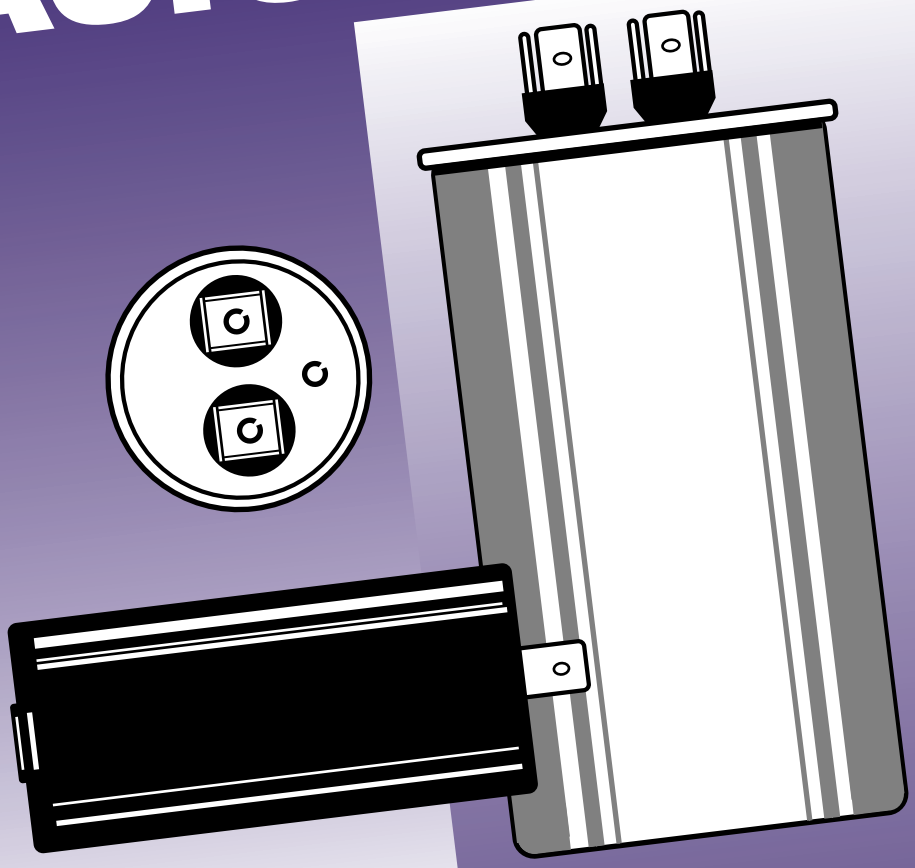
# CAPACITOR BASICS



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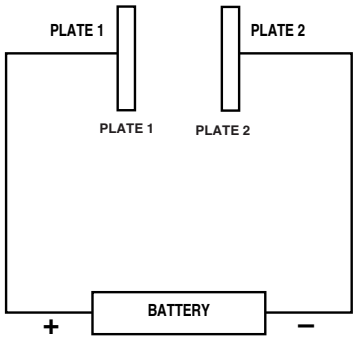
# Table Of Contents

# CAPACITORS

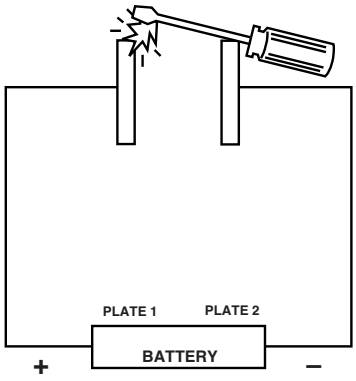
**1. *INTRODUCTION:*** The purpose of this brochure is to provide practical information about Motor Starting and Motor Run Capacitors as they apply to the Air Conditioning, Refrigeration and Heating service industry. A basic understanding of electricity and electric motors is helpful if one is to derive the most benefit from the presentation.

While this report is primarily written for service technicians, it is also worthwhile reading for wholesaler sales people so they may knowledgeably assist their customers in selecting a capacitor.

**2. *WHAT IS A CAPACITOR? HOW DOES IT WORK?:*** Very simply, a capacitor is a device that stores and discharges electrons. While you may hear capacitors referred to by a variety of names (condenser, run, start, oil, etc.) all capacitors are comprised of two or more metallic plates separated by an insulating material called a dielectric.



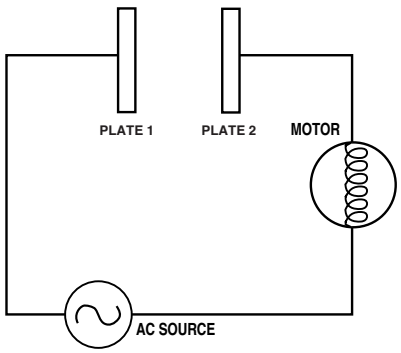

A very simple capacitor can be made with two plates separated by a dielectric, in this case air, and connected to a source of DC current, a battery. Electrons will flow away from plate 1 and collect on plate 2, leaving it with an abundance of electrons, or a “charge”. Since current from a battery only flows one way, the capacitor plate will stay charged this way unless something causes current flow.




If we were to short across the plates with a screwdriver, the resulting spark would indicate the electrons “jumping” from plate 2 to plate 1 in an attempt to equalize. As soon as the screwdriver is removed, plate 2 will again collect a charge.

Now let’s connect our simple capacitor to a source of AC current and in series with the windings of an electric motor. Since AC current alternates, first one plate, then the other would be charged and discharged in turn.

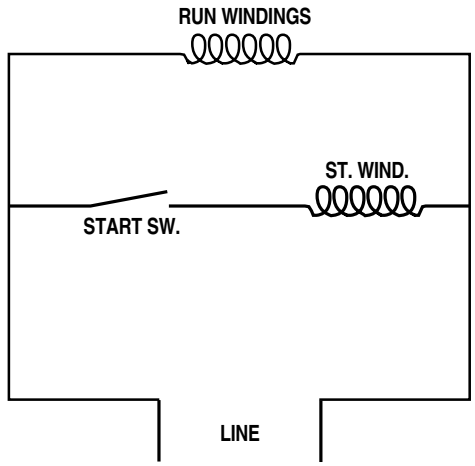
First plate 1 is charged, then as the current reverses, a rush of electrons flow from plate 1 to plate 2 through the motor windings. When the current reverses again the electrons will rush back to plate 1.




