

Contents

The Holiday Lighting Season.....	4
Working From or Starting a Customer Base.....	5
Types of Lights and How They Work.....	5
Choosing Lights for Specific Areas or Applications.....	8
Working With Miniature Light Sets.....	9
Basic Tips For Troubleshooting Lights.....	10
Repairing Mini Light Sets Like a Professional.....	11
Repairing C7 & C9 Light Strings.....	12
Flashing, “Chasing” and Blinking Lights.....	13
Attaching Lights to Homes and Buildings.....	14
Attaching Lights and Greenery on Brick.....	17
Lighting Bushes, Shrubs, Hedges and Trees.....	18
Decorating With Garland and Bows Around Windows and Doors.....	24
Outlining Sidewalks, Driveways and Patios With Light Stakes.....	26
Lighting Taller Commercial Buildings.....	28
Electrical Considerations.....	29
Take-Down and Storage of Lights After the Season Ends.....	32
Recommended Sources For Buying Suggested Products.....	32
Summary of Frequently Asked Questions.....	33
Pricing and Bidding Installation Jobs.....	34
Job Materials/Labor Estimate and Customer Estimate Sheets.....	35

THE HOLIDAY LIGHTING SEASON

Most landscape, maintenance and other outdoor service businesses experience a lull or even complete shutdown after the first freeze in the fall of the year. That means that sometimes good employees are lost and new ones have to be found for the next spring looking. **By building a seasonal light business, it may be possible to keep good employees year around and eliminate the problem of hiring and laying off good help...which may, in itself, be one of the biggest advantages you experience by adding this service to your list of offerings.** You'll find that most potential holiday lighting customers want their lights installed and turned on by around Thanksgiving and the relatively short time period between the end of traditional summer servicing can easily bridge over into the fall and winter and provide the extended opportunities that this handbook will outline for making the most of the lighting season. Once your business is built up, it means that you may have to start installing lights as early as the middle or first of October, particularly if you get some big commercial jobs such as shopping centers, etc. **You may want to get your feet wet the first year by taking on just a few small jobs to build confidence and gradually expand into larger and more elaborate decorating projects as your experience lends itself to the situation.** Likewise, doing a few small to medium size jobs very well the initial season will get you a lot of referrals the second year and in the seasons that follow. And, as an added benefit, some of the customers you add at Christmas may want you to take care of their summer maintenance and landscaping needs as well. **You will have a built-in client base with which to continue servicing your customers into other parts of the year and thus achieve a totally year-round operation capable of sustaining itself when otherwise it would have been a necessity to scale back or shut down almost completely.** In short, the addition or start-up of a holiday lighting business venture may in fact perpetuate itself into other business that you had previously not considered or chosen to offer previously.

When Does the Holiday Lighting Season Start and Conclude?

Installation of holiday lighting can start about the time regular outdoor maintenance ends and it continues steadily until about two weeks after Thanksgiving. From then until the first of the year, there will probably be a limited amount of maintenance on the lights you've installed. Oftentimes, this will simply depend on how much inclement weather occurs in your immediate area. **A lot of rain, snow, or high wind may occasionally play havoc with your installations, but all things considered, you will most likely find that the last two to three weeks of the year are relatively carefree in terms of maintaining the lighting jobs you've completed.** Normally, you can expect to get a well-deserved break during the actual week of Christmas right up through New Year's Day.

After the first of the year, it's time to begin the process of taking the lights down and packing them away for your customers. The first couple of days may be spent going around to jobs and turning off timers. While you're at it, be sure to take extension cords out of lawns, off of porches, and other obvious places. Once the lights are turned off and the cords picked up most customers do not mind if it is a few days or longer until lights are taken off the house and out of trees. **Good communication** with your customers is the key to keeping them happy and allowing you some "slack" in getting the job done...both on the front and backside of the job! Depending on the number of customers you choose to service, it can take until the first part of February to completely remove the lights, properly label them, box them, and put them in storage.

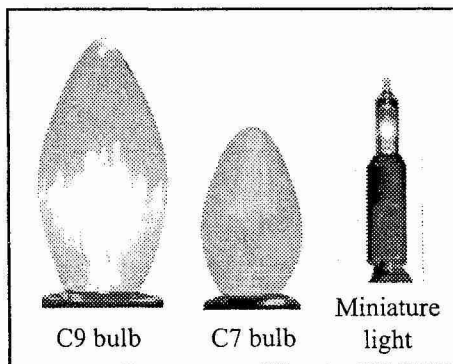
By the way, by offering to store your customers' lights, you have the inside track to their business the following year and provide a service your competition probably does not offer. **If you offer this service, just be aware of the responsibilities that come with it.** Do you have enough free space to store all the goods? Is your warehouse or storage facility free of potential problems like excessive dust or even flooding? Is the storage unit properly insured? Assuming responsibility for your customers' material can offer benefits; just make sure you're prepared to stand behind the commitment.

