The CAST Lighting Technical Guide

System Maintenance, Troubleshooting and Repair

Version 1.4

About this Technical Guide

The following guide is meant to serve two main functions:

1. **Education.** In-depth descriptions of technical topics are presented with the intention to share state-of-the-art knowledge.

2. **Empowerment.** Detailed instructions in troubleshooting and repair of CAST landscape lighting systems so the contractor can service systems in the field.

By addressing both these critical functions, CAST is supporting the growth and success of contractors who use CAST Lighting products.

Please Note: The information in this guide is primarily intended for individuals who have attended a CAST Lighting Hands-on Training. This training provides a basic understanding of the CAST method of installation that is the foundation upon which this technical guide builds.

IMPORTANT - PLEASE READ

CAST Lighting recognizes the authority of federal, state and local statutes, regulations and codes that govern the installation, service and repair of electrical equipment. The information, advice, suggestions and instructions in this technical guide are meant to be followed only with strict adherence to any statutes, regulations or codes that may govern such work.

If any of the material in this guide conflicts with any relevant statutes, regulations or codes then the statute, regulation or code takes precedence.

It is the responsibility of individuals who read this manual to learn of, and to adhere to, any relevant statutes, regulations and codes. Individuals should not proceed with any kind of electrical work unless they completely understand any limitations or restrictions that may legally apply.

While system maintenance, troubleshooting and repair on the transformer secondary is all low voltage work (12v to 22v), replacement of breakers, receptacles and relays involve work on the 120v side. Individuals should take this information into account when deciding whether or not an electrical contractor is required for the repair.

CAST Lighting accepts no responsibility for any harm or damage that may result from an individual's use of the information contained herein if the individual acted in violation of any applicable statute, regulation or code.

Under no conditions should homeowners attempt to service the electrical components of a landscape lighting system.

www.cast-lighting.com

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System Maintenance

The CAST landscape lighting system is composed of the highest quality components designed to function optimally for an unlimited length of time. To ensure this longevity of operation and to maintain the system integrity, we recommend a schedule of ongoing maintenance.

This maintenance is required to keep components clean; to relamp fixtures and adjust their placement; to check the operation of transformers, timers and photocells and to check on the integrity of wiring and electrical connections.

Ideally, the installer will include a maintenance agreement with the initial contract. The terms of the agreement may vary according to the size and complexity of the system and other factors relating to the relationship with the homeowner.

What Determines the Maintenance Schedule?

Typical maintenance intervals range from once every 6 months to once every 18 months. The optimal service interval depends on climate, complexity and vulnerability of the system, plant material, budget and relationship with the homeowner.

1. Climate

Extremes of temperature can shorten life expectancy of system components. High heat and humidity may accelerate socket and wire corrosion and shorten lamp life through an increase of operating temperatures and deterioration of lamp pins and contacts. CAST lighting components are designed to minimize such corrosive damage but it is likely that some electrical components may need replacement after an undeterminable number of years.

Extreme cold temperatures may also affect system performance. A drop of 40º F can result in a decreased wire resistance leading to a voltage increase of as much as 0.5 volts at the fixture. This may be enough to significantly decrease lamp life. The cold temperature also increases the thermal shock imposed on lamp filaments during start-up, contributing toward early lamp failure.

Some Northern regions are also prone to frost heaves caused by the expansion, contraction and displacement of soil. Frost heaves can move fixtures and break wire.

2. Complexity and Vulnerability Influence on Maintenance

Obviously, the bigger a system is, the more likely that maintenance issues will surface. For this reason alone, more frequent maintenance visits are advised. There are also many factors that make the system more vulnerable. In such cases the

Maintenance Check List

1. Ensure that all lamps are working. Optional: Replace all system lamps every 18-24 months.
2. Clean all fixture lenses (a CLR solution works well) and remove dirt and debris from inside and outside all fixtures. RainX™ or similar hydrophobic treatment may be applied to lenses.
3. Trim or prune plant material as needed.
4. Check that all fixtures are positioned and aimed optimally.
5. Remove debris from around Spider Splice junctions to ensure ongoing access.
6. Check that no buried wires are exposed or damaged.
7. Confirm that timers and photocells are operating properly. Clean these units and trim plant material (if needed) to ensure photocell exposure.
8. Replace timer battery (Model CTDTC only) once a year.
9. Tighten all screws in transformer terminals.
10. With system powered on, confirm that primary amperage matches the amperage recorded at installation. If it does not match, troubleshoot system to determine cause.

maintenance schedule should have shorter intervals.

Factors that increase vulnerability of a system:

- **Use of higher voltage taps.** While it is sometimes necessary to use higher voltage taps, this increases the vulnerability of lamps to successive burnout (one lamp burnout leads to premature burnout of other lamps on the run).
- **Fewer numbers of fixtures on a single wire run.** Risk of successive burnout is also increased by fewer numbers of fixtures on a run.
- **Landscaping work.** Despite the installers best efforts to bury and protect wire runs, landscape workers may damage wires.

3. Plant Material

As plant material grows, fixtures may need to be repositioned and re-aimed. Lamp types may also need to be changed.

4. Budget and Relationship

It is often a hard sell to add a maintenance program on top of an expensive lighting system (especially when it's sprung on the homeowner at proposal time). A common approach that works well is to give one-year free maintenance, after which a billed maintenance schedule begins.

Some installers decline to take on a lighting project if the homeowner refuses the maintenance program. The wisdom in this is evident when you consider that a great initial installation (without ongoing maintenance) can turn into an eyesore and damage the reputation of the installer.

Successful contractors sell the project up-front as an ongoing relationship rather than a one-time design and installation.

The Importance of Documentation

System maintenance is greatly facilitated when the installer records system data in the following places:

- **Fixture Record Tags –** For fixture/Lamp-specific data
- **Transformer System Record Forms** (located inside the transformer lids) – For Transformer-specific data
- **Spider Splice Caps –** For wire-run identification

Maintenance Procedures

1. Cleaning fixtures

Bronze and copper fixtures that still have their natural uncoated finish should be wiped with a cloth to remove dirt and other detritus. If persistent stains are present due to bird droppings or other causes, then a wire brush or coarse steel wool can be used to remove the stain. Complete the cleaning process with a damp cloth being careful to remove any steel particles. Note that excessive use of the wire brush or steel wool will remove the surface patina.

If needed, a mild soapy solution can be used on the fixtures, but any kind of detergent or cleaning solution may cause changes to the colors of the surface patina.

Each fixture should be opened and inspected. Dirt, insects and other foreign material should be removed. If insects have invaded the fixture, then an appropriate insecticide can be applied inside the fixture to prevent future infestation.

2. Cleaning lenses

Convex lenses in CAST fixtures reduce precipitation of solids on lens surfaces, but some precipitation still occurs. The most effective cleaner for lenses is CLR® solution. This solution is applied to the lens and wiped dry with a cloth. Persistent stains may be removed with a scrubbing pad. Rain-X or similar hydrophobic solution may be applied to help prevent future precipitation on the lens.

3. Inspection of Spider Splices and wire runs

Locate each Spider Splice junction and remove any material that may have obscured it. Open the junction, pull out the splice bundle, and clean the enclosure if needed.

Visually inspect all areas where wire has been run. If wire has been exposed, re-bury wire.

Troubleshooting

The following chart serves as a reference to aide the installer in troubleshooting various problems that may arise in a CAST Landscape Lighting System. Since CAST Lighting products are so robust, the majority of problems arise from either installation issues or damage to system components post installation.

While this troubleshooting chart may be helpful in identifying problems with systems from other manufactures, the causes and remedies may not apply.

For each cause, an indication of 'Likelihood of Cause' (LC) is given. This information helps the installer by identifying which causes are most likely to be the reason for the problem. The 'Very Likely' causes (***) should be checked first; only when they are discounted should the 'Less Likely' (**) then the 'Rarely' (*) causes be investigated.

PROBLEM	LC*	CAUSE	REMEDY
LAMP ISSUES			
Premature lamp burnout	***	Overly high voltage during or after installation caused by: • Failure to adjust voltage to optimum range of 10.8 to 11.5v (at the lamp) during installation. • Variations in 120v line voltage. • Other lamps on the same run burned out, causing voltage rise at remaining lamps.	• Adjust lamp voltage to within limits. • Be sure to measure voltage with all system lights on. • Instruct homeowner to replace lamps soon after they fail or schedule total lamp replacement every 12-18 months. • Monitor 120v line voltage to assess variation then reduce lamp voltages down to compensate for highest expected line voltage
	***	Water from irrigation system contacts lamp.	• Adjust timing of irrigation system so it does not turn on while lamps are on, or • Install Sprinkler Shield (CSPRS), or • Reposition fixtures and/or nozzles.
	***	Oil from fingers on lamp envelope causing hot spots and breakage. (Note: this only occurs with tungsten halogen lamps.)	Avoid touching lamp surface with bare fingers.
***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**			

CAUTION: Repairs that require work with 120-volt currents should only be undertaken by licensed electricians.