Note that electrons do not pass through the capacitor but rather travel back and forth, from one plate to the other, through the motor windings. This rush of electrons, first one way then the other, has a desirable effect when applied to certain motors.

## 3. WHAT EFFECT DOES A CAPACITOR HAVE ON A MOTOR?:

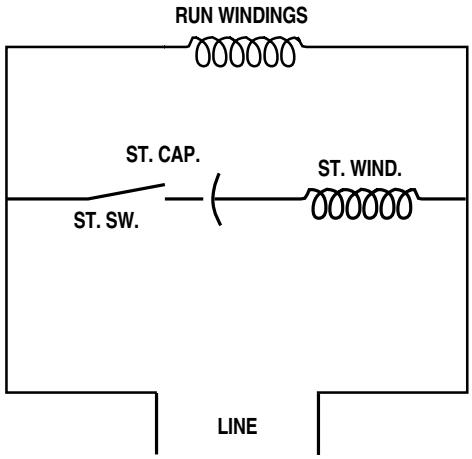
Simple Split Phase Motor




**Simple Split Phase Motor:**
Common split phase motors have two sets of windings, start and run. Start windings are used to overcome inertia and allow the motor to start under load. Start windings are wound with smaller wire and many more turns than run windings. This greater resistance, as compared to the run winding, causes the current in the run winding to lag behind that of the start. The effect is much the same as two phase current. The motor can start and when up to about 3/4 speed, the start switch opens and causes the start winding to drop out of the circuit.

It is the “out-of-phase” condition between the start and run windings that produce the torque needed to start the motor under load.

Capacitor Start Motor



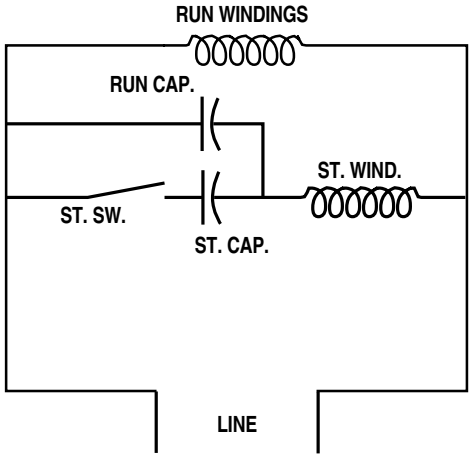

**Capacitor Start Motor:**
A start capacitor is added in series with the start winding. The effect is to throw the current in the start winding even further “out-of-phase” than can be accomplished by the resistance of the start winding alone.

The result is even greater starting torque. Typically, an increase is from 300% to 500%. It also decreases the starting current and increases the voltage on the start winding from the circuit.

As with a simple split phase motor, when speed increases to about 3/4 of full speed, the starting switch will open and remove the start capacitor and start winding from the circuit.

**NOTE:** Since start windings are made of small size wire and produce high resistance, they would quickly burn out if left in the circuit beyond the time it takes to bring the motor to 3/4 speed. Start windings can fail for a variety of reasons which will be covered later.

Capacitor Start - Capacitor Run Motors

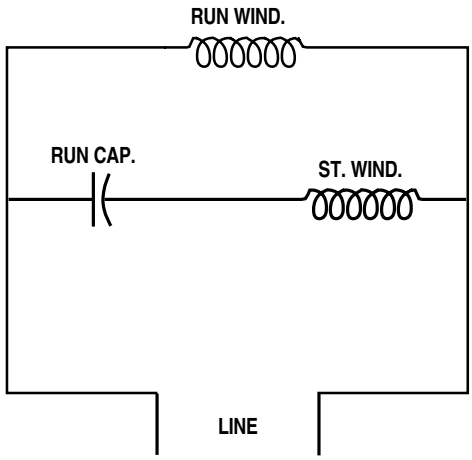



***WHAT EFFECT DOES A CAPACITOR HAVE ON A MOTOR?: (CONTINUED)***

**Capacitor Start - Capacitor Run Motors:**
In addition to the start capacitor, a run capacitor is now added in series with the start winding and parallel to the start capacitor. While the start capacitor "drops out" when the motor reaches 3/4 speed, the run capacitor stays in the circuit at all times with the start winding. Its purpose is to improve the power factor of the motor during running and reduce current consumption. Although its purpose is not to aid in starting the motor, we shall see later that it does have a small positive effect when starting.

Run capacitors have far lower capacitance and much different construction and appearance than start capacitors.

PSC Motor




**Permanent Split Capacitor (PSC) Motors:**
This type motor is a split phase motor with the addition of a run capacitor in series with the start winding. No starting switch is used, so the capacitor and start winding are in the circuit at all times. The motor is so constructed to allow for this without burning the start winding. A PSC motor has low starting torque but is very efficient in operation and generally costs less that a capacitor start-capacitor run motor.

To increase starting torque, most PSC motors can be fitted with a so called "hard start kit" comprising of a potential relay and start capacitor. Recently, the development of positive temperature co-efficient resistors (PTCR) has allowed solid state technology to be used to increase starting torque in PSC motors in place of the traditional hard start kit. More on this will be covered under "Application" section.

## 4. *TYPES OF CAPACITORS & CONSTRUCTION:*

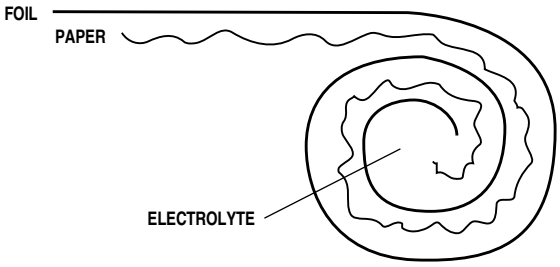
A capacitor, as mentioned previously, is comprised of two metallic plates separated by some insulating material commonly called a dielectric. The ability of a capacitor to store electrons is known as its capacitance and is rated in microfarads, abbreviated mfd. A microfarad is one millionth of a farad.