WORKING FROM OR STARTING A CUSTOMER BASE

Lawn maintenance professionals obviously have a built-in customer base from which to draw. You have personal contact on the job as well as contact during billing or collecting money. Let your customers know that you are going to be in the holiday lighting business either verbally or with circulars enclosed with your billing. While you're in the neighborhood put circulars on the doors of surrounding houses or visit with people personally. This type of advertising costs you little or nothing and can probably get you all the jobs you want the first year. By far, the best type of advertising is word of mouth. When you do a good job for people, their friends will want to know who did it. If it looks better than jobs by your competitors, then customers are willing to pay you more. You may have to do some of your first jobs at a cheaper rate just to get people to see your work...but it is a small price to pay for good word of mouth and the experience you will gain in the process. It is possible to offer discounts to initial customers, but let them know that it is for advertising purposes and not due to lack of expertise in your work because you are just starting. ***Go into this business with the attitude that you are going to do Christmas lighting better than anyone else and by doing so you can charge more for the same job than anyone else.*** It is nice when you can name your price and get the job because the customer has seen your work and does not want anyone else but **you** to install their lights. This does not come easy but is very possible after only one year. **Show confidence...**even if you do not have it in the beginning. *If you are not sure of what to do after reading and studying this handbook, refer to the back pages and give Southwest Lighting and Sound a call.* Our staff can help you with design, bids, pricing, and electrical requirements and help give you the confidence you need to be successful!

TYPES OF LIGHTS AND HOW THEY WORK

There are two basic sizes of the larger, traditional outdoor Christmas lights: **C7** and **C9**. Both of these styles have large glass lamps and they are **wired in parallel**. The C7 and C9 strings are a lot brighter and require more power than the widely used miniature lights. The big advantage of C7/C9 lights is that since they are wired in parallel, when one goes out, the rest stay lit no matter what. On the contrary, **miniature lamp strings are wired in series** and thus when a series circuit is broken by removal of one lamp or a bad connection at one lamp socket, that whole series of lamps will fail to light. **On job sites that have minimal power and the sheer number of lights required to do a specific job will consume what is available, miniature lamp strings do offer the advantage of drawing very little power per bulb and therefore a greater number of mini lights can be used in comparison to the same number of C7/C9 lights electrically speaking.** Most of the time, however, the reasoning behind choosing one style of light string over the other has to do with the overall visual impact each type of light can offer. For example, **C7/C9 lights offer a high-impact method of outlining rooflines on residential and commercial properties whereas miniature lights are often better suited (and contribute better visually) when used in shrubs, hedges, and other non-linear applications.**



C7 and C9 Strings and Lamps

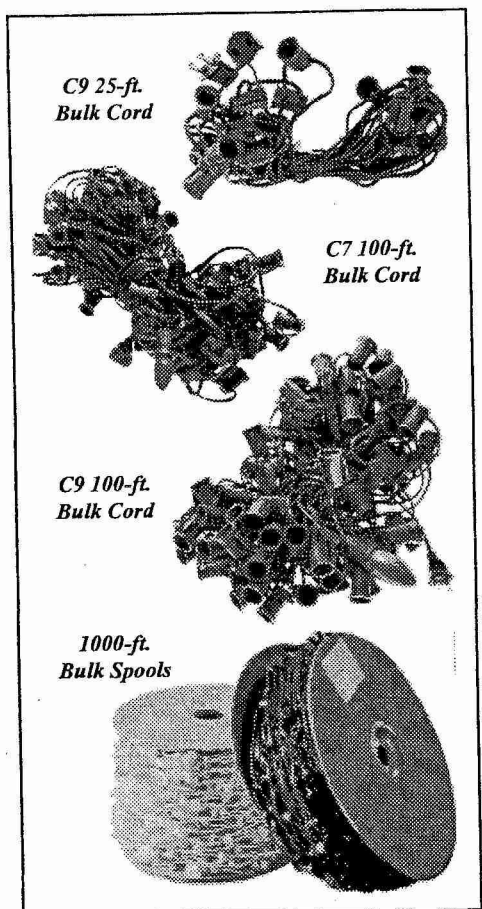
C7 and C9 light strings traditionally come in **25-ft. lengths** with the **lamp sockets spaced one foot (12")** on center. Additionally, there is a male plug and fuse holder on one end and a female plug (or "end-to-end connector") on the other for connecting more than one string together. There are a multitude of color choices and several different types of lamps for each string. The most common lamps available are as follows:

C7, 5w/120v or 130v ceramic; clear and transparent
C7, 7w/130v clear and transparent colors; twinkle

C9, 7w/120v or 130v ceramic, clear and transparent
C9, 10w clear and transparent colors; twinkle

Depending on where you purchase your bulbs, both lamp sizes may be available in either standard **120v** (about **2000** hours) or **130v** “long life” (up to **3000** hours). There is not a lot of difference in the price of the 120v and the 130v long life lamps, so, when they are available, it is best to purchase the long life lamps since you will be responsible for maintaining them (replacing them when they burn out after installation). In addition to regular transparent colored bulbs, “**triple dipped**” **colored lamps** were introduced in recent seasons in both C7 and C9 styles and are occasionally available though they are somewhat “rare” on the open market. These premium lamps produce richer transparent coloring and help reduce the chance of chipping, cracking or fading that can appear around the middle of traditional transparent bulbs after extended hours of use. And, it’s worth noting that because of the extra coating of color, triple-dipped bulbs sometimes appear almost “black” in appearance when held next to regular transparent bulbs; however, when illuminated, triple-dipped bulbs appear jewel-like and the richer, deeper coloring is apparent. **In most cases, you will want to opt for standard transparent bulbs simply for the fact that they are more widely available, less expensive and the standard style of bulb expected by customers.** Just keep in mind that for those customers who demand “only the best” and aren’t opposed to paying a bit more, you may want to suggest the premium triple-dip transparents.

