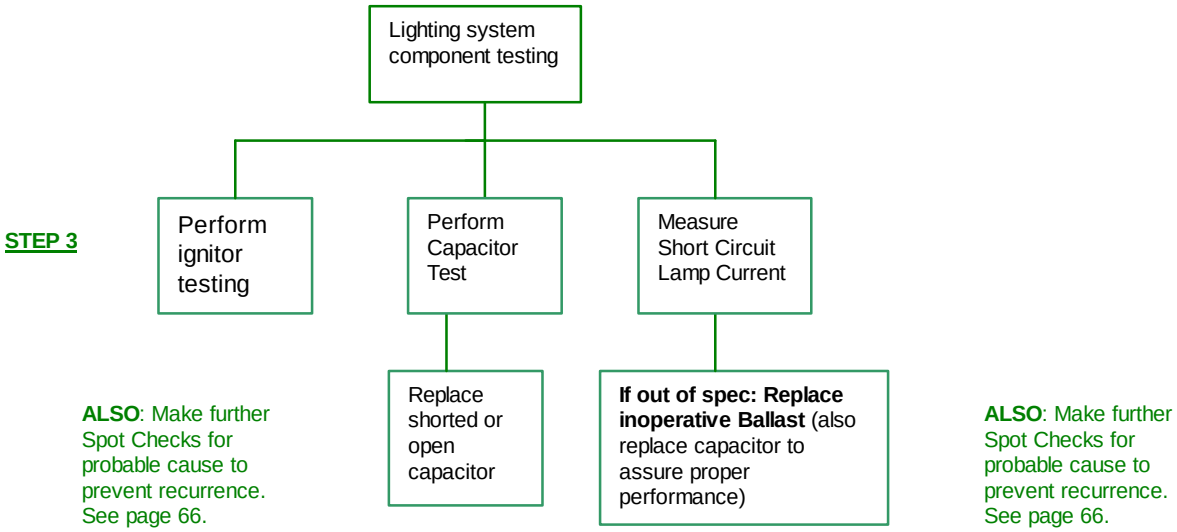


TROUBLESHOOTING

A. Lamp Will Not Start (STEP 2)



A. Lamp Will Not Start (STEP 3)



ALSO: Make further Spot Checks for probable cause to prevent recurrence. See page 66.