The capacitance is dependent on the area of the plates, the distance between plates, and the stability of the insulation. Of these, the area of the plates, is most important in determining capacitance. All else remaining constant, an increase in plate area will yield an increase in capacitance.

Since we have already seen that capacitors are used for different purpose, i.e.: motor start or motor run, there are different methods of construction used to produce capacitors. They are usually referred to by either type of dielectric employed or by the function they perform.

### 4. *TYPES OF CAPACITORS & CONSTRUCTION: (CONTINUED)*

**Motor Start (Electrolytic) Capacitors:**
Start capacitors are comprised of compactly wound aluminum foil separated by layers of paper, all of which is impregnated by a conducting electrolytic which creates the effect of two plates and a dielectric. The capacitor is housed in a sealed phenolic container.




Start capacitors are designed for intermittent duty only, typically for no more than 20 starts per hour, with each starting period not to exceed three seconds. Longer starting periods or more frequent starts will lead to excessive heat rise within the capacitor and cause premature failure.

Start capacitors are rated in microfarads and voltage. Ratings typically run from 100 VAC to 300 VAC and from 21 thru 1200 mfd. Proper selection of start capacitors is important and will be covered under “Application”.

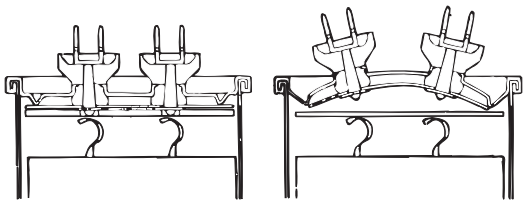
**Motor Run Capacitors:**
Unlike the plastic housing of the start capacitor, the run capacitor is typically enclosed in a drawn, seamless metal can. While early run capacitors were round, today most are oval in cross section. This is because one day a General Electric engineer realized that if the roll of the capacitor was compressed, it could fit into an oval can and save space. Years ago, this type of construction was known as a “Gregg Oval” in honor of the inventor.

A run capacitor, unlike a start, is designed for continuous duty. It is in the circuit whenever the motor is running. They typically have much lower mfd ratings that start capacitors; usually from 2 to 60 mfd. The common voltage ratings are 370 and 440 VAC.

The purpose of the oil (or other fluid today) is to increase the dielectric strength of the paper or polypropylene and to act as a heat sink. Remember, run capacitors are continuous duty devices and the large quantity of fluid helps dissipate the heat before it can adversely affect the capacitor. Oil has a tendency to lose dielectric strength as temperature increases.

About 35 years ago, oil was replaced with a chemical substance containing Polychlorinated biphenyl or PCB. PCB is a wonderful dielectric and heat sink, however, it is injurious to the environment and has been banned by the EPA. This led to the search for another dielectric and several have been developed that exhibit all the desirable characteristics of PCB’s while being environmentally safe.

The only drawback to these new compounds is that they are flammable. If the heat increased too much, the resulting pressure rise could burst the capacitor and start a fire. Therefore, all non-PCB capacitors incorporate a physical interrupter to prevent excessive pressure rise.




PHYSICAL INTERRUPTER

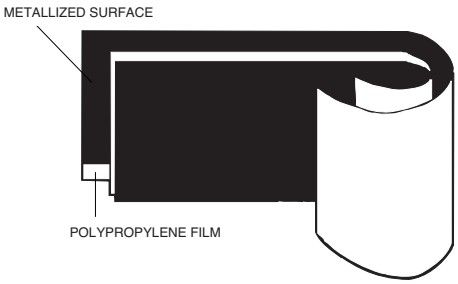
As the pressure within the capacitor increases, the top of the can “pops” upward, breaking the connection between the terminals and the plates.

Motor run capacitor construction has evolved over the past twenty years from a traditional use of paper, foil, and a PCB-based impregnating oil, to two basic modern types.

## 4. *TYPES OF CAPACITORS & CONSTRUCTION: (CONTINUED)*

**Impregnated Metallized Capacitors:**

The newest technology in capacitor design is metallized film capacitors. In operation and application, they serve the same purpose as conventional run capacitors, but their construction is very different.




Rather than using sheets of foil separated by several layers of paper to create the plates and insulation, metallized capacitors use sheets of polypropylene film onto which is “sprayed”, or metallized, a thin layer of metal. Two metallized films are then wound together very tightly to form the capacitor.

The resulting roll is very hard and cannot be squeezed into a traditional oval shape.

Therefore, many metallized film capacitors are round. They are, however, much smaller than conventional run capacitors. A 35 mfd, 440 volt metallized capacitor is 50% smaller than an oil paper capacitor. It also weighs 60% less because there is much less liquid in a metallized capacitor. Many oval shaped run capacitors are now metallized film. The “roll” is small enough to fit into the oval can previously used for film/paper construction. Retaining the oval shape is important for the replacement market.

We learned previously that run capacitors are filled with a liquid that serves to strengthen the dielectric characteristics of the paper and also to dissipate heat. In a metallized capacitor, the liquid is only used as a heat sink. The polypropylene film is an excellent dielectric and requires no assistance. In fact, the capacitor “roll” is wound so tightly that the liquid never penetrates between layers.

The core of a metallized capacitor is surrounded by many layers of plain polypropylene film. This provides excellent insulation between the plates and the metal case and, therefore, no marking is necessary to indicate the neutral terminal.

Finally, metallized capacitors “self heal”. The most common cause of capacitor failure is a breakdown of the insulation between plates which leads to a short. If a hole occurs in the metallized film, an arc will jump between the plates. The heat from this arc will vaporize the metal surrounding the hole and self extinguish, thus preventing the short.

Metallized capacitors, because of their smaller size, weight, and longer life expectancy are rapidly gaining favor with equipment manufacturers. In the near future, they will most certainly replace conventional oil-paper run capacitors on new equipment.