PROBLEM	LC*	CAUSE	REMEDY
Lamp lights only when tapped	***	Lamp is improperly inserted into socket	Re-insert lamp securely into socket.
	***	Lamp filament has broken and carries current only intermittently.	Replace lamp.
	*	Socket contacts or connections have been damaged	Replace socket.
More Information, read: "Reducing Lamp Burnout"			
WIRING ISSUES			
No power to a single fixture (Other fixtures on same run are powered)	***	Bad Splice (See 'CAST Soldering Method' p. 34)	Redo splice.
	**	Cut Wire between Spider Splice and fixture	Repair or replace cut wire.
	*	Bad socket.	Replace socket.
	*	Transformer Issue – this can only be a cause if all lamps on a single run are burned out.	See 'Transformer Issues'
No power to all fixtures on a single wire run (Fixtures on other runs are powered)	***	Bad Splice.	Redo splice.
	***	Cut Wire between transformer and fixture	Repair or replace cut wire.
	***	Overloaded home run wire – more than 25 amps /300 watts (secondary breaker trips).	Reduce load on wire run by reducing lamp wattage(s), reducing number of fixtures on that run or using a heavier gauge wire.
	**	Shorted home run wire due to damaged wire (secondary breaker trips).	Locate damaged wire and repair or replace.
	**	Loose connection at the transformer common or voltage taps. Check that wires are stripped properly to prevent short circuits between terminals and to ensure wire insulation is not interfering with connections.	Ensure that home run wires are adequately inserted into taps and that tap screws (front and back) are tightened securely. Note: these screws should be tightened annually. Re-strip wire if needed.
	*	Multiple Deck or Niche Light fixtures are mounted on metal that connects the grounds of these fixtures (secondary breaker trips).	Check that each of these fixtures are spliced with the same polarity – the lettered strands of fixture leads should all be spliced together.
No power to all fixtures on all runs	***	Transformer issue.	See 'Transformer Issues' (p. 7).
	**	Breaker Box issue.	See 'Line Voltage Issues' (p. 9).
***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**			

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PROBLEM	LC*	CAUSE	REMEDY
Voltage loss on a wire run is greater than expected	***	Wires may have been poorly stripped resulting in cut strands. Or, splices may been done poorly.	Use caution and best practices when stripping wires and making splices.
TRANSFORMER ISSUES			
Secondary breaker trips (Immediately)	***	Overloaded wire run. Check for this by removing one or more lamps to reduce load.	Reduce load on wire run by reducing lamp wattage(s), reducing number of fixtures on that run or using a heavier gauge wire.
	**	Shorted home run wire due to: • Damaged wire in field • Shorted wire in fixture • Shorted wire in splice • Shorted wire at terminals	Locate damaged or shorted wire and repair or replace. Note: check that wire insulation is not interfering with terminal connection and that stripped wires are not contacting adjacent terminals (or wires connected to those terminals).
	*	Defective secondary breaker.	Replace secondary breaker.
	*	Multiple Deck or Niche Light fixtures (SCB lamps) are mounted on a common metal surface. This can result in a short since one fixture wire in these fixtures is connected to the fixture body.	Check that each of these fixtures are spliced with the same polarity – the lettered strands of fixture leads should all be spliced together. Note: A known issue has been that the lettered strand is not always connected to the same fixture point - in this case, connect one fixture at a time to determine if the fixture wires need to be reversed at the splice.
Secondary breaker trips (intermittently)	***	Common tap load is near maximum (25 amps/300 watts) and overloads due to: • Variations in 120v line voltage, or • Damage to wire run, or • Deterioration of wire splice	• Redistribute wire runs among commons • Reduce load on wire runs by reducing lamp wattage(s), reducing number of fixtures on runs or using heavier gauge wire. • Check for damage to wire runs and for integrity of splices.
No power to voltage tap (single tap only)	***	Terminal screw in the rear of the tap has come loose.	Ensure that terminal screws are tightened securely. Note: these screws should be tightened annually.
	*	Terminal tap has been heat damaged due to a loose connection.	Replace terminal tap.
	*	Internal wire from core has been heat damaged due to loose connection.	Call CAST.
***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**			

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PROBLEM	LC*	CAUSE	REMEDY
No power to all voltage taps (Primary Breaker has not tripped)	***	No line voltage to transformer. (Check voltage at GFCI outlet to confirm this.)	Refer to "Line Voltage Issues"
	**	Timer Failure. Remove timer and insert bypass plug to check for this.	Refer to "Timer Issues"
	**	Photocell failure. Remove photocell and insert bypass loop to check for this.	Refer to "Photocell Issues".
	*	Transformer relay has failed. (Only for transformer models of 900 watts and greater.) When the relay has failed there will be no power to the timer outlet.	Check to ensure that wire connections to relay are secure. If needed, replace relay. For additional protection, install No-Surge Soft-Start unit.
	*	GFCI voltage is OK but timer outlet has no power or displays less than GFCI voltage. This may indicated a break in neutral or hot wire in transformer power cord.	Check continuity of transformer power cable to ensure that transformer plug ends have continuity to timer receptacle. If not, replace power cord.
No power to all voltage taps (Primary Breaker and/or service panel breaker trips intermittently - nuisance tripping)	***	Transformer load is near maximum and overloads due to variations in 120v line voltage.	Reduce load on transformer.
	**	Inrush current from transformer is tripping the panel breaker. (This only occurs when transformer is located within about 15 ft. from the panel.)	Install No-Surge Soft-Start unit.
	*	Inrush current is not adequately absorbed by transformer's thermistor. (This only occurs when transformer is located within about 15 ft. from the panel.) Note: Transformers manufactured prior to Dec. 2003 did not come equipped with a thermistor and are prone to this problem. Transformers manufactured after Jan. 2008 employ No-Surge technology and may not have a thermistor installed.	Install No-Surge Soft-Start unit.
No power to all voltage taps (Primary Breaker trips immediately)	***	Transformer is overloaded.	Reduce load on transformer.
	*	Short circuit inside transformer. Check internal transformer wiring for damaged or disconnected wire. (Most common at terminal taps.)	Repair, replace or reconnect damaged or disconnected wires.
	*	Relay has failed.	Replace relay. Install No-Surge Soft-Start unit.
***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**			

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PROBLEM	LC*	CAUSE	REMEDY
Voltage at one or more voltage taps is lower than expected	***	The wire entering from the top of the terminal block (from inside the transformer) may be loose.	Tighten set screw at the top of the terminal block. If problem is not corrected, pop out the terminal block and inspect the connection to ensure that wire(s) is (are) making good contact with the set screw contact plate inside the block.
Buzzing or Noisy Transformer	***	Low Line Voltage	Troubleshoot line voltage issue.
	*	Loose relay connection(s).	Secure connections to relay.
	*	Relay damaged due to dust or moisture inside relay. Note: transformers manufactured after July 2006 have sealed relays that prevent this problem.	Replace relay. Install No-Surge Soft-Start unit.
Voltage taps are powered even when the timer and/or photocell is unplugged	***	Power Bypass Relay has malfunctioned (internal switch remains closed).	Replace Power Bypass Relay. Install No-Surge Soft-Start unit.
LINE VOLTAGE ISSUES (Note: Licensed electrician required for 120v work)			
Breaker at panel trips (Immediately)	***	Circuit overloaded. Check that breaker is able to accommodate transformer load. As a general guide: • Min. 20 amp breaker for 1500w & 1200w • Min. 15 amp breaker for 300w, 600w & 900w	Ideally you will have a breaker dedicated to the landscape lighting system. Consult electrician.
Breaker at panel trips (Intermittently)	*	Inrush current from transformer is tripping the Non-'High Magnetic' type panel breaker. This only occurs when transformer is located within about 15 ft. from the panel.	Install No-Surge Soft-Start unit.
GFCI Outlet trips	***	Fault to ground.	Consult electrician.
	*	Defective GFCI Outlet or outlet is incorrectly wired.	Consult electrician.
LAMP SOCKET ISSUES			
Socket Contacts fail to make good connection with lamp pins or contacts	***	Corroded socket. Can result from incomplete insertion of lamp into socket or from prolonged exposure to heat and humidity.	Replace socket.
***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**			