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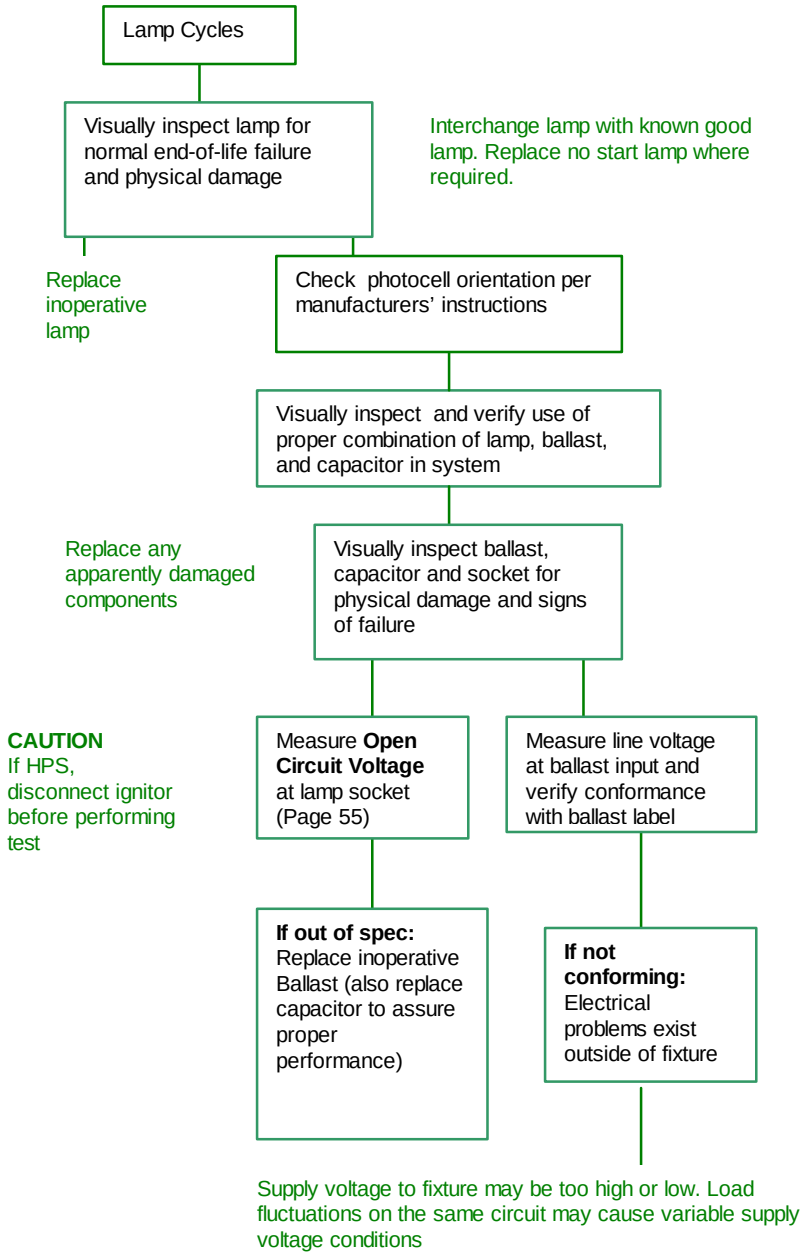
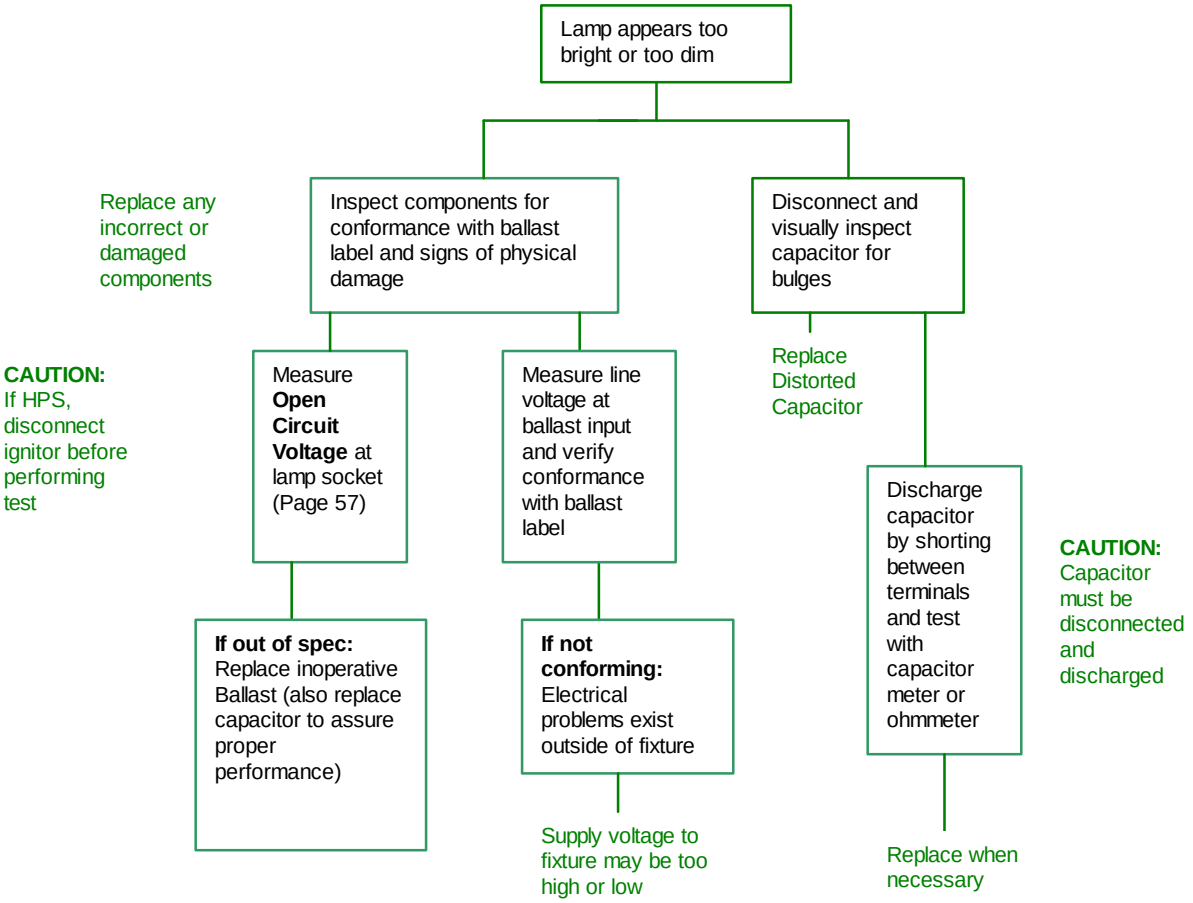
B. Lamp Cycles