**Dry-Type:**

Dry-Type capacitors are similar in construction to oil-filled, but do not use an oil impregnant. The advantages of dry-type construction are a saving in size, and weight. The possible disadvantages are a lower tolerance to high current failure conditions. Dry-type capacitors are finding their way into more applications as engineers resolve difficulties encountered in field and life testing situations.

**Dual and Triple Section Capacitors:**

Multi-section capacitors are nothing more than two or three separate capacitor in a common enclosure with one common terminal. They are marked with the voltage rating and the mfd for each section.

Example: 20/4 mfd 370 volt

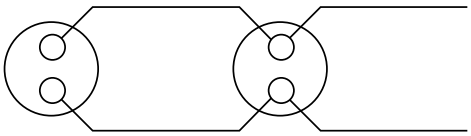
## *5. APPLICATION AND REPLACEMENT:*

When replacing a capacitor, it is best to install one of the correct voltage and microfarad rating for the particular motor. Generally, however, a difference of 10% in mfd will not adversely affect the motor.

A problem arises when the proper capacitor is not readily available. While most technicians carry an assortment of popular sizes with them, there is such a wide variety available that he may not always have the proper one at hand. In this case, the correct rating can be achieved by connecting two or more capacitors in parallel or series.

### 5. *APPLICATION AND REPLACEMENT: (CONTINUED)*

**Parallel Connection:**
When capacitors are connected in parallel, the mfd rating will be the sum of the individual ratings. This can be expressed in the equation CT = C1 + C2 + C3, etc. The effect of parallel connection is to increase the plate area. The voltage rating of the lowest rated capacitor in the connection becomes the effective voltage of the combination. If a capacitor rated at 125 volts, 180 mfd is required, two capacitors rated at 125 volts, 90 mfd each can be wired in parallel.



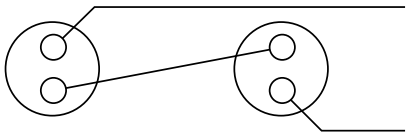
Generally, a capacitor of the same mfd rating but a higher voltage rating can be used as a replacement.

Example: 88-108 mfd 125V - replace with 88-108 mfd 330 volt.

Doing this will generally result in added cost and increased size. A capacitor of correct voltage and MFD rating should be installed at the earliest opportunity.

From this, we can see why the run capacitor of a capacitor start/capacitor run motor slightly aids the motor in starting. Since they are connected in parallel, the total capacitance on start up is the sum of both the start and run capacitor.

**Series Connection:**
When capacitors are connected in series, the total capacitance is always less than that of the smallest capacitor. The effect of connecting capacitors in series is an increase in dielectric thickness thereby reducing capacitance. The formula for determining total capacitance in series connection is:



$$CT = \frac{C_1 \times C_3}{C_1 + C_3}$$

Example: Two 250 mfd capacitors connected in series.

$$CT = \frac{250 \times 250}{250 + 250} = 125 \text{ mfd}$$

The capacitance of two equal capacitors connected in series is one half the value of one capacitor.

The effective voltage when two capacitors are connected in series is the sum of the individual voltage ratings. Therefore, two 250 mfd, 125 volt capacitors in series equals one 125 mfd, 250 volt capacitor. VT = V1 + V2.

When connecting capacitors in series, it is best to use two capacitors of equal mfd rating. If capacitors with unequal mfd ratings are connected in series, the voltage will divide across them in inverse proportion to the mfd rating.

**Choosing Ratings:**
Always select a start capacitor with a mfd rating no more than 10% ± of the one called for. When replacing a run capacitor, never select a lower rating than the one called for. You may exceed the specified mfd as follows:

| Specified mfd | Do not add more than |
|---|---|
| 10-20 mfd | +2.5 mfd |
| 20-50 mfd | +5 mfd |
| 50 and up mfd | +10 mfd |

### 5. *APPLICATION AND REPLACEMENT: (CONTINUED)*

When the rating is unknown, it is necessary to consult the manufacturer of the motor for the correct replacement. Capacitors are matched to the internal construction of each motor and, therefore, no standard rule can be applied.

Voltage ratings for start capacitors should match the voltage of the motor, although a higher voltage rating will have no effect, providing the mfd rating is correct. Never use a lower voltage rating as the capacitor will fail.

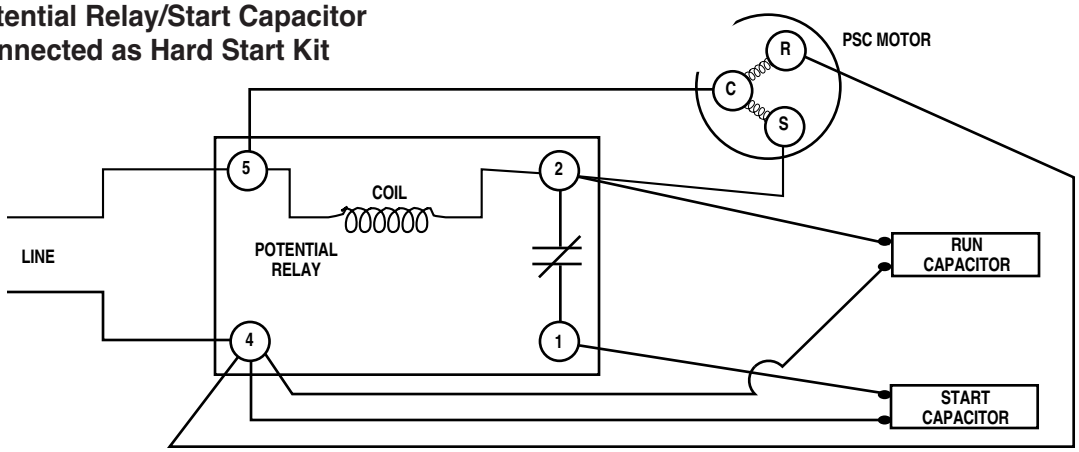
Run capacitors must have a voltage rating higher than the motor. Since run capacitors are in the circuit at all times and connected across both start and run windings, they are subject to line voltage plus the voltages induced by the windings. A 220 volt motor may require a 370 or 440 volt run capacitor. When in doubt, always use the next highest voltage rating.