After choosing the style of bulbs you will be using for a specific job, the next two considerations are the **distance** you will be needing to cover and **available power** (more about electrical requirements later). As noted, 25’ lengths are common; however, there are other options for commercial installers to consider:



- **25’ cords** constructed using **20-gauge wire** with a **5-amp fuse** and a male plug on one end and a female plug on the other end for connecting multiple light strings together.
- **100’ commercial-style cords** (found most of the time without a fuseholder since they are constructed with heavier **18-gauge wire**). These usually feature a 20’ lead wire on the end with the male plug and a heat-sealed cap on the opposite end. These special cords are not designed to be connected end-to-end.
- **1000’ bulk spools** are great for cutting off the exact amount of stringer needed. You can run up to **200 feet**...assuming you are using C7 5-watt bulbs with traditional 12” spacing. If you are working with C9 bulbs with typical 7-watt filaments, **140 feet** is the recommended maximum run. Obviously, if you choose to run a **tighter spacing** of, say, 6” spacing (in this case, you’ll have two sockets per foot) **run half the total recommended distance.**

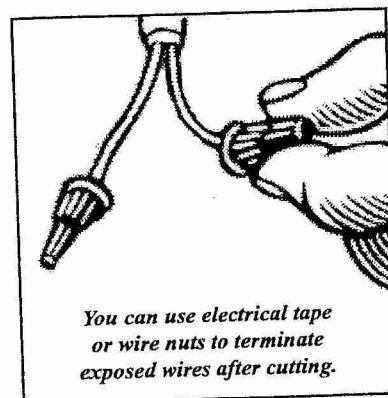
Light Line Specifications and Why It Matters

The **traditional 25’ light cords** with **5-amp fuses** are made from **20 gauge wire** which will handle **600 watts** or **5 amps**. How many strings you can plug together depends of the wattage rating of the lamps used. Don’t load them right up to the maximum wattage or you will most likely blow the fuse and you’ll find yourself wasting valuable installation time while troubleshooting or replacing the fuse. You could plug **3 sets together** as long as you are using **5-watt lamps**.

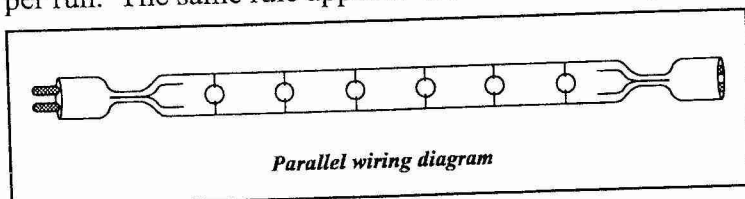
One way to calculate this is: **25 sockets x 5-watt bulbs x 3 cords = 375 watts**. Note that with three sets

of either C7 or C9 strings using 7-watt lamps (**25 sockets x 7-watt bulbs x 3 cords = 525 watts**) you will be pushing the fuse to the limit and can expect it to overheat and blow, therefore it is recommended to connect only **two sets** when using 7-watt bulbs. If you are using C9 bulbs and you choose to use **extra-bright 10-watt lamps** rather than traditional 7-watt, you can easily operate one cord (**25 bulbs x 10 watts each = 250 watts**) but two strings plugged together will equal 500 watts and will push the limits of the fuse. So, connect only **two (2) sets of C9 sets** using standard 7-watt bulbs to stay within the acceptable range and try to limit the higher 10-watt bulbs to use with heavier gauge 100' cords or bulk stringer on spools which use 18 gauge.

Most commercial-grade **100' cords** are made using **18 gauge wire** and they can easily accommodate 100 lamps of either 7-watt or 10-watt rating. Bulk wire and the attached sockets (sometimes referred to as "stringer" in the trade) can be cut to any length you need...which makes custom lighting jobs truly "custom" when cut to fit specific areas. In other words, you may find that when using a 100' cord that you only need 93 total feet, for example. Because the wiring on these cords is parallel, you can cut off any extra portion that you don't need and add a plug to "finish it out" or simply **use wire nuts or electrical tape to enclose the end** and protect it from moisture or the elements. On the flip side, you can extend 100' cords made with this heavier 18-gauge wire if you don't exceed the overall wattage limit. A good rule of thumb to remember is this: **You can make custom cords any length as long as the total wattage of all the lamps in the run do not add up to more than 1000 watts.** As an example, you could run up to **200 feet** using 5-watt lamps; about **140'** of 7-watt lamps; or **100'** of 10-watt lamps. This is, of course, assuming that the lamp spacing is the traditional one foot spacing, but remember that these bulk cords may be available with different socket spacings so pay close attention to the specs to stay within the limits.