C. Lamp Too Bright or Dim



4. ELECTRICAL TESTS

NOTE: Voltage and current measurements present the possibility of exposure to hazardous voltages and should be performed only by qualified personnel.

The following equipment is recommended for testing HID fixtures:
RMS Voltmeter
Ranges: O-150-300-750 Volts AC
Ammeter (Clamp-on type acceptable)
Ranges: O-1-5-10 Amperes AC
Multi-meter (with voltage and current ratings as shown above).
Ohmmeter

TROUBLESHOOTING

LINE VOLTAGE

Measure the line voltage at input to fixture to determine if the power supply conforms to the requirements of the lighting system. For constant wattage
ballasts, the measured line voltage should be within 10% of the nameplate rating. For high reactance or reactor ballasts, the line voltage should be within 5% of the nameplate rating.

If the measured line voltage does not conform to the requirements of the lighting system, as specified on the ballast or fixture nameplate, electrical problems exist outside of the fixture which can result in non-starting or improper lamp operation.

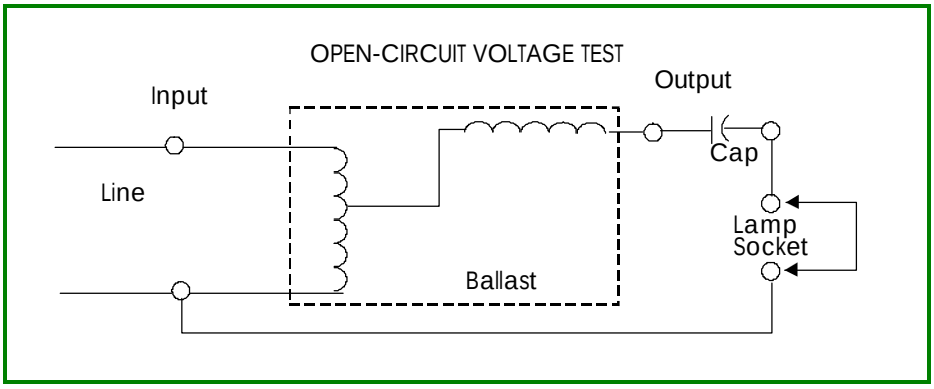
Check fuses, breakers and switches when line voltage readings cannot be obtained. High, low or variable voltage readings may be due to load
fluctuations on the same circuit.

OPEN CIRCUIT VOLTAGE

To determine if the ballast is supplying proper starting voltage to the lamp, an open circuit voltage test is required. The proper test procedure is:

1. Measure input voltage (V1) to verify rated input voltage is being applied.

2. With the lamp out of the socket and the proper voltage applied to the ballast, read the voltage (V2) between the socket pin and shell. Reading
must be within test limits shown.



As an alternative, this test may also be performed simply by screwing an adapter into the lamp socket for easy access. Then hook up the voltmeter to this adapter. Reading must be within test limits shown.