If the inlet or the discharge of a blower housing using a direct drive blower motor is obstructed, the motor will turn at higher RPM. When this occurs, the induced voltage across the windings will increase. A properly rated capacitor that fails due to high voltage could be an indication of improper air flow due to obstruction. In this instance, the capacitor is acting as a performance fuse. If a higher voltage rated capacitor must be used, do so only as a temporary measure.

**Adding Capacitor Hard Start Kits:**
Most PSC motors and compressors can be fitted in the field with a potential relay and start capacitor, generally called a hard start kit. This allows the motor to start under a greater load than would normally be possible. It is necessary to consult the manufacturer of a reliable cross reference to select the proper relay and capacitor.

Recently, the development of PTCR's have replaced the hard start kit on certain applications. The PTCR solid state start assist is connected in parallel with the run capacitor of the PSC motor and creates the additional "out-of-phase" effect formerly provided by the relay and capacitor set up. While less expensive and easier to install, the PTCR does not produce as much effect as the traditional hard start kit and so its use has generally been limited to smaller motors.

**Potential Relay/Start Capacitor Connected as Hard Start Kit**




**NOTE:** A problem may arise when a motor is equipped with a start capacitor and potential relay. The contacts of a potential relay are normally closed and open to drop the start capacitor from the circuit when the motor reaches about 3/4 rated speed. When the contacts open, the capacitor can be left in a charged condition and the charge will bleed off internally in several minutes while the motor runs. However, if for some reason, power is interrupted soon after starting, the capacitor will not have time to equalize. The relay contacts will close immediately and the full surge of the capacitor will be discharged across the contacts. Repeated instances like this will cause the relay contacts to pit and burn and lead to the premature failure of the relay.

The remedy is to install a bleed resistor across the capacitor terminals. This resistor, usually 15,000 to 18,000 OHMS, de-energizes the capacitor in seconds after the contacts open.

## 6. USE THE CHART ON PAGE 11 TO TROUBLE SHOOT CAPACITORS:

When a defective start capacitor is found, always check for the cause of failure. It could be that the failure was normal, due to age. The replacement capacitor can then be expected to restore the motor to satisfactory operation with no further problems.

Another cause of start capacitor failure may be a defective starting switch or relay holding the capacitor in the circuit too long. Start capacitors are designed for intermittent duty only and excessively long start periods can lead to premature failure. Also, the unit may be cycling too frequently. The general standard is for no more than 20 starts per hour or the capacitor will deteriorate.

Either of these last two conditions will cause the replacement capacitor to also fail in a short time. Always look for the ***cause*** of capacitor failure to avoid call backs.

Trouble Shooting Run Capacitors:
A shorted run capacitor has the effect of keeping the start winding in the circuit at all times. The motor typically draws high amperage, runs hot and may cycle on overload. It will run at about 3/4 speed. To check, disconnect one side of the capacitor while the motor is running, taking care to avoid electrical shock. If the speed increases and the motor appears to run as normal, the capacitor is shorted and must be replaced.

With a multiple capacitor hook-up, testing for shorted capacitor is the same for parallel or series connection. In parallel, if one shorts, the total capacitance of the system is decreased and the motor will start slowly. In series, if one shorts, the capacitance increases but the voltage capability of the circuit decreases and, as a result, the remaining capacitor soon fails.

An alternate test for a shorted run capacitor is with an OHM meter. A shorted capacitor will register zero resistance.

An open run capacitor may have little apparent effect on the motor, which will appear to run near normal performance. To test, disconnect one side of the capacitor and start the motor. Take a reading of the current drawn with an ammeter. Now connect the capacitor. If the capacitor is good, the amps should drop. If there is no change in amperage, the capacitor is defective and must be replaced.

**CAUTION:** When working with capacitors, always remember that they store an electrical charge. To prevent electrical shock, never assume that a capacitor is discharged until you have manually discharged it. This can be done by touching both terminals with the blade of a screwdriver having an insulated handle. This sudden surge of electrons can, however, sometimes in itself damage the capacitor. A better way is to have a bleed resistor connected to insulated leads and use this to jump the terminals. Use a 15,000 OHM resistor for starts and a 220,000 OHM resistor for runs.