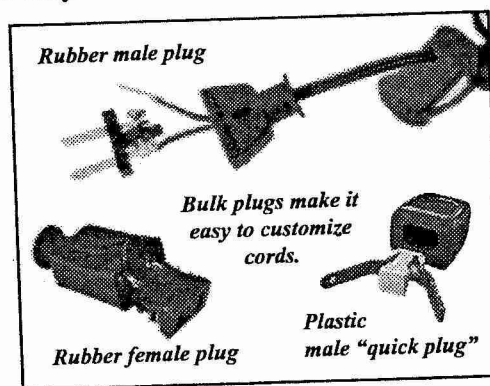
The **1000' bulk spools** that are often found in the commercial trade can be cut to size and are made with the same type of **18 gauge wire** as that found in the 100-ft. cords and which will likewise handle **1000 watts** per run. The same rule applies: Make custom-length cords in any desired length as long as the total wattage



of all the lamps in the run do not exceed more than 1000 total watts. You could have **200 feet** of 5-watt lamps; about **140'** of 7-watt lamps, or **100'** of 10-watt lamps. Again, this is assuming that the lamp spacing is standard 12" on center.

One thing to remember is that these bulk spools of stringer are available with different socket spacings so **calculating the wattage based on the specific number of sockets...not necessarily total length...is crucial** to staying within the tolerance levels of the wire. For example, you may want to use 6" spacing around windows for a "marquee" look; on the contrary, for large, commercial buildings you may want to use **18"** or **24"** spacing because the eye visually "closes in" the wider gap when lights are hung up high. In this particular case, because there are less sockets and less wattage per overall foot you could create a little longer custom string before you reach the 1000-watt limit.

Remember that when working with bulk cord, you will have to put a male plug on one end and make sure the other end is terminated properly so that it will not short out or be a potential safety hazard. Reducing potential electrical problems will make your jobs go smoother which in turn eliminates wasting valuable time running all over town troubleshooting problems on previously "finished" jobs. **Above all, safety and attention to the smallest electrical details should be at the top of your installation priorities.**



CHOOSING LIGHTS FOR SPECIFIC AREAS OR APPLICATIONS

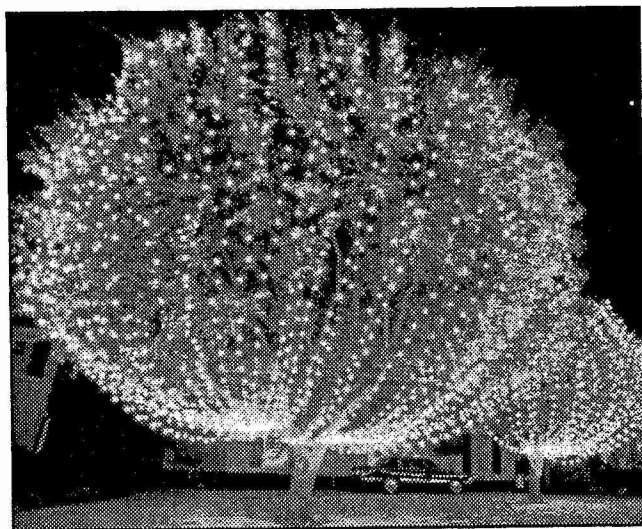
C7 and C9 lamps and strings are normally used in the following locations for best overall effect:



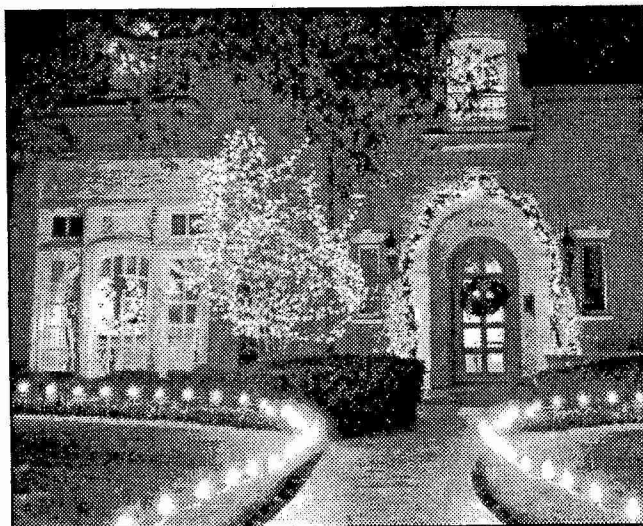
▲ *Lighting the rooflines of residential homes.*



▲ *Outlining the perimeter of commercial buildings.*

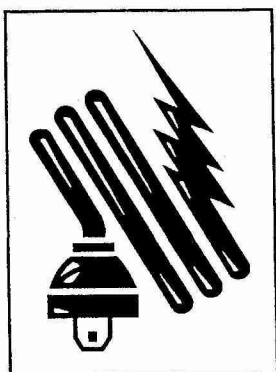


▲ *Light the canopy of medium-to-large trees using C7 bulbs.*



▲ *Outline walkways, patios or driveways using light stakes.*

Standard wattage bulbs vs. extra-bright, higher wattage bulbs



As a general rule of thumb, plan on using **standard wattage C7/C9 lamps** unless, perhaps, you are installing lights on a tall building where you need the **extra brightness** to make them show from a distance.