OPEN-CIRCUIT VOLTAGE TEST LIMITS

	LAMP		RMS
	Wattage	ANSI Number	VOLTAGE
MERCURY BALLASTS	50	H46	225-255
	75	H43	225-255
	100	H38	225-255
	175	H39	225-255
	250	H37	225-255
	400	H33	225-255
	2-400 (ILO)	2-H33	225-255
	2-400 (Series)	2-H33	475-525-
	700	H35	405-455
	1000	H36	405-455
METAL HALIDE BALLASTS	70	M85	210-250
	100	M90	250-300
	150	M81	220-260
	175	M57	285-320
	250	M80	230-270
	250	M58	285-320
	400	M59	225-255
	2-400 (ILO)	2-M59	225-255
	2-400 (Series)	2-M59	600-665
	1000	M47	400-445
	1500	M48	400-445
HIGH PRESSURE SODIUM BALLASTS	35	S76	110-130
	50	S68	110-130
	70	S62	110-130
	100	S54	110-130
	150	S55	110-130
	150	S56	200-250
	200	S66	200-230
	250	S50	175-225
	310	S67	155-190
	400	S51	175-225
	1000	S52	420-480
LOW PRESSURE SODIUM BALLASTS	18	L69	300-325
	35	L70	455-505
	55	L71	455-505
	90	L72	455-525
	135	L73	645-715
	180	L74	645-715

TROUBLESHOOTING

Open Circuit Voltage rest at Socket

Open Circuit Voltage rest at Socket Head Connection

WHEN OPEN CIRCUIT VOLTAGE TEST RESULTS IN NO READING

Further checks should be made to determine whether cause is attributable to lamp socket short, shorted or open capacitor, inoperative ballast, improper wiring or open connection. Simple checks may be made as follows:

Shorted Socket Check
1. Turn off power and remove lamp from socket.
2. Check for internal short in lamp socket with continuity meter across two lamp leads.
3. Should read NO continuity.

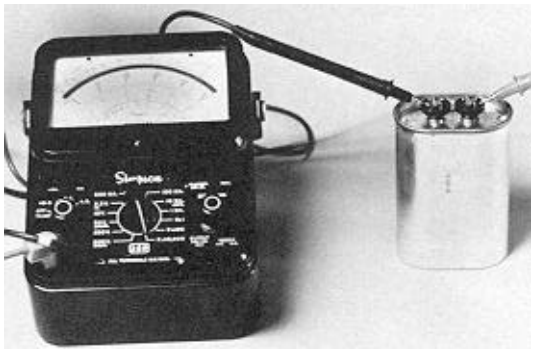
CAPACITOR CHECK

1. Disconnect capacitor from circuit.
2. Discharge capacitor by shorting between terminals.
3. Check capacitor with ohmmeter set at highest resistance scale:

If meter indicates a very low resistance which then gradually increases, the capacitor does not require replacement.

If meter indicates a very high resistance which does not diminish, it is open and should be replaced.

If meter indicates a very low resistance which does not increase, the capacitor is *shorted* and should be *replaced*.