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PROBLEM	LC*	CAUSE	REMEDY
Socket or Socket Wires appear burned or cracked	***	Socket has overheated with prolonged use. Note: CAST MR-16 sockets manufactured after 2004 are equipped with a heat shield and extra-high-temperature-resistant wiring.	Replace socket. Add heat shield to MR-16 sockets if not already equipped. (Request Part #XCHMHS2 for CCTL1C, #XCHMHS1 for all other MR-16 fixtures.)
Path Lights with Bayonet-Mount Sockets fail	***	These sockets were replaced with more robust Wedge-Base Sockets in 2004.	Return fixture to CAST for socket retrofit.
Niche Lights with Wedge Base Sockets fail	***	A limited line of Niche lights with Wedge Base Sockets were manufactured in 2004. These sockets were replaced with SCB Sockets.	Return fixture to CAST for socket retrofit.
FIXTURE FINISH ISSUES			
Chalky coating appears on bronze surface	***	This is a natural occurrence with bronze after exposure to the environment. The coating is caused by zinc leaching to the surface. The leaching process may last one to several weeks depending upon the presence of rain, condensation and other factors.	The coating eventually disappears as the surface progresses to an old-penny brown. The coating may also be removed by applying CLR and wiping with a cloth. This application may need to be repeated until the leaching process has concluded. Spraying WD-40 followed by rubbing in with a cloth will result in an even brown color.
Bronze surface is unevenly colored or streaked	***	The bronze surface may change color unevenly depending upon environmental exposure. This is normal and the surface evens out as it ages.	To immediately bring bronze and copper to its final patination, see "Coloring of Bronze and Copper" (www.cast-lighting.com/art-tony-color.html
Path Light hats and vases show a different color than the copper stem	***	The bronze and copper may undergo color changes at different rates. Over time, they will both transform into a similar patina blue-green.	
Client wants fixtures to be black or verdi upon installation	***	Refer to article in website - "Coloring and Patinization Bronze"	

***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**

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PROBLEM	LC*	CAUSE	REMEDY
Rust spots appear on bronze surface	***	The presence of iron and other minerals in rain or irrigation water may cause accumulation of these minerals on the surface of the fixtures leading to rust spots or discoloration.	Clean fixture with CLR, using steel wool or a wire brush if necessary. (Wipe clean after scouring to ensure that iron or steel does not remain on the fixture.) If irrigation water is the problem, then try to re-aim nozzles or re-locate fixtures. Spraying WD-40 followed by rubbing in with a cloth will result in an even brown color.
	**	This is a known issue for certain production runs prior to 2006. It is caused by the presence of iron particles in the sand used in sand-casting. (Rust spots from this cause are small and localized.)	Rust spots are superficial and can be easily removed with steel wool or a wire brush. (Wipe clean after scouring to ensure that iron or steel does not remain on the fixture.)
FIXTURE LENS AND FILTERS ISSUES			
Lens become cloudy	***	Results from deposition of minerals from rain, sprinklers and condensation and from other environmental factors.	Washing and scouring the lens with CLR will remove most types of deposition.
Lens cracks or breaks	***	Physical abuse.	Replace lens.
	*	Thermal shock – cold water on hot lens. (Note: CAST lenses are highly resistant to this type of damage.)	Replace lens.
Filters will not fit inside vase of Bullet Area Light	***	There is a known issue with insufficient space for supplemental filters inside early models of the Bullet Area Light (CBAL1CB).	Remove the heat shield from the socket. Note: if heat shield is removed, do not exceed lamp wattage of 35W.
***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**			

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PROBLEM	LC*	CAUSE	REMEDY
FIXTURE O-RINGS			
O-Rings crack or break	***	O-ring material has lost it's elasticity and resilience.	Replace O-Rings. Note: Apply non-silicone grease to rings once a year to prolong their life.
	**	O-rings can be damaged from using excessive force when sliding fixture shroud over O-ring.	Before sliding shroud over O-ring, use non-silicone lubricant on O-ring then use gentle twisting motion to affix shroud.
	**	Shrouds use a thumb screw for securing onto the fixture body. Before sliding the shroud over the O-ring, this thumb screw needs to be backed off so that it does protrude beyond the inside shroud surface. A protruding screw can damage the O-ring.	Back off shroud thumb screw before attaching shroud.
PHOTOCELL AND TIMER OUTLETS, PHOTOCELL JUMPER WIRE			
Photocell or Timer Outlet or Photocell Jumper Wire is burned or cracked	***	Prior to 2004, the full current of the transformer passed through the timer and photocell outlets. Since 2004, all transformers (900w and above) incorporate a relay that sends a greatly reduced current through the outlets. Older Transformers (900w and above) may develop burning or cracking of the outlets and jumper wire.	Replace damaged outlets and jumper wires. For older transformers (900w and above – without a relay), contact CAST about retrofitting with a relay.
PHOTOCELL ISSUES			
Photocell fails to turn on transformer	***	Timer is not set or operating properly. To check for this, unplug timer, ensure that voltage is present, and insert timer bypass plug, re-test photocell. (Note: when you cover the photocell, it will take 2 to 3 minutes for the switch to engage.)	Address timer issue.
	*	Photocell outlet is damaged.	Replace photocell outlet.
	*	Photocell is damaged.	Replace photocell.
Photocell fails to turn off transformer (When timer is not present)	***	Photocell head is dirty.	Clean the photocell.
	***	Photocell is located in shady or dark area.	Relocate or re-aim photocell.
***Likelihood of Cause (LC): *** 'Very likely', ** 'Less likely', * 'Rarely'**			

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How to Locate a Cut or Damaged Wire on a Wire Run

The following steps assume the following:

- Power is present at the voltage and common taps (check with meter).
- The lamp-and-wire load on the suspect run is not overloading the common (300W/25A max).
- Fixtures are lamped with functioning lamps.
- All fixtures on the run have no power. Note: if only some of fixtures on a run have no power then the problem is at the Spider Splice, the fixture or between the two.

1. With transformer powered on, turn off all secondary breakers. After each of the following steps, turn on secondary breakers to see if problem is resolved.
2. Remove suspect leads from voltage and common taps. Confirm that wires are stripped properly then re-insert into taps.
3. Check likely areas of wire damage, such as in planting beds and along turf trim lines. Pull the wire out of the ground in these locations, carefully inspect for damage.
4. Remove lamps from each fixture, checking for signs of socket corrosion and damaged socket wires. Replace lamps.
5. Cut and re-strip all wires at the Spider Splice. Being careful to separate all exposed leads, power up the transformer and check for voltage at the home run leads. If voltage is present, then the problem was in the slice, the fixture or between the two. If voltage is not present, then the problem is between the splice and the transformer.
6. To locate the damaged section, a wire tracing tool can be used, such as the Amp probe Advanced Circuit and Wire Tracer (Model AT-4001). This tool's transmitter is connected to the wire run and the ground at the transformer, then a receiver is used along the buried wire's path to locate the cut.

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Socket Replacement – MR-16

Tools Required

1. Phillips Head Screwdriver
2. Needle-Nose Pliers
3. Wire Cutters
4. Automatic Wire Strippers (CASTSTRIP1)
5. Crimping tool
6. Heat Gun
7. High Temp Bearing Grease

Bullet Parts

1. Stake (CMS1CB)
2. Knuckle (XCBPNUCKA1)
3. Body (XCBPCAN1)
4. Shroud (XCBPSHROUD1A)
5. Spring (XCEHSPRING)
6. Heat Reflector (XCHMHS1)
7. MR-16 Socket (XCESMR161)
8. 1/4” Heat Shrink (XCEWEPS30014)
9. O-rings (XCORAS568320, XCORAS568136)
10. Butt Crimp (XCEWM14BCK)

Bullet parts.

Remove shroud and heat reflector.

Remove spring.

Unscrew vase from knuckle.

Remove O-ring and place aside.

Unscrew and remove knuckle screw.

Separate knuckle pieces.

Push socket wire into knuckle.

Cut wire junction on wire-side of crimp.

Repeat with other wire.

Cut both white wires at junction.

Remove O-ring.

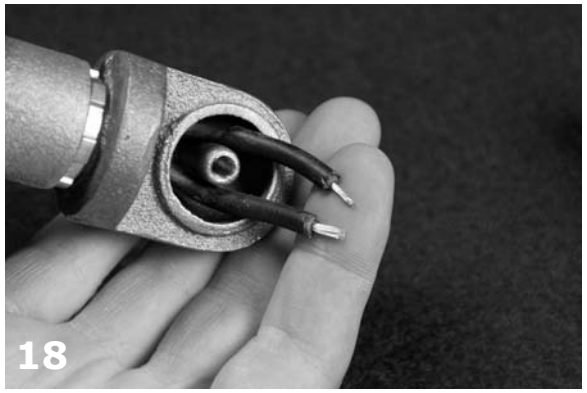
Pull fixture wire from knuckle.

Remove old socket from insulation sleeve.

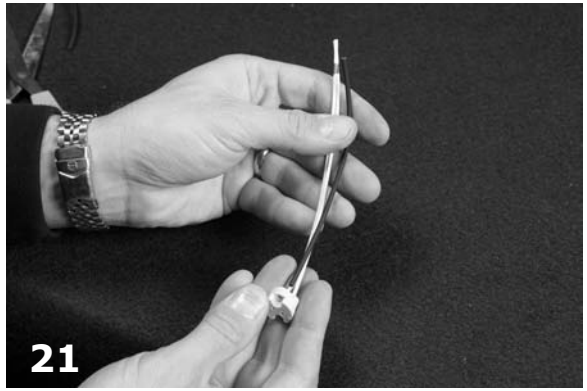
Grasp bottom part of knuckle.

Using pliers, remove old heat shrink.