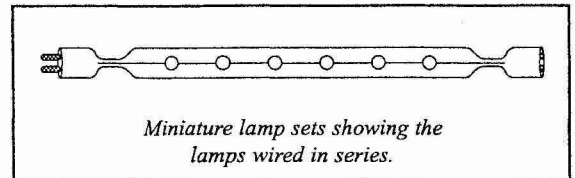
For example, C9 lamps can be purchased in 10-watt “strength” for this type of application. Use the higher wattage lamps only on taller structures or well-lit areas where you actually need more brightness just to make the lighting show up since it is “competing” with other lighted objects in the immediate area. But with this said, just remember: **coming up with enough power can be one of the biggest challenges you’ll face when working with holiday lighting.** Staying with standard watt bulbs will help you stay within the suggested parameters described in this booklet and allow

you a less-troublesome time of trying to “power up” your various lighting projects. For more in-depth information regarding power specifications and wiring, see “Electrical Considerations” on page 29.

WORKING WITH MINIATURE LIGHT SETS

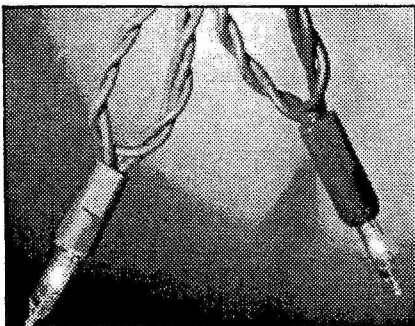
Miniature lamp strings, as described earlier, consist of a sequence of small, low-power consumption lamps connected in a series. Voltage in most areas range from 115 volts to 125 volts; therefore, the **voltage of each one of the lamps multiplied by the number of lamps has to equate in this same 115-125v range**. Common configurations of miniature lamp strings include **35 lamps** in a series with 3.5 volts per bulb; **50 lamps** in a series with **2.5 volts** per bulb; or **20 lamps** in series at **6 volts** per bulb. Some strings may even have multiples of these series to produce longer strings. For example, most 100-lite strings actually consist of two (2) 50-light series (using 2.5v lamps) wired “back to back” during factory production. Some 100-lite strings may consist of five 20-light series (using 6v bulbs). Regardless, it’s extremely important to **remember to use the proper voltage bulb when replacing or repairing bulbs in a set**. Using the wrong voltage will cause a replacement bulb to burn extra dim or extra bright depending on the circumstance and, in most cases, will actually shorten the life of the rest of the bulbs in the set.

The lamps in miniature light strings have what is called a “**shunt**” which, in the event of the filament burn-out, **heats up thermally and connects the two leads of the lamp back together**. When this occurs, it reconnects and completes the circuit and lets the rest of the lamps in the series remain lighted. You then replace the burned-out lamp with the proper type—no problem—in theory. However, sometimes the shunt fails to bridge across, the series is broken, all the lights in the series are out and you do not have a clue which one is bad. Anyone who has worked with miniature lights has experienced this at some point in time and knows firsthand how exasperating it can be. Ways to deal with this particular issue will be addressed in “*Basic Tips for Troubleshooting Lights*” and “*Repairing Mini Light Sets Like a Professional*.” One important thing to note is **when you first notice that a lamp is out, it needs to be replaced immediately**. **The rest of the lamps in the series have to absorb the voltage which was originally running through the burned-out lamp** which means that the voltage on the remaining lamps will be running higher than normal and will decrease **their** life and make them burn out much more quickly. One lamp out in a series may not be too critical...but several out may result in all the lamps in that section going out very quickly. Make it a point to replace burned out lamps when you first notice them to reduce maintenance or repair later.



Common Styles of Miniature Light Sets

- **35-light sets** (35 lamps in a single series with 3.5 volts for each lamp)
- **50-light sets** (50 lamps in a single series with 2.5 volts for each lamp)
- **100-light sets** (2 series of 50-light circuits hardwired together by the manufacturer)
- **140-light “Chasing” sets** (4 series of 35-light circuits hardwired together by the manufacturer)
- **150-light “commercial” sets** (3 series of 50-light circuits hardwired together by the manufacturer)



▲ **Standard 22-gauge wire (left) compared to the heavier, commercial 20-gauge style.**

IMPORTANT: Note that **all standard mini light sets list three (3) sets as the maximum number for connecting together**...regardless of the number of lights in the set due to the 22-gauge wire tolerance in conjunction with the fuse in the plug. Don’t try to see how many sets of standard mini lights you can connect...you’ll only blow fuses. You need to plan on using **plug splitters** and/or **extension cords** to break up the series of connections.

Note that there is *one exception* to the “connect only three” rule above: most **commercial-grade 150-light sets** are made with **20-gauge wire** to carry more load. With these sets, you can connect up to **six (6) 150-light sets end-to-end** for roughly **400 feet** of continuous lighting.