## 7. CAPACITOR TESTING EQUIPMENT:

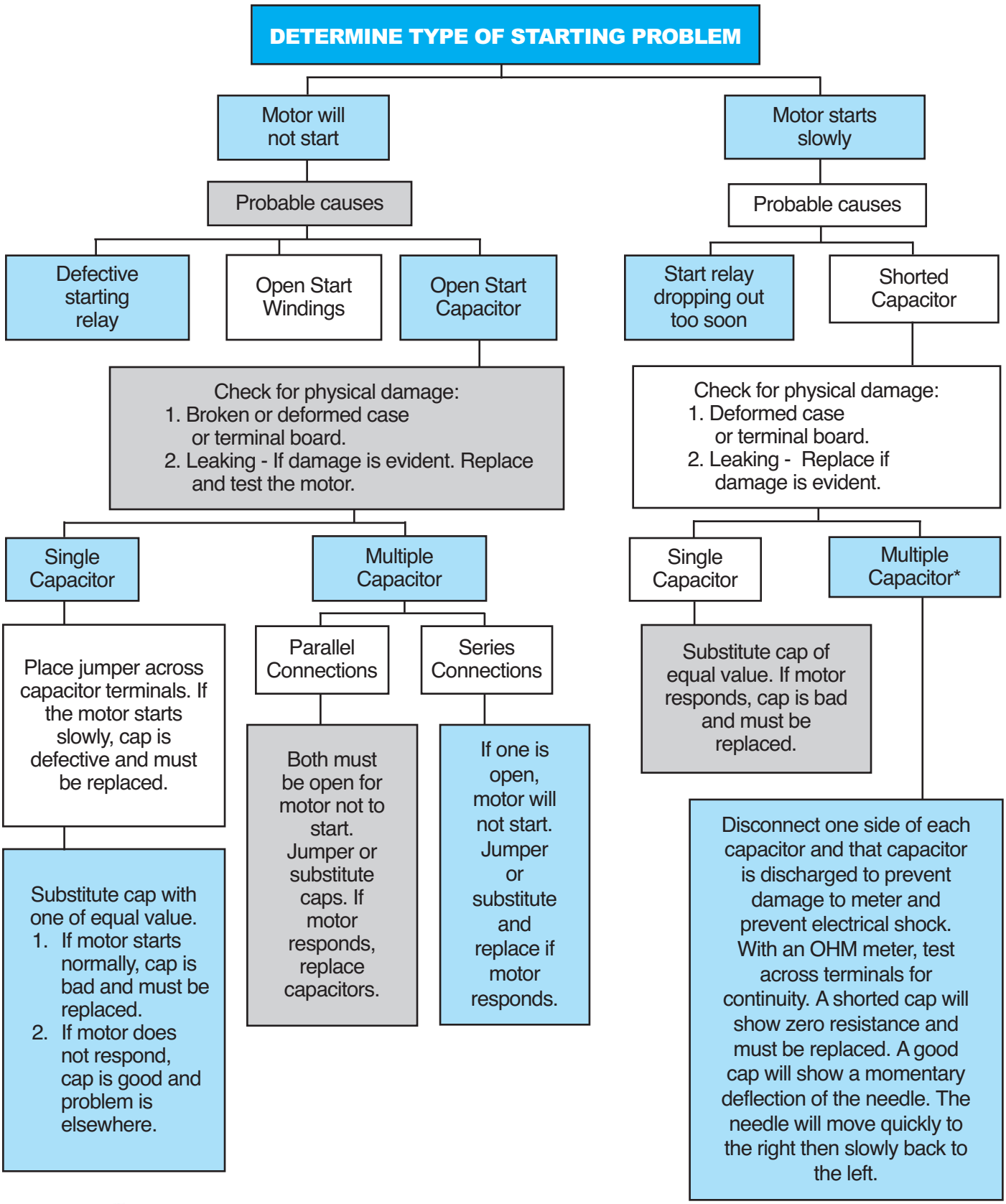
There are a number of devices available for testing and evaluating capacitors. Some are relatively inexpensive and indicate only whether the capacitor is open, shorted, or good.

More expensive units can be purchased which will tell you the mfd rating of a good capacitor if that information is not on the unit. Your local parts wholesaler sells these devices and a technician who services equipment with capacitors should consult with him to determine which test device best serves his needs.

## 8. CONCLUSION:

Capacitors are devices for storing electrons. They are used to increase the starting torque and power factor of electric motors. Replacements must be made with care to insure the correct type and rating (mfd and voltage) for each application. Two or more can be connected in parallel or series to arrive at different ratings. Trouble shooting should be done in a logical sequence to insure the proper identification of the defective part.

# Capacitor Trouble - Shooting
## Flow Chart



# USA CAPACITORS

## USA Single Capacitors

### SINGLE SECTION

| MARS NO. | DESCRIPTION |
|---|---|
| **Oval 370V** | |
| 14002 | 2 MFD 370V OVL |
| 14003 | 3 MFD 370V OVL |
| 14004 | 4 MFD 370V OVL |
| 14005 | 5 MFD 370V OVL |
| 14006 | 6 MFD 370V OVL |
| 14007 | 7.5 MFD 370V OVL |
| 14008 | 10 MFD 370V OVL |
| 14009 | 12.5 MFD 370V OVL |
| 14010 | 15 MFD 370V OVL |
| 14012 | 17.5 MFD 370V OVL |
| 14014 | 20 MFD 370V OVL |
| 14015 | 25 MFD 370V OVL |
| 14017 | 30 MFD 370V OVL |
| 14018 | 35 MFD 370V OVL |
| 14021 | 40 MFD 370V OVL |
| 14023 | 45 MFD 370V OVL |
| 14025 | 50 MFD 370V OVL |
| 14089 | 70 MFD 370V OVL |
| 14090 | 80 MFD 370V OVL |

| | |
|---|---|
| **Oval 440/370V** | |
| 14027 | 3 MFD 440/370V OVL |
| 14028 | 4 MFD 440/370V OVL |
| 14029 | 5 MFD 440/370V OVL |
| 14030 | 6 MFD 440/370V OVL |
| 14031 | 7.5 MFD 440/370V OVL |
| 14032 | 10 MFD 440/370V OVL |
| 14033 | 12.5 MFD 440/370V OVL |
| 14034 | 15 MFD 440/370V OVL |
| 14037 | 20 MFD 440/370V OVL |
| 14040 | 25 MFD 440/370V OVL |
| 14041 | 30 MFD 440/370V OVL |
| 14043 | 35 MFD 440/370V OVL |
| 14045 | 40 MFD 440/370V OVL |
| 14048 | 45 MFD 440/370V OVL |
| 14049 | 50 MFD 440/370V OVL |
| 14050 | 55 MFD 440/370V OVL |
| 14051 | 60 MFD 440/370V OVL |

### SINGLE SECTION

| MARS NO. | DESCRIPTION |
|---|---|
| **Round 370V** | |
| 14098 | 10 MFD 370V RND |
| 14210 | 15 MFD 370V RND |
| 14212 | 17.5 MFD 370V RND |
| 14214 | 20 MFD 370V RND |
| 14215 | 25 MFD 370V RND |
| 14217 | 30 MFD 370V RND |
| 14218 | 35 MFD 370V RND |
| 14821 | 40 MFD 370V RND |
| 14823 | 45 MFD 370V RND |
| 14225 | 50 MFD 370V RND |
| 14226 | 55 MFD 370V RND |
| 14227 | 60 MFD 370V RND |
| 14229 | 70 MFD 370V RND |
| 14199 | 80 MFD 370V RND |

| | |
|---|---|
| **Round 440/370V** | |
| 14105 | 5 MFD 440/370V RND |
| 14107 | 7.5 MFD 440/370V RND |
| 14232 | 10 MFD 440/370V RND |
| 14833 | 12.5 MFD 440/370V RND |
| 14234 | 15 MFD 440/370V RND |
| 14237 | 20 MFD 440/370V RND |
| 14240 | 25 MFD 440/370V RND |
| 14241 | 30 MFD 440/370V RND |
| 14243 | 35 MFD 440/370V RND |
| 14245 | 40 MFD 440/370V RND |
| 14248 | 45 MFD 440/370V RND |
| 14251 | 50 MFD 440/370V RND |
| 14252 | 55 MFD 440/370V RND |
| 14254 | 60 MFD 440/370V RND |
| 14256 | 65 MFD 440/370V RND |
| 14258 | 70 MFD 440/370V RND |
| 14259 | 80 MFD 440/370V RND |