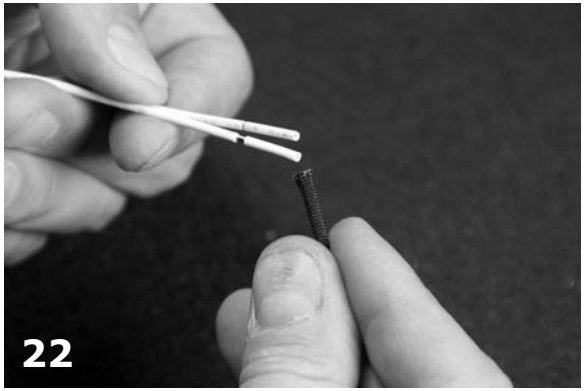
Strip wires.



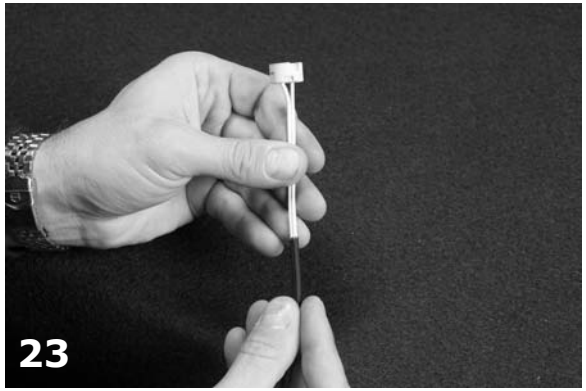
Slip O-ring over top part of knuckle.



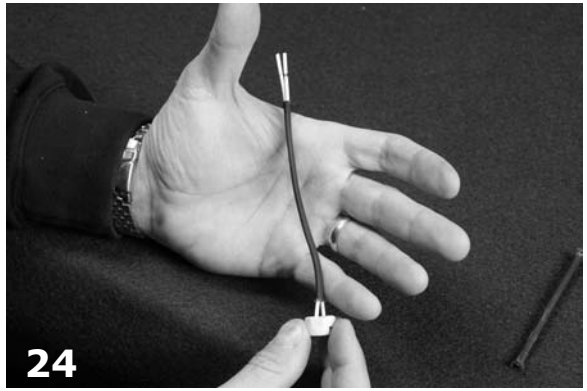
Grasp new socket and straighten wires.



Insert both wires into insulation sleeve.



Slide insulation sleeve as far as it will go.



Insert socket wire into knuckle top.

Pull wire until socket rests against knuckle.

Remove wire insulation tips.

Trim bare socket wire to same length as lead wire.

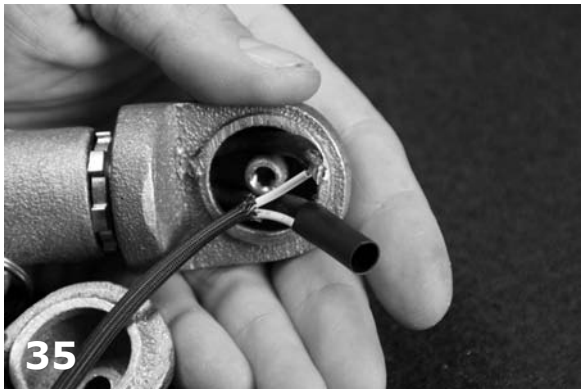
Slide crimp barrel over bare wire ends.

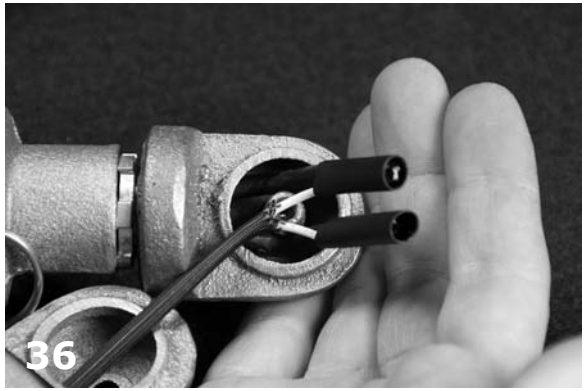
Using crimp tool, crimp barrel over wire ends.

If barrel crimp extends past crimp, trim it.

If crimp edge is sharp, file it smooth.

Slip heat shrink tube over crimp and wire.





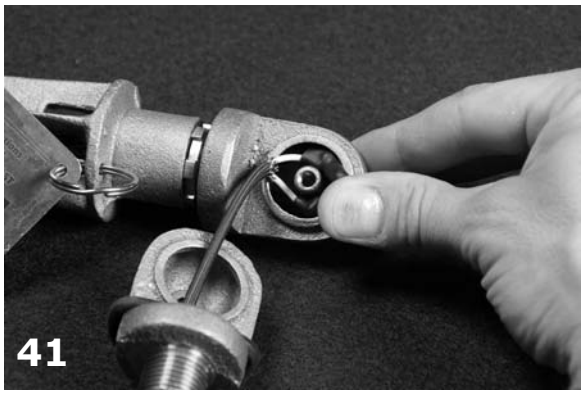
Repeat steps with other wires.

Apply heat gun evenly to heat shrink.

While heat shrink is still hot, go to next step.

Using pliers, compress heat shrink past crimp.

Trim excess heat shrink



Press crimps into wire channel.

Retract socket wire to allow reassembly.

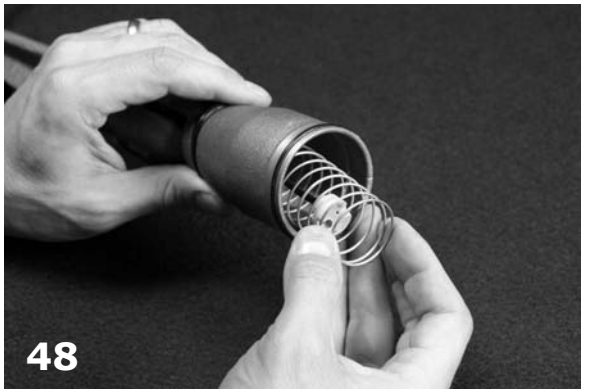
Slide O-ring over knuckle into place.

Re-insert screw and tighten.

Place O-ring on knuckle.

Screw vase onto knuckle.

Socket head should be able to rest on lip.



Re-insert spring.

Insert heat reflector into socket head.

Using pliers, bend back tabs.

Bearing grease.*

Apply grease to O-ring.

Grease should cover entire O-ring

Before applying shroud, retract set screw so it does not extend past inside shroud surface.

This is the correct position of set screw.

Completed repair.

Terminal Block Replacement

Tools Required

1. Phillips Head Screwdriver
2. Long handled Flat Head Screwdriver

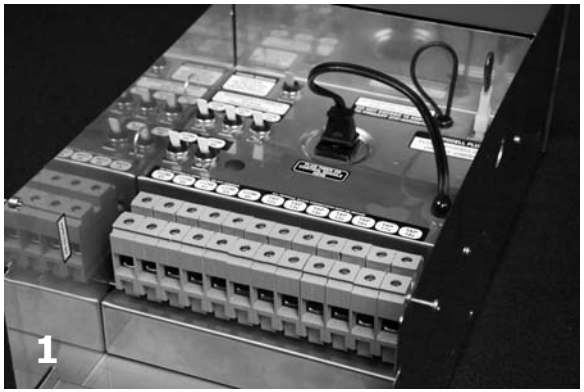
Parts

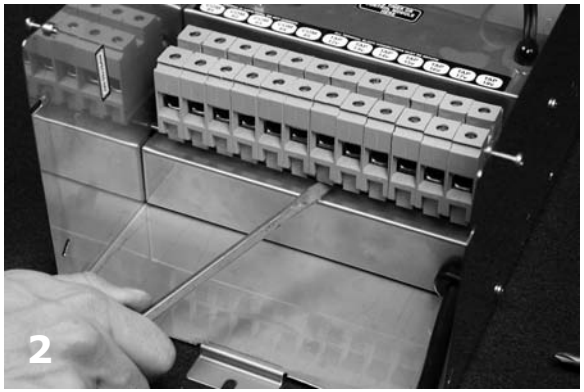
1. CAST 125A Rail-Mounted Terminal Block ((XCEWTB1)

⚠ WARNING – RISK OF ELECTRIC SHOCK

Read these Safety Instructions.

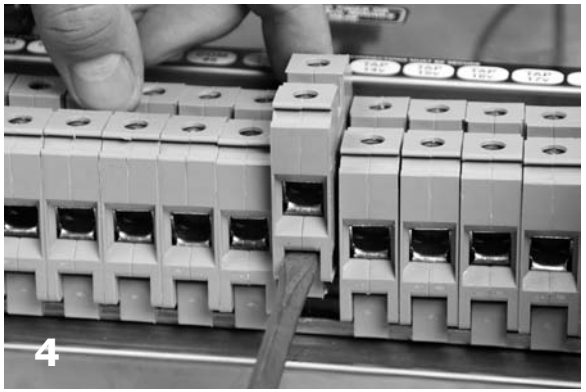
Unplug the transformer from the 120-volt outlet before servicing the transformer.