Choosing the Type of Mini Lights You Will Purchase

Normal lamp life for “discount store” sets is often between 300-500 hours. Long-life mini light sets are rated at around 1,200 hours. **Spend the extra money to buy the good long life sets.** They don’t have as many problems and last a lot longer because they are constructed with better materials, stronger bulb filaments and are geared for those interested in a “**quality**” set as opposed to a “**disposable**” set. In fact, you have probably casually noticed that some mini light sets appear to burn brighter than others. Some sets use very low rated bulb filaments (calculated as **milliampere** or **mA**) which in turns gives them a dull, **yellowish** appearance. These are usually produced by low-end light factories and most commonly offered by discounters and thrift stores due to their inexpensive production costs and overall material specifications. Low-quality sets feature filaments that deliver “brightness” in the range of **140mA-160mA**. Brighter-burning, higher-quality sets (and some loosely defined “superbright” sets) have traditionally been listed from **170mA-200mA**. Note that the newer bulb rating standards introduced just recently call for the high end of milliamperage to register right at **170mA**. This and other electrical standards are constantly in a state of flux and are dictated in principal by consumer safety advocates and testing laboratories. In the latest change to the brightness standard, the primary reason suggested by the industry watchguards was to significantly reduce the amount of bulb heat generated by mini light strings.

In addition to our strong recommendation that you strive to utilize only high-end products in your work, perhaps the most important factor in considering your product selection is the **actual usage** each light set must endure. Some installations will be in use longer (illuminated for more total hours) and that will drain the life out of many sets even during the course of only one season. You need to anticipate rotating out at least **one third** of all miniature sets every year to account for this basic reality. This should be a part of the built-in cost of a job and a simple expectation on your part. Likewise, **if you skimp on product selection...even if you get lucky one year by relying heavily on “cheap” sets...it will eventually catch up with you and cost more in the long run.** Do the job right the first time and know that your investment in quality is well worth it for the reduction in troubleshooting and the general peace of mind that quality products provide.

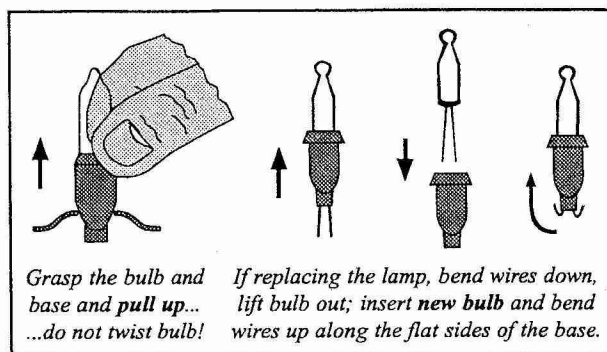
BASIC TIPS FOR TROUBLESHOOTING LIGHTS

Miniature Light Sets

Sometimes in the shipping process or after taking a set out of the box on the jobsite, lamps become loose and don’t make good contact. The first thing to try when a set of mini lights is “out” is to **make sure each lamp base is properly seated in the socket.** If the string or series still fails to light up after checking to make sure that there is a bulb in every socket to complete the circuit, then you know there is at least one or more burned-out lamps in which the “shunt” has failed to bridge across an open gap after “kicking in.” Or, **perhaps there is a bulb that is not making good connection down in the socket where the brass contact points are located.** This could be due to a twisted wire, a damaged contact point, etc. Each lamp in the specific series that is not burning may have to be taken out and physically checked to see if there are any twisted wires or “one-legged” bulbs (that is, a bulb with only a single wire on one side of the base and a missing or broken-off wire on the opposite side). **Keep in mind that all bulbs must have two, un-crossed wires coming out the bottom of the lamp base and positioned on the sides of the lamp base in order to make proper contact in the light socket.** If you can determine that you have a defective bulb in a string that is not working, replace the lamp with a good one to see if it will allow the series to light up. Look to see if the wires coming out of the bottom of the lamp and going through the base of the lampholder are properly positioned so they can make contact with the copper contacts on the sides of the lamp socket. Most replacement bulbs come with new bases already attached so you don’t usually need to “thread” just the glass portion of the lamp into an old base; however, some replacement bulbs are only available in “**pigtail**” style; that is, only the glass bulb and straight

wires **without a base**. In this latter case, you will need to re-use the bases from any bad bulbs in a set and re-thread them (*see illustration below*) with a pigtail replacement bulb with the **same voltage**.

If, after going through these basic steps, all bulbs are present, properly seated in the sockets and the problem can't be corrected quickly, simply go to another string and **save the bad ones to repair at night** or on a bad weather day when it is not possible to work outside. Above all, **don't waste valuable time out on the jobsite attempting to fix bad strings if you have plenty of new sets on hand**. Finish the job at hand and think about repairing the troublesome sets at a later time.

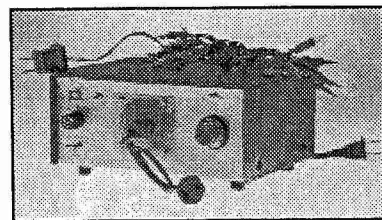


OTHER POSSIBLE SOLUTIONS: If you have several strings plugged end-to-end and they are all out, you most likely have **too many strings connected together** and have **blown the fuse in the first string**. If the fuses are replaceable (usually found **inside a small compartment** in the male plug), replace them with the proper type and re-configure the lights with plug splitters and/or extension cords so that there are not more than the recommended number of sets plugged together. **Virtually all miniature light strings manufactured after 1998 have replaceable fuses**. If the fuses are **not** replaceable (when the fuse is inside a **sealed plug**) you may have to cut a plug off of a discarded set and splice it in place. Look to see if there is a ridge or white stripe on one of the wires. This usually denotes the neutral wire and even though it will work if wired either way, it's best to get in the habit of keeping them straight since there are times when it does matter.