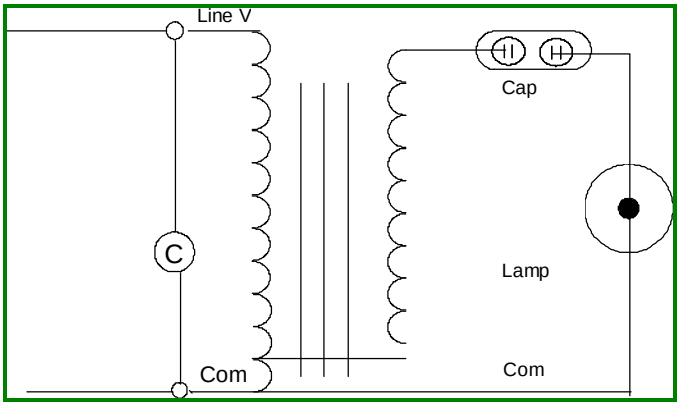
Capacitor Check

BALLAST CONTINUITY CHECK

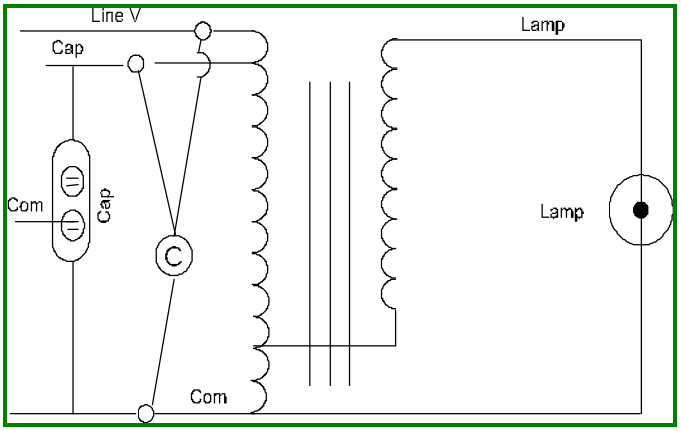
Continuity of Primary Coil

1. Disconnect ballast from power supply and discharge the capacitor.

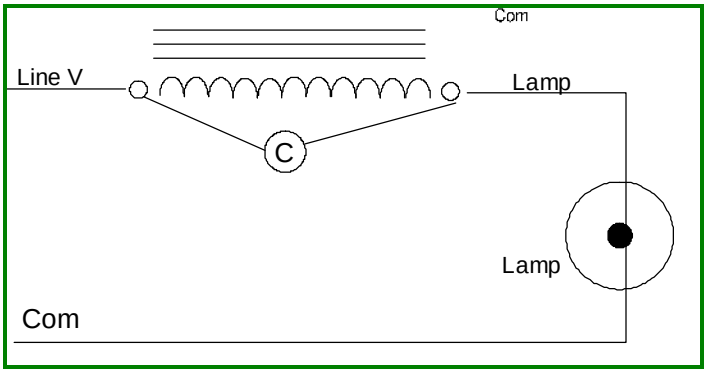
2. Check for continuity of ballast primary coil between input leads.



Between Common and Line Leads.



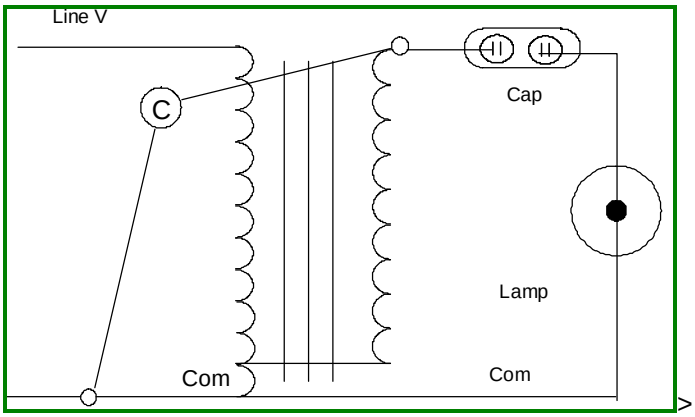
Between Common and Capacitor Leads.



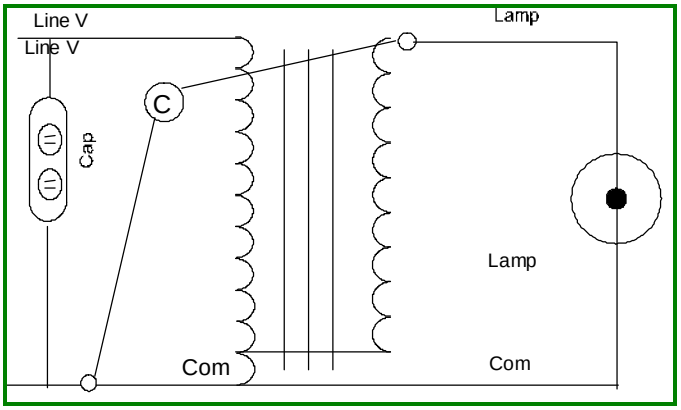
Between Line and Lamp Leads.