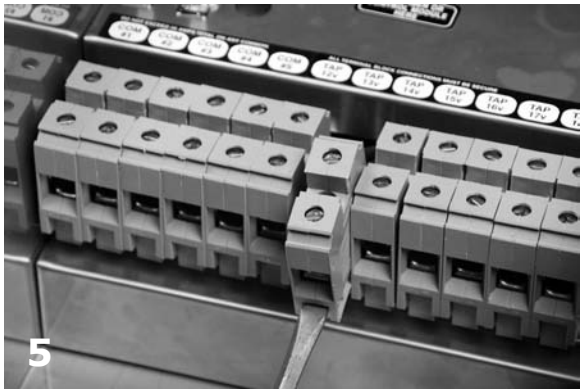


Insert screwdriver under terminal tab.

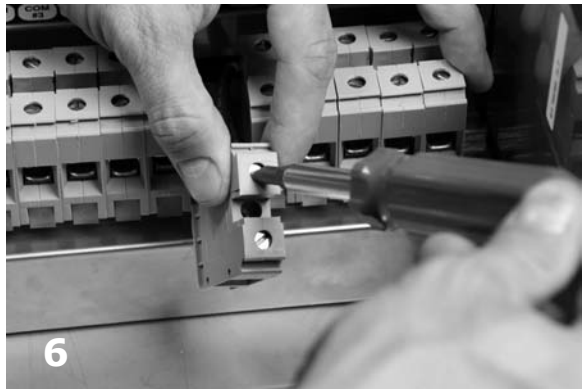
Pushing down on screwdriver, pry tab loose.



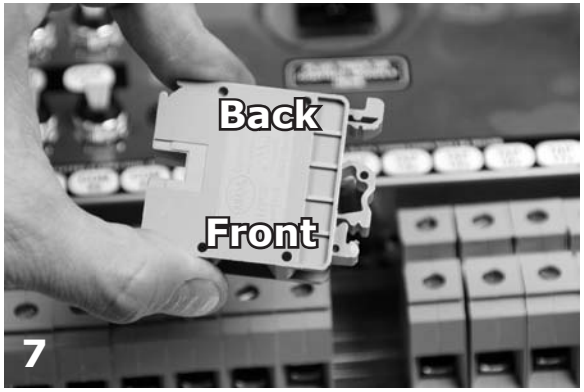
Fully disengage terminal.



Pull terminal away from housing.



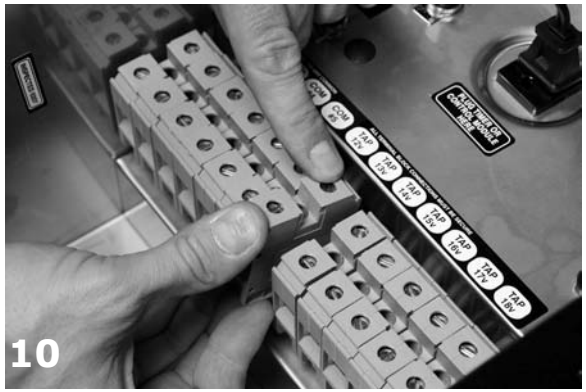
Unscrew tap screw to remove terminal.



Replace terminal noting correct direction.

Insert wire(s) into terminal back and tighten.

Note, bare wire should be visible.



Press terminal block into place - back first.

Apply pressure to front and back to secure.

Firmly tap terminal top for final seating.

Circuit Breaker Replacement

Tools Required

1. Phillips Head Screwdriver
2. Pliers

⚠ WARNING – RISK OF ELECTRIC SHOCK

Read these Safety Instructions.

Unplug the transformer from the 120-volt outlet before opening the transformer's inner compartment.

Do not plug the transformer into the 120-volt outlet while the inner compartment is open.

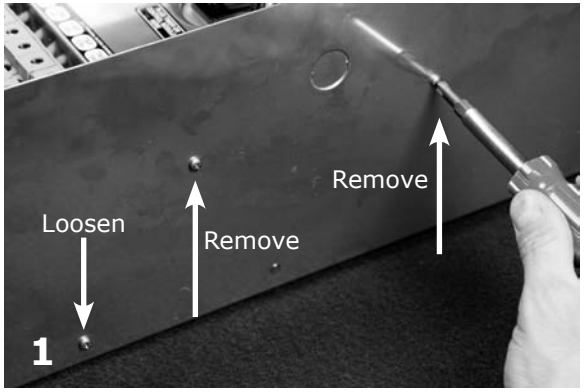
Replacement Parts

Primary Breakers

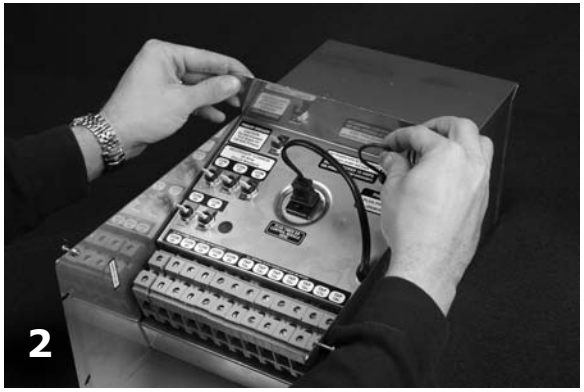
- 8-Amp Breaker for CM900SSMT (XCEWCB8A)
- 10-Amp Breaker for CM1200SSMT (XCEWCB10A)
- 12-Amp Breaker for CM1500SSMT (XCEWCB12A)

Secondary Breaker

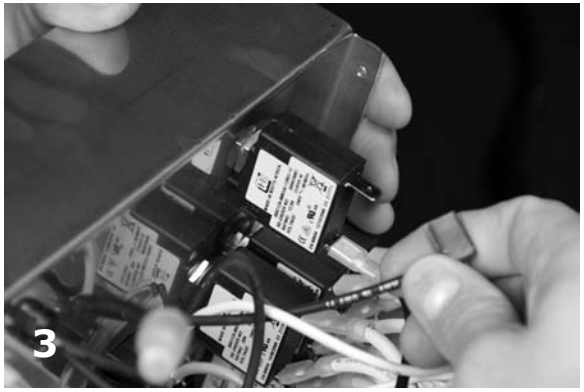
- 25-Amp Breaker for all transformers (XCEWCB25A)



Remove and loosen screws from each side.



Grasp inner back plate and tilt forward.

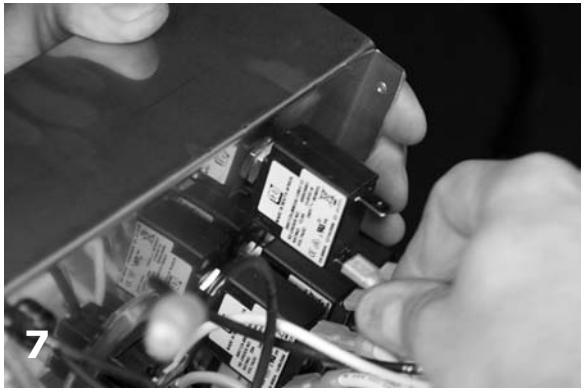


Locate breaker on back side and remove wires.

On panel face, loosen breaker set screw.

Remove set screw and plate. Remove breaker.

Insert new beaker. Replace plate and set screw.



Reattach wires. Lower and secure inner panel.

Power Bypass Relay Replacement

Tools Required

1. Phillips Head Screwdriver
2. Pliers

Replacement Parts

Power Bypass Relay
Model: XCBPRELAY1

Installed in CAST Transformers Model Nos:

CJ900PSMT, CJ900SSMT, CM900SSMT, CM1200SSMT, CM1500SSMT, CP900SSMT, CP1200SSMT

When to Replace the Relay

There are two main conditions that justify the replacement of the relay:

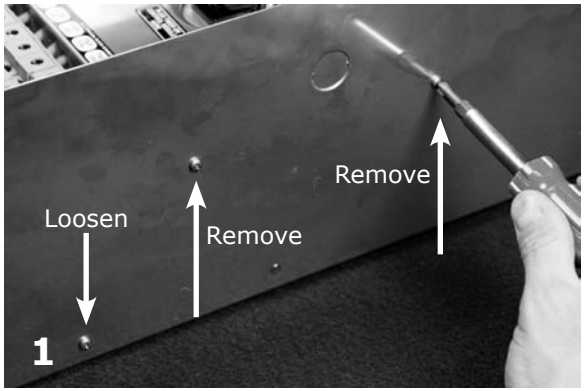
1. The relay is stuck in the 'closed' position. When this occurs, no click is heard as the transformer is powered up. Also, power passes to the voltage taps even when nothing is plugged into the timer and/or photocell receptacles.
2. The relay does not close or it cycles between closed and open. When this occurs, a buzzing may be heard. First check to make sure connections are secure (tightening connections may solve the problem).

⚠ WARNING – RISK OF ELECTRIC SHOCK

Read these Safety Instructions.