## USA Dual Capacitors

### DUAL SECTION

| MARS NO. | DESCRIPTION |
|---|---|
| **Oval 370V** | |
| 14066 | 25/5 MFD 370V OVL |
| 14069 | 30/5 MFD 370V OVL |
| 14072 | 35/5 MFD 370V OVL |
| 14171 | 40/5 MFD 370V OVL |
| 14174 | 45/5 MFD 370V OVL |

| | |
|---|---|
| **Oval 440/370V** | |
| 14184 | 25/5 MFD 440/370V OVL |
| 14187 | 30/5 MFD 440/370V OVL |
| 14185 | 35/5 MFD 440/370V OVL |
| 14188 | 35/7.5 MFD 440/370V OVL |
| 14086 | 40/5 MFD 440/370V OVL |
| 14189 | 40/7.5MFD 440/370V OVL |
| 14190 | 45/5 MFD 440/370V OVL |
| 14140 | 80 MFD 440/370V OVL |
| 14297 | 80/5 MFD 440/370V OVL |
| 14298 | 80/7.5MFD 440/370 OVL |

| | |
|---|---|
| **Round 370V** | |
| 14260 | 20/5 MFD 370V RND |
| 14261 | 25/5 MFD 370V RND |
| 14264 | 30/5 MFD 370V RND |
| 14266 | 35/5 MFD 370V RND |
| 14178 | 40/5 MFD 370V RND |
| 14268 | 40/7.5 MFD 370V RND |
| 14269 | 45/5 MFD 370V RND |
| 14249 | 45/7.5 MFD 370V RND |
| 14191 | 50/5 MFD 370V RND |
| 14192 | 50/7.5 MFD 370V RND |
| 14239 | 50/10 MFD 370V RND |
| 14193 | 55/5MFD 370V RND |
| 14194 | 55/7.5 MFD 370V RND |
| 14195 | 60/5 MFD 370V RND |
| 14196 | 60/7.5 MFD 370V RND |
| 14054 | 70/7.5 MFD 370V RND |
| 14197 | 80/5 MFD 370V RND |
| 14198 | 80/7.5 MFD 370V RND |
| 14201 | 80/10 MFD 370V RND |

### DUAL SECTION

| MARS NO. | DESCRIPTION |
|---|---|
| **Round 440/370V** | |
| 14353 | 25/3 MFD 440/370V RND |
| 14278 | 25/5 MFD 440/370V RND |
| 14279 | 25/7.5 MFD 440/370 RND |
| 14126 | 30/3 MFD 440/370V RND |
| 14281 | 30/5 MFD 440/370V RND |
| 14282 | 30/7.5 MFD 440/370V RND |
| 14077 | 35/3 MFD 440/370V RND |
| 14070 | 35/4 MFD 440/370V RND |
| 14283 | 35/5 MFD 440/370V RND |
| 14284 | 35/7.5 MFD 440/370V RND |
| 14091 | 35/10 MFD 440/370V RND |
| 14078 | 40/3 MFD 440/370V RND |
| 14286 | 40/5 MFD 440/370V RND |
| 14287 | 40/7.5 MFD 440/370V RND |
| 14088 | 40/10 MFD 440/370V RND |
| 14079 | 45/3 MFD 440/370V RND |
| 14288 | 45/5 MFD 440/370V RND |
| 14289 | 45/7.5 MFD 440/370V RND |
| 14172 | 45/10 MFD 440/370V RND |
| 14290 | 50/5 MFD 440/370V RND |
| 14291 | 50/7.5 MFD 440/370V RND |
| 14124 | 50/10 MFD 440/370V RND |
| 14299 | 55/10 MFD 440/370V RND |
| 14292 | 55/5 MFD 440/370V RND |
| 14293 | 55/7.5 MFD 440/370V RND |
| 14294 | 60/5 MFD 440/370V RND |
| 14295 | 60/7.5 MFD 440/370V RND |
| 14296 | 60/10 MFD 440/370V RND |
| 14358 | 65/5 MFD 440/370V RND |
| 14359 | 65/7.5 MFD 440/370V RND |
| 14162 | 65/10 MFD 440/370V RND |
| 14255 | 70/5 MFD 440/370V RND |
| 14166 | 70/7.5 MFD 440/370V RND |
| 14169 | 70/10 MFD 440/370V RND |
| 14257 | 80/5 MFD 440/370V RND |
| 14216 | 80/7.5 MFD 440/370V RND |
| 14117 | 80/10 MFD 440/370V RND |

Scan to view
"Why MARS USA Capacitors"

# Blue Box RUN CAPACITORS

## SINGLE SECTION

### 370 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12002 | 2 |
| 12003 | 3 |
| 12004 | 4 |
| 12005 | 5 |
| 12006 | 6 |
| 12007 | 7.5 |
| 12008 | 10 |
| 12009 | 12.5 |
| 12010 | 15 |
| 12012 | 17.5 |
| 12014 | 20 |
| 12015 | 25 |
| 12017 | 30 |
| 12018 | 35 |
| 12021 | 40 |
| 12023 | 45 |
| 12025 | 50 |
| 12024 | 55 |
| 12087 | 60 |
| 12011 | 65 |
| 12089 | 70 |
| 12090 | 80 |