Continuity of Secondary Coil

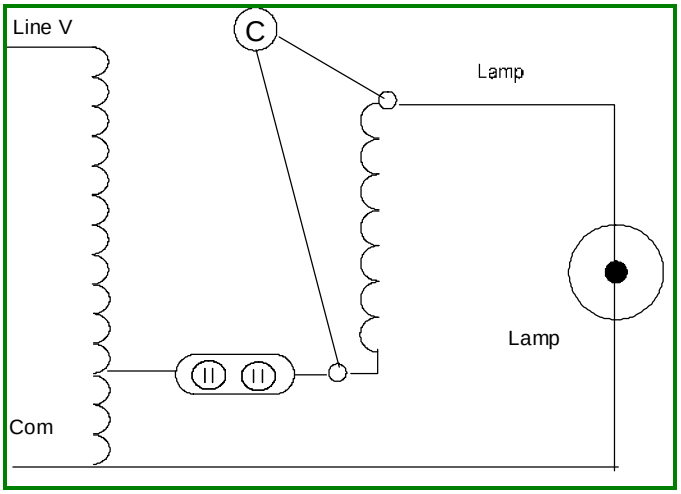
1. Disconnect ballast from power supply and discharge the capacitor.
2. Check for continuity of ballast secondary coil between lamp and common leads.



Between Common and Capacitor Leads.



Between Common and Lamp Leads.

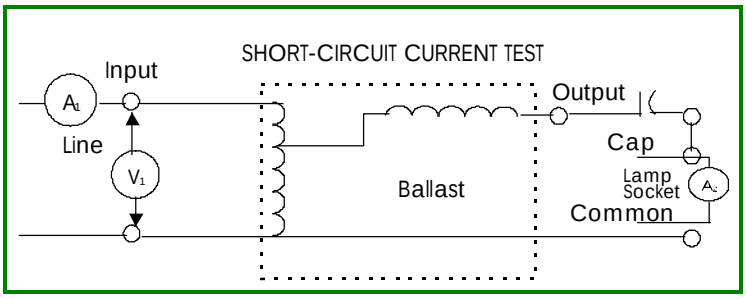


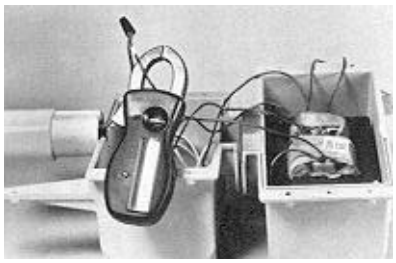
Between Capacitor and Lamp Leads.Between Common and Lamp.

SHORT CIRCUIT LAMP CURRENT

To assure the ballast is delivering the proper current under lamp starting conditions, a measurement may be taken by connecting an ammeter between the lamp socket Center pin and the socket shell with rated input voltage applied to the ballast. If available, a socket adapter may be used:

1. Energize ballast with proper rated input voltage.
2. Measure Current with ammeter at A1 and A2 as shown below.
3. Readings must be within test limits shown.





Short Circuit Lamp Current Test

When using a clamp-on ammeter for this measurement, be certain the meter is not near the magnetic field of the ballast or any steel member which might distort the magnetic field.

SHORT CIRCUIT LAMP CURRENT TEST LIMITS

	LAMP		SECONDARY SHORT CIRCUIT CURRENT AMPS
	Wattage	ANSI Number	
MERCURY BALLASTS	50	H46	.85-1.15
	75	H43	.95-1.70
	100	H38	1.10-2.00
	175	H39	2.0-3.6
	250	H37	3.0-3.8
	400	H33	4.4-7.9
	2-400 (ILO)	2-H33	4.4-7.9
	2-400 (Series)	2-H33	4.2-5.40
	700	H35	3.9-5.85
	1000	H36	5.7-9.0
METAL HALIDE BALLASTS	70	M85	.85-1.30
	100	M90	1.15-1.76
	150	M81	1.75-2.60
	175	M57	1.5-1.90
	250	M80	2.9-4.3
	250	M58	2.2-2.85
	400	M59	3.5-4.5
	2-400 (ILO)	2-M59	3.5-4.5
	2-400 (Series)	2-M59	3.3-4.3
	1000	M47	4.8-6.15
	1500	M48	7.4-9.6
HIGH PRESSURE SODIUM BALLASTS	35	S76	.85-1.45
	50	S68	1.5-2.3
	70	S62	1.6-2.9
	100	S54	2.45-3.8
	150	S55	3.5-5.4
	150	S56	2.0-3.0
	200	S66	2.50-3.7
	250	S50	3.0-5.3
	310	S67	3.8-5.7
	400	S51	5.0-7.6
	1000	S52	5.5-8.1
LOW PRESSURE SODIUM BALLASTS	18	L69	0.30-.40
	35	L70	0.52-.78
	55	L71	0.52-.78
	90	L72	0.8-1.2
	135	L73	0.8-1.2
	180	L74	0.8-1.2