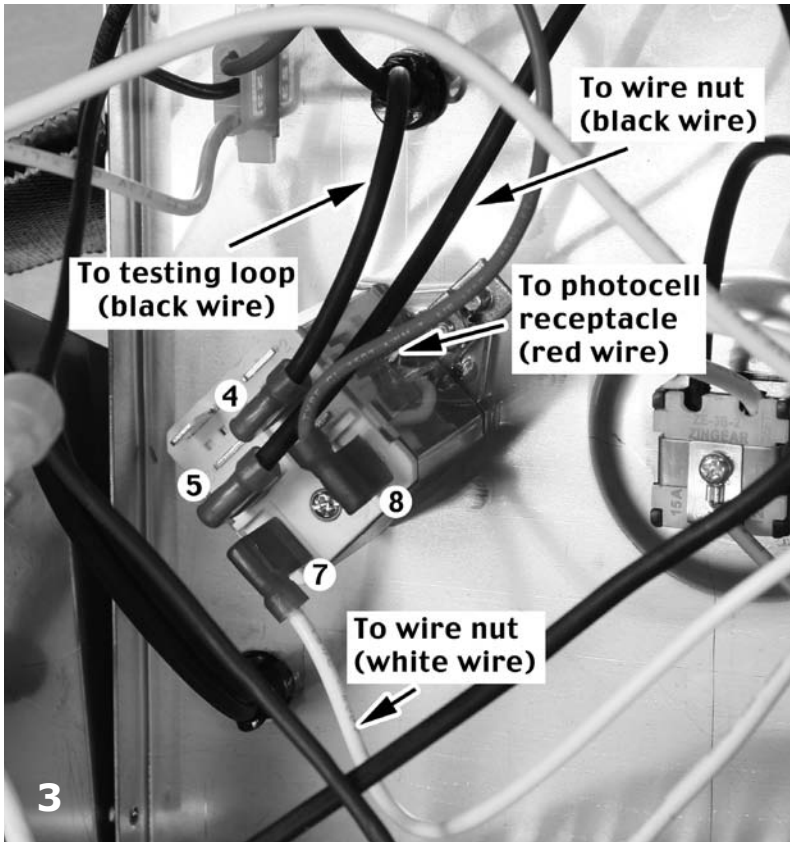
Unplug the transformer from the 120-volt outlet before opening the transformer's inner compartment.

Do not plug the transformer into the 120-volt outlet while the inner compartment is open.



1. Remove and loosen screws from each side.

2. Grasp inner back plate and tilt forward.

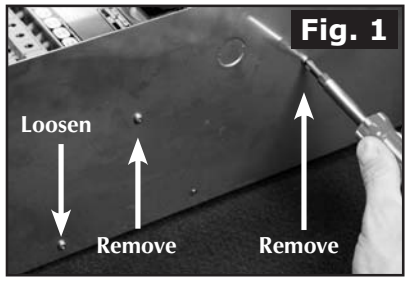


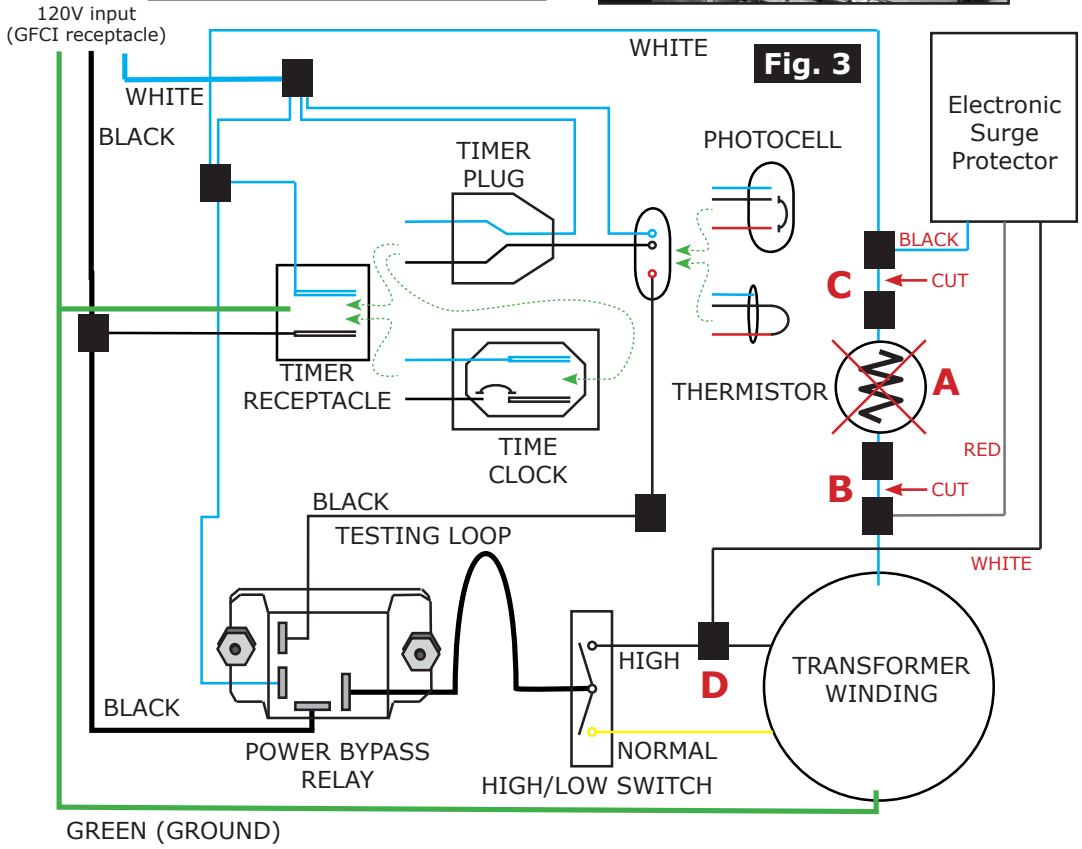
3. Locate the Power Bypass Relay (see picture 3).
4. Using fingers, grasp each connector and detach it from the relay.
5. Note the two screws that secure the relay to the panel. Using a Phillips head screwdriver, unscrew each screw while firmly holding the nut with the pliers. Remove the relay.
6. Attach the new relay using the old screws and nuts.
7. Re-attach wires referring to the photo here. Note that each relay connector is numbered (numbers embossed on plastic).
8. Follow each wire to ensure that connections are correct.
9. Close inner panel and re-attach panel screws.

CAST Electronic Surge Protector Retrofit for CAST Transformers (Journeyman Series) (600w and 900w Models)

Instructions (See CAUTION below.)

1. Unplug transformer from 120V outlet.
2. Remove outer transformer lid.
3. Loosen drop-down door screws.
4. Remove two screws from each side of the transformer housing and loosen the third screw. (See Figure 1.)
5. Grasp test loop and pull outward to expose inner transformer compartment. (See Figure 2.)
6. Locate thermistor (rectangular component covered with black cloth tape) (See "A" in diagram). Remove and discard this unit by cutting wires at crimps. Strip back cut wires 1/2".
7. Align the end of the cut white wire (connected to the transformer core) with the end of the red wire from the Surge Protector. (See "B" in diagram.) Connect these two wires with an orange twist-on connector. Twist until secure.
8. Align the end of the other cut white wire with the end of the black wire from the Surge Protector. (See "C" in diagram.) Connect these two wires with an orange twist-on connector. Twist until secure.
9. Cut the black wire at location "D". Strip back cut wires 1/2". Align the two ends of the cut wire with the end of the white wire from the Surge Protector. Connect with an orange twist-on connector. Twist until secure.
10. Position the Surge Protector so that the compartment panel can be closed without pinching wires.
11. Close and secure compartment panel.