REPAIRING NON-WORKING MINI LIGHT SETS LIKE A PROFESSIONAL

When you get really "serious" about working with a number of miniature light sets and you decide the time is right, keep in mind that there are **commercial tester machines** available that enable you to plug in a miniature light set that doesn't light up and quickly determine which lamp is bad without having to check each individual lamp and socket. It works by placing **high voltage (from an automotive coil) through the string to force the shunts to close so that either the socket will buzz where there is a connection problem or the good lights on the string will light and you will know which lamps are burned out**. This eliminates checking each lamp in the series individually and saves a world of valuable time and headache.

If you opt to purchase a commercial tester, expect great results in repairing bad strings, but be prepared for an occasional mild shock (the kind you get when you grab hold of a spark plug wire) particularly if you are holding the set or touching the sides of the tester when encountering a set which has had the wire insulation cut, damaged, or shorted out. **The key to working with the commercial light tester is to keep your hands and fingers on the insulated top cover and testing button itself rather than holding the bad set or touching the metal portion of the tester when activating it**. An indirect short will most likely cause the tester to send the mild shock back to the person pressing the button...so be aware when you are using the machine. Most of the time, however, the tester simply "finds" the bad bulb and allows you to quickly and effortlessly repair the set with little fanfare. **If the tester fails to easily find the problem with the set you are testing, you probably have a set which is un-repairable and it should be discarded in favor of a new set.**



▲ **Commercial-grade light repair box.**

If you have any questions after reading the instructions, call us—we'll tell you how to use the commercial light tester to its fullest capability. It is a great time saver and a valuable part of a progressive lighting business. After a season or two of working with mini lights you will probably want to purchase a commercial light tester to help cut down on the time of checking for all the various aspects of what might be keeping some

troublesome sets from being quickly repaired. The tester will actually help you **find bad fuses, missing bulbs, twisted wires**, and other hidden culprits with relative ease. They aren't inexpensive but when you consider the time and frustration it will save you, the cost is well worth every penny. One could say this type of tester is literally worth its weight in gold when you need a **timesaving solution for fixing sets that have already been installed**. Do you have lights out on a focal point tree in a commercial display or bank lobby? Just grab the tester and go fix the problem light string. Because the tester is small and truly mobile (about the size of a shoebox), you can easily take it to a job site and repair light sets "on the fly" if necessary. And, sets that only have minor problems can be added back into your working inventory which cuts down on overall expenses because you're actually "recycling" non-working sets. **So, don't throw "bad" light sets away....think in terms of repairing them when you get a chance**. At some point you can get them repaired because nine times out of ten, any problem with the set is only minor. Rarely will you have to throw a set away because it is truly beyond repair. **Be frugal with your materials and your business will reflect it on the bottom line.**

REPAIRING C7 & C9 LIGHT STRINGS

C7 and C9 strings do not normally give as many problems as miniature lights for the simple fact that the flat, **parallel wiring used in C7/C9 construction allows each lamp to function independently** from the rest in the set. In other words, there's no circuit or series of lights relying on each other to complete a loop. And, as easy as C7/C9 lights are to work with, there are some basic things to look for when installing them to prevent wasted time later. **When screwing the lamps in a new string, check to see that it is "clean"...meaning free from any short pieces of wire sticking out of the bottom tip of the bulb**. When you encounter a bulb like this from time to time, note that this is caused when the lead from the bulb is not cleanly soldered to the bottom tip of the socket or it may not have been cut off completely in the manufacturing process. **If you detect a small piece of the wire extending past the soldered portion, this can cause a short between the bottom contact and the side contact in the socket and will blow the fuse in 25' cords or the main breaker itself**. If all the lamps were screwed-in without checking them for this particular defect at the time of installation, it will be harder to find and somewhat time consuming to unscrew each bulb to check for the defect but you will need to eliminate the possibility that this is indeed the problem. Once you do find such a bulb, simply replace it and the problem of blowing fuses should be eliminated.

OTHER POSSIBLE CAUSES: If moisture gets in a socket, sometimes it will form a **carbon path** between the sides and the bottom of the socket. Since carbon conducts electricity this can result in a direct short and blow the fuse in the string. **The only way to check it is to remove each lamp and look in the socket to see if it is black**. If you do find that this is the likely problem, this socket will have to be removed from the cord by unsnapping the bottom of the socket with a small screwdriver and taping over the cord where the socket was and where holes now appear. Remember...time is money and new sockets can be put back in place if necessary at a later time.

As noted earlier, **too many strings plugged together or strings carrying too many total watts** can also cause a fuse to blow in the first string (as is the case with miniature light sets).