WHEN SHORT CIRCUIT LAMP CURRENT TEST RESULTS IN HIGH, LOW OR NO READING:

Further checks should be made to determine whether cause is attributed to improper supply voltage, shorted or open capacitor or inoperative ballast. Checks may be made as follows:

Supply Voltage Check

1. Measure Line Voltage as described on page 54.
2. If ballast is multi-voltage unit such as ADVANCE® Quadri-Volt, make certain input voltage connection is made to proper input voltage terminal or lead.

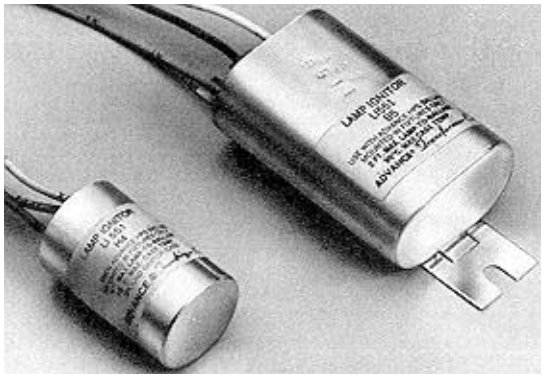
Capacitor Check

1. Verify capacitor rating is as required and shown on ballast label.
2. Perform Capacitor Check as described on page 58.

Ballast check

Perform Open Circuit Voltage test as described on page 55.

HPS IGNITORS



High Pressure Sodium Lamp Ballast Ignitors

Ignitors are used as a starting aid with all high pressure sodium and certain low-wattage metal halide lamps.

Measurement of the starting pulse voltage of an ignitor is beyond the capability of most instruments available in the field. In laboratory tests, an oscilloscope is used to measure pulse height and width. In the field, some simple tests may be performed to determine if the ignitor is operable:

1. Replace the ignitor with another ignitor which is known to be operable. If the lamp then starts, the previous ignitor was either miswired or inoperative.

2. Remove the High Pressure Sodium lamp and replace it with a known operable HPS lamp of proper wattage. If lamp lights, ignitor is operating properly.

3. If lamp does not light, disconnect ignitor and proceed as follows:

A. 35W to 15OW (55V) HPS
Insert 120 V incandescent lamp in socket. If lamp lights, ignitor requires replacement.
If test lamp fails to light, refer to TROUBLESHOOTING FLOW CHART A on page 50.

B. 15OW (1OOV) to 400W HPS
Install mercury lamp of comparable wattage. If mercury lamp starts—ignitor requires replacement.
If test lamp fails to light, refer to TROUBLESHOOTING FLOW CHART A on page 50.

C. 1000 W
Replace ignitor.

NOTE: Ignitors are not interchangeable. Refer to ballast label for designation of proper ignitor to be used with ballast.

FURTHER CHECKS

Probable Causes of Inoperative Ballast
1. Normal end-of-life failure.
2. Operating incorrect lamps. Use of higher or lower wattage lamps than rated for ballast will cause premature ballast end-of-life.
3. Overheated due to heat from fixture or ambient temperature.
4. Voltage surge.
5. Miswiring or pinched wires
6. Shorted or open capacitor.
7. Incorrect capacitor rating for ballast.
8. Capacitor miswired or wiring shorting against frame.

Probable Causes of Shorted or Open Capacitor
1. Normal end-of-life failure.
2. Overheated due to heat from fixture or ambient temperature.
3. Capacitor heat barrier inadvertently removed.
4. Incorrect voltage rating of capacitor.
5. Mechanical damage such as overtightened bracket.