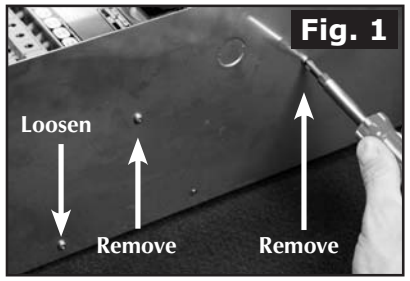


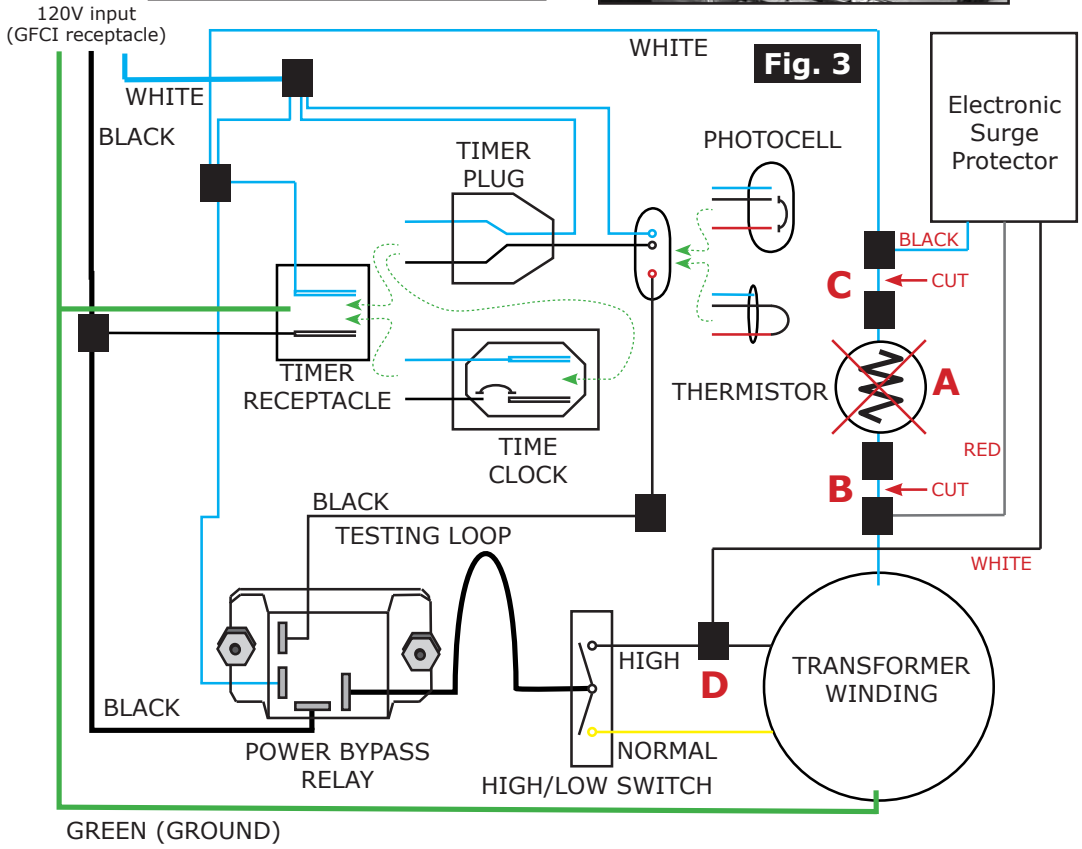
CAUTION: Unplug the transformer from the 120V outlet before opening the internal transformer compartment. 120V conductors are exposed during this replacement procedure. Utilize an electrician if statutes, regulations or codes require you to do so.

CAST Electronic Surge Protector Retrofit for CAST Transformers (Journeyman Series) (600w and 900w Models)

Instructions (See CAUTION below.)

1. Unplug transformer from 120V outlet.
2. Remove outer transformer lid.
3. Loosen drop-down door screws.
4. Remove two screws from each side of the transformer housing and loosen the third screw. (See Figure 1.)
5. Grasp test loop and pull outward to expose inner transformer compartment. (See Figure 2.)
6. Locate thermistor (rectangular component covered with black cloth tape) (See "A" in diagram). Remove and discard this unit by cutting wires at crimps. Strip back cut wires 1/2".
7. Align the end of the cut white wire (connected to the transformer core) with the end of the red wire from the Surge Protector. (See "B" in diagram.) Connect these two wires with an orange twist-on connector. Twist until secure.
8. Align the end of the other cut white wire with the end of the black wire from the Surge Protector. (See "C" in diagram.) Connect these two wires with an orange twist-on connector. Twist until secure.
9. Cut the black wire at location "D". Strip back cut wires 1/2". Align the two ends of the cut wire with the end of the white wire from the Surge Protector. Connect with an orange twist-on connector. Twist until secure.
10. Position the Surge Protector so that the compartment panel can be closed without pinching wires.
11. Close and secure compartment panel.





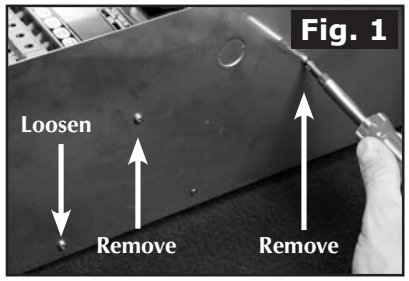
CAUTION: Unplug the transformer from the 120V outlet before opening the internal transformer compartment. 120V conductors are exposed during this replacement procedure. Utilize an electrician if statutes, regulations or codes require you to do so.

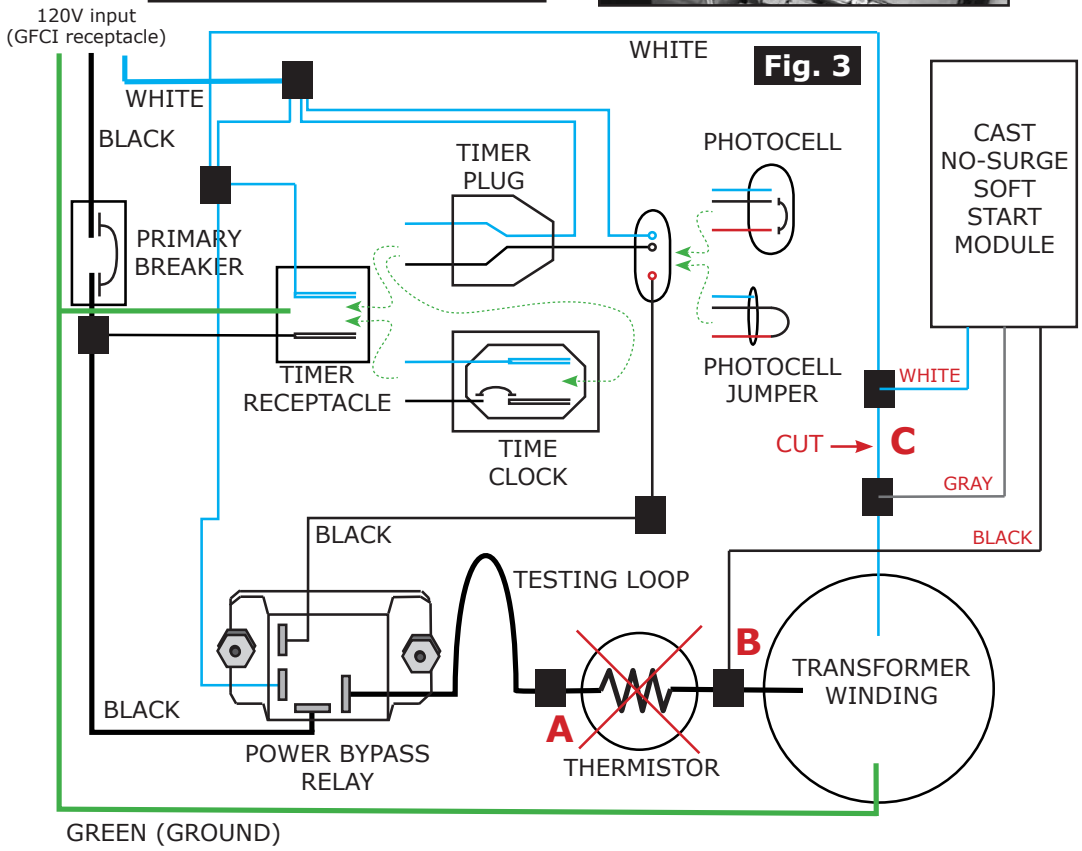
Old world craftsmanship. . .today's technology®

CAST No-Surge™ Retrofit for CAST Transformers (Master Series)

Instructions (See CAUTION below.)

1. Unplug transformer from 120V outlet.
2. Remove outer transformer lid.
3. Remove two screws from each side of the transformer housing and loosen the third screw. (See Figure 1.)
4. If the side knockouts have plastic inserts, remove them.
5. Grasp test loop and pull downward and outward to expose inner transformer compartment. (See Figure 2.)
6. Locate thermistor (rectangular component covered with black sleeving) (See "A" in diagram). Remove and discard this unit by cutting wires at crimps. Strip back cut wires 1/2".
7. Align the ends of the two cut wires with the end of the black wire from the No-Surge unit. Connect these three wires with a twist-on connector. Twist until secure. (See "B" in diagram.)
8. Locate the white wire connecting the transformer core with the crimped connection leading to the relay and receptacle (See "C" in diagram.)
9. Cut this wire at location "C". Strip back cut wires 1/2". Align the end of the white wire going to the transformer core with the gray wire from the No-Surge unit. Connect with an orange twist-on connector. Twist until secure.
10. Align the end of the other cut white wire with the white wire from the No-Surge unit. Connect with an orange twist-on connector. Twist until secure.
11. Position the No-Surge unit so that the compartment panel can be closed without pinching wires.
12. Close and secure compartment panel.





CAUTION: Unplug the transformer from the 120V outlet before opening the internal transformer compartment. 120V conductors are exposed during this replacement procedure. Utilize an electrician if statutes, regulations or codes require you to do so.

REFERENCES

I. Preventing Lamp Burnout in Low Voltage Landscape Lighting.

Lamp burnout is the number one headache for landscape lighting installers. Even if the lighting design is spectacular, if lamps are burning out prematurely the homeowner will be unhappy. The CAST office gets many calls from both installers and homeowners complaining about lamp burn-out and all we can do is point out the most common causes – voltage that's too high or low, skin oil on the lamps and water splashing on a hot lamp.