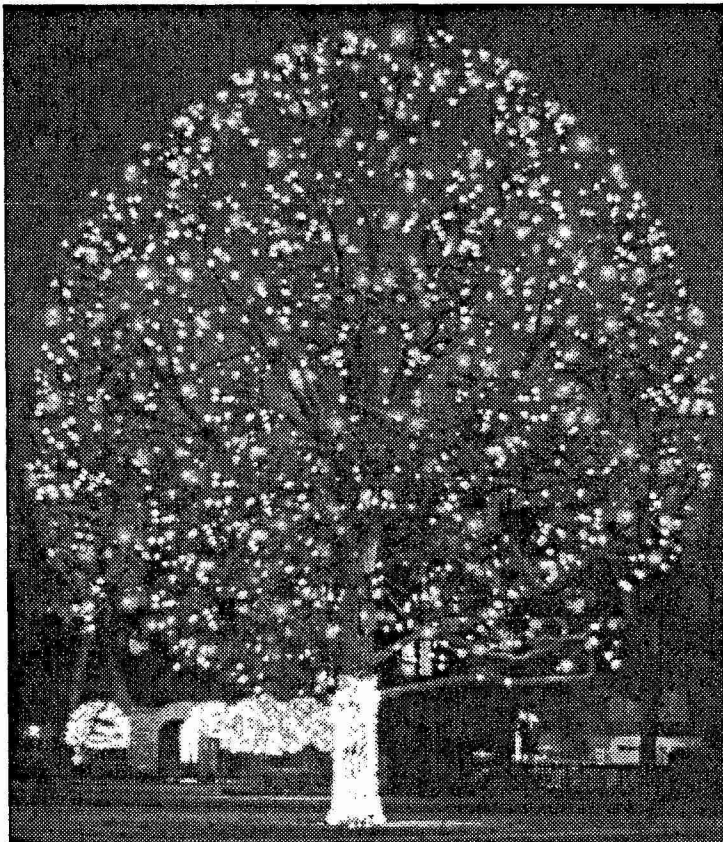
The **fuseholder** in C7 and C9 strings can be another source of problems. Where the fuseholder is pressed on to the string in manufacturing, it makes contact by pushing a set of sharp prongs through the wire insulation. After the strings get older, **sometimes these contacts burn off from the heat on the wire**. This can be more of a problem when these strings are used in a large tree where the wind blows and actually stretches the cord between the branches. **Solution?** Replace the fuseholder. If you're in a bind to make things work until you can get another fuseholder to attach to the line, you can bypass it on one condition: that is, if you protect that line by plugging it into the end of another string which has its own fuseholder. This will give "safety coverage" to the line with the missing fuse because the first fuse in any series of strings plugged end-to-end protects the rest of the strings connected to it.

FLASHING, "CHASING" AND BLINKING LIGHTS

Miniature Light Sets

Miniature light strings can be made to "flash" or "blink" by inserting one **flasher bulb** in any socket in the series. This will cause every light in the series to flash on and off at the same time. The flasher lamps usually have a **red tip** on the end of the bulb so they can be identified and removed if necessary. To change a flashing series back to steady burning, simply replace the flasher lamp with a standard bulb. 100-lite strings that consist of two (2) series of 50 lights each can be turned into **2-way** flashing strings by putting a flasher lamp **anywhere in each of the two sections**. However, don't put more than a single flasher bulb in any one series...one is plenty to get the job done.

Here's some more thoughts in regard to flashing miniature lights: Whenever you see this effect in use, it often gives the impression of a **carnival atmosphere** or a truly amateurish attempt at decorating. Now, if that's what your customer really wants, than give it to them; but if you're looking to create a classy, upscale feel...simply stay with the tried-and-true standard of steady-burning lights or implementing a few random-twinkling miniature sets. **Moving or "chasing" lights can be great for specific forms of animation but, in general, you'll want to stay away from light sets that rely on any type of movement or "gimmick."** What you'll find is that most people who are willing to pay for a premium service like custom lighting are usually fairly sophisticated in taste and your finished lighting job should reflect that sensibility with style, elegance, and above all else...professionalism. After all, anybody can throw a set of chasing lights on a hedge or around a window and say they "decorated" or "put up Christmas lights." Just keep this thought in mind when contemplating the use of non-steady lights: **A professional installer should be able to offer the homeowner or business proprietor a truly specialized service that relies on objective creativity; clean, neat and unobtrusive installation solutions; and a visually pleasing presentation worthy of the installer's time and effort and ultimately the customer's investment in your service and expertise.**



Creating Movement With C7 or C9 Lights

Both **C7** and **C9** style bulbs are available in "blinking" as well as the standard, steady type. Remember that the parallel wiring of these larger bulb strings makes each lamp "stand on its own" and there are some clever ways to take advantage of this fact. An elegant way to make a large tree appear to "**slightly twinkle**" is to insert a few twinkle bulbs in **random places** around the tree. You'll want to limit the number of twinkle bulbs and be aware that the use of a large amount of C7 or C9 twinkle bulbs can cause **electrical interference** inside homes on TVs and radios. Twinkling bulbs have to heat to a specific temperature to work. If you live in an area that has extremely cold temperatures (25°F or lower), the bulbs may never get warm enough to work properly.

The main thing to keep in mind when considering adding this type of bulb to a lighting job: **Subtle use of twinklers goes a long way and that less can be so much more!**