Tungsten-halogen 12-volt lamps are very sensitive to conditions of over and under-voltage. Voltages over 12v will overheat the filament, accelerating loss of its tungsten atoms, leading to filament thinning and rapid breakage. Voltages under about 10v cause premature burnout for the same reason. (See the article "Why Voltage is Key for Tungsten Halogen Lamps")

* Bad field splices are actually a bigger problem since they are often the cause of system failure (For the solution to that problem, see the article "Wire Soldering for Secure Connections").

Lamp burn-out should not be a problem if you:

1. Use only CAST Lighting lamps. Some points to keep in mind:
   a. Use only glass-covered MR-16 lamps. Open-faced MR-16's suffer rapid internal reflector damage.
   b. MR-16 lamps have two main types of internal reflectors, dichroic and aluminum. Dichroic reflectors are designed to allow heat to pass through the back side of the lamp (good for display cases, bad for outdoor fixtures). Excess heat build-up inside a fixture can damage sockets and pins. For this reason, CAST supplies the Service Saver line of MR-16's with aluminum reflectors. We also use a heat shield behind the lamp inside all our MR-16 fixtures.
2. Never touch the lamp envelope of a tungsten-halogen lamp with bare fingers. Oils from your skin create hot spots that can burst the lamp. (Note: MR-type, PAR and non-tungsten-halogen lamps can be touched, but to be on the safe side, wear gloves when replacing all lamps.)
3. Avoid situations where the irrigation system may spray water on unprotected lamps in Path Lights. If there's no way to avoid this, then work with the homeowner to set timers so the irrigation system turns on after the lights go off or reposition the fixtures.
4. Aim for 10.8v to 11.5v at the socket.
5. Only test voltages with all system lamps on (including the lamp you are testing).
6. Make sure your meter is accurate at low voltages. Most meters in the $50 to $150 range are calibrated to 120v with an accuracy of +/– 2%. These inexpensive meters maintain this accuracy only at 120v and may be off by as much as 0.8 volts at 12v. The CAST Volt/Amp Meter is the only meter on the market calibrated for maximum accuracy at 12v.
7. Measure voltage at the fixture socket with the lamp in place. (Note: use our CTESTMR16 pigtail for MR-16's.)
8. If you cannot measure the voltage at the socket with the lamp in place, test the voltage at the Spider Splice and subtract the following amounts from the meter readings:
   a. If the lowest fixture wattage on the run is 20W, subtract 0.3 volts.
   b. If the lowest fixture wattage on the run is 35W, subtract 0.5 volts.
   c. If the lowest fixture wattage on the run is 50W, subtract 0.8 volts.
9. Record the voltage at the GFCI outlet as a reference for future testing. A difference in 10v on the 120v side translates to a difference in 1.0v on the low voltage side. Household voltages can vary according to time-of-day, season and the presence of other loads (especially air conditioners) on the system. Always check

CAUTION: Repairs that require work with 120-volt currents should only be undertaken by licensed electricians.

for these variations when burn-outs inexplicably occur.

10. Replace burned-out lamps as soon as possible. When a lamp burns out, all other lamps on that run will receive a voltage jump. The amount of this jump depends on the voltage loss on that run and the number of fixtures.

    A worst-case scenario would be a very long run (250 ft.) with (2) 50w fixtures. One lamp burns out and the voltage jumps 2.4v, enough to burn out the other lamp in very short order.

    An easy way to estimate the risk of lamp burnout on a run is to use the formula:

    Voltage loss / number of fixtures = voltage jump when one lamp burns out

    A voltage jump of over one volt is a risky situation. It would be a wise strategy to increase wire gauge to minimize voltage loss on these high-risk wire runs. (Try out different wiring scenarios with our Online Calculator.)

11. Replace all lamps once every 18 months. Many installers will schedule maintenance visits every Spring and Fall. With this schedule, you can do a complete lamp replacement in Spring of one year, then Fall of the next year, then skip a year and do another complete replacement the following Spring, and so on.

12. Provide the homeowner with replacement lamps with instructions to replace them asap after burn-out. Be sure to mark all Fixture Record Tags with the correct replacement lamps.

13. Make sure that lamps are securely seated in sockets, and that socket contacts are in good condition. It often happens that lamps fail to function not because the lamp burns out, but rather that the socket and/or lamp contacts are making poor contact. Both situations lead to increased electrical resistance creating excess heat that damages the contacts and eventually causes them to fail.

CAST Soldering Method

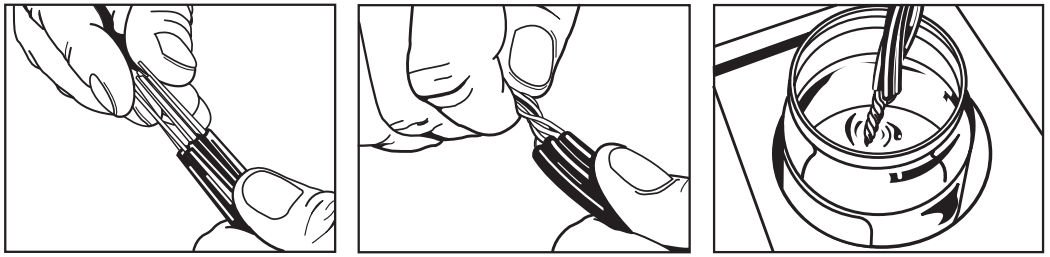
This method ensures the best possible splice that maintains an excellent connection, impervious to corrosion.

It also significantly reduces the strain on fingers and wrists that plague installations using non-soldered wire nut connections.

The CAST Soldering Method

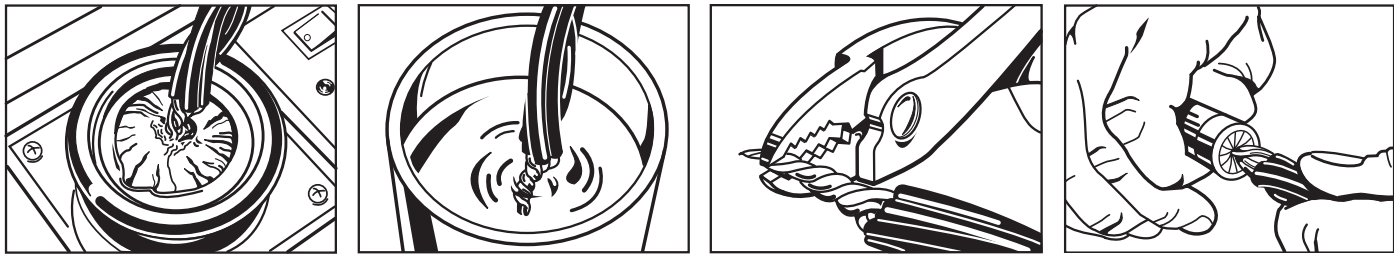
Soldering Kit & Tote available from your CAST distributor.

Strip wires 1 1/4", twist each exposed wire, line up wires → Twist wires together → Dip into flux



⚠ **Caution: Solder is extremely hot; wear eye protection and keep away from children.**

Dip into solder → Dip into water → Trim excess → Twist until tight



This method is quick, easy, reduces finger strain and results in a connection that will never fail!

CAST LIGHTING LIMITED WARRANTY

CAST Lighting warrants its products against defects in material and workmanship. Without charge, CAST Lighting will either repair or replace (CAST Lighting reserves the right to decide between repair or replacement) any properly installed CAST Lighting product which fails under normal operating conditions and has not undergone abuse beyond normal wear-and-tear within the specified warranty period.

Lighting Fixtures (does not include Demo Kit components)

- Bodies, Castings, Housings, Stakes, Stems and Lenses: Lifetime Warranty
- O-Rings and Socket Components: 3-Year Warranty

Transformers (does not include Electronic Mini-Transformers)

- Windings and Stainless Steel (SS Series) Enclosures: Lifetime Warranty
- Mild Steel (PS Series) Enclosures: 3-Year Warranty
- Electrical Components: 3-Year Warranty
- Photocells and Timers: 3-Year Warranty
- Note: Before CAST Lighting will accept suspect transformers, they must be bench-tested at the distributor to confirm malfunction. Warranty will not be honored for transformers with cut wires or other modifications.

Electronic Mini-Transformers: 3-Year Warranty

No-Ox® Wire: 25-Year Warranty

Tools and Meters: 1-Year Warranty

Demo Kit Components: 90-Day Warranty

Lamps: No Warranty

All products are warranted from the date of invoice, provided it is returned to the factory, transportation prepaid, and our factory inspection determines it to be defective under the terms of the warranty.

This warranty covers only equipment manufactured by CAST Lighting and does not extend to transportation, installation, labor compensation, or replacement charges, nor does it apply to any equipment of another manufacturer used in conjunction with CAST Lighting equipment.

NOTE – FIELD REPAIRS RECOMMENDED

All CAST Lighting products are designed to be field repairable by a qualified installer. All service parts are readily available and we encourage field repairs as a significant cost and labor saving can be realized by the installer. All warranted components, as stated in the above warranty, which are installed in the field, will be honored.