### 440 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12026 | 2 |
| 12019 | 2.5 |
| 12027 | 3 |
| 12028 | 4 |
| 12029 | 5 |
| 12030 | 6 |
| 12031 | 7.5 |
| 12032 | 10 |
| 12033 | 12.5 |
| 12034 | 15 |
| 12036 | 17.5 |
| 12037 | 20 |
| 12040 | 25 |
| 12041 | 30 |
| 12043 | 35 |
| 12045 | 40 |
| 12048 | 45 |
| 12049 | 50 |
| 12050 | 55 |
| 12051 | 60 |
| 12052 | 65 |
| 12130 | 70 |
| 12135 | 75 |
| 12140 | 80 |

### 370 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12092 | 2 |
| 12093 | 3 |
| 12094 | 4 |
| 12095 | 5 |
| 12096 | 6 |
| 12097 | 7.5 |
| 12098 | 10 |
| 12099 | 12.5 |
| 12210 | 15 |
| 12211 | 16 |
| 12212 | 17.5 |
| 12214 | 20 |
| 12215 | 25 |
| 12217 | 30 |
| 12218 | 35 |
| 12221 | 40 |
| 12223 | 45 |
| 12225 | 50 |
| 12226 | 55 |
| 12227 | 60 |
| 12128 | 65 |
| 12229 | 70 |
| 12199 | 80 |
| 12116 | 100 |

### 440 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12102 | 2 |
| 12103 | 3 |
| 12104 | 4 |
| 12105 | 5 |
| 12106 | 6 |
| 12107 | 7.5 |
| 12232 | 10 |
| 12233 | 12.5 |
| 12234 | 15 |
| 12236 | 17.5 |
| 12237 | 20 |
| 12240 | 25 |
| 12241 | 30 |
| 12243 | 35 |
| 12245 | 40 |
| 12248 | 45 |
| 12251 | 50 |
| 12252 | 55 |
| 12254 | 60 |
| 12357 | 65 |
| 12258 | 70 |
| 12259 | 80 |
| 12068 | 90 |

## DUAL SECTION

### 370 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12141 | 15/3 |
| 12056 | 15/4 |
| 12057 | 15/5 |
| 12058 | 15/10 |
| 12059 | 17.5/4 |
| 12060 | 17.5/5 |
| 12061 | 20/3 |
| 12062 | 20/4 |
| 12063 | 20/5 |
| 12064 | 20/10 |
| 12164 | 20/15 |
| 12142 | 25/3 |
| 12065 | 25/4 |
| 12066 | 25/5 |
| 12143 | 25/7.5 |
| 12131 | 25/8 |
| 12167 | 25/10 |
| 12133 | 25/15 |
| 12144 | 30/3 |
| 12145 | 30/4 |
| 12069 | 30/5 |
| 12146 | 30/7.5 |
| 12147 | 30/10 |
| 12148 | 35/3 |
| 12071 | 35/4 |
| 12072 | 35/5 |
| 12149 | 35/7.5 |
| 12150 | 35/10 |
| 12151 | 40/3 |
| 12158 | 40/4 |
| 12171 | 40/5 |
| 12152 | 40/7.5 |
| 12134 | 40/10 |
| 12173 | 45/3 |
| 12174 | 45/5 |
| 12153 | 45/7.5 |
| 12136 | 45/10 |
| 12137 | 45/15 |
| 12138 | 50/5 |
| 12154 | 55/5 |
| 12155 | 55/7.5 |
| 12139 | 60/5 |
| 12156 | 60/7.5 |
| 12157 | 60/10 |
| 12159 | 65/5 |
| 12163 | 80/5 |
| 12123 | 80/7.5 |

### 440 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12165 | 10/5 |
| 12270 | 15/4 |
| 12271 | 15/5 |
| 12177 | 15/10 |
| 12180 | 20/5 |
| 12083 | 20/15 |
| 12184 | 25/5 |
| 12182 | 25/7.5 |
| 12183 | 25/10 |
| 12186 | 25/15 |
| 12181 | 30/4 |
| 12187 | 30/5 |
| 12038 | 30/7.5 |
| 12035 | 30/10 |
| 12085 | 35/3 |
| 12179 | 35/4 |
| 12185 | 35/5 |
| 12188 | 35/7.5 |
| 12176 | 35/8.5 |
| 12272 | 35/10 |
| 12080 | 40/3 |
| 12086 | 40/5 |
| 12189 | 40/7.5 |
| 12273 | 40/10 |
| 12190 | 45/5 |
| 12274 | 45/7.5 |
| 12108 | 50/5 |
| 12013 | 50/7.5 |
| 12275 | 55/5 |
| 12276 | 55/10 |
| 12109 | 60/5 |
| 12110 | 60/7.5 |
| 12101 | 65/10 |
| 12297 | 80/5 |
| 12298 | 80/7.5 |


### 370 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12121 | 15/3 |
| 12122 | 15/4 |
| 12203 | 15/5 |
| 12204 | 15/10 |
| 12205 | 17.5/4 |
| 12206 | 17.5/5 |
| 12207 | 20/4 |
| 12260 | 20/5 |
| 12016 | 20/7.5 |
| 12208 | 20/10 |
| 12209 | 20/15 |
| 12242 | 25/3 |
| 12175 | 25/4 |
| 12261 | 25/5 |
| 12262 | 25/7.5 |
| 12213 | 25/10 |
| 12244 | 30/3 |
| 12263 | 30/4 |
| 12264 | 30/5 |
| 12224 | 30/7.5 |
| 12228 | 30/10 |
| 12039 | 30/15 |
| 12082 | 35/3 |
| 12231 | 35/4 |
| 12266 | 35/5 |
| 12235 | 35/7.5 |
| 12238 | 35/10 |
| 12074 | 40/3 |
| 12267 | 40/4 |
| 12178 | 40/5 |
| 12268 | 40/7.5 |
| 12246 | 40/10 |
| 12073 | 45/3 |
| 12247 | 45/4 |
| 12269 | 45/5 |
| 12249 | 45/7.5 |
| 12250 | 45/10 |
| 12075 | 50/3 |
| 12191 | 50/5 |
| 12192 | 50/7.5 |
| 12239 | 50/10 |
| 12193 | 55/5 |
| 12194 | 55/7.5 |
| 12067 | 55/10 |
| 12076 | 60/3 |
| 12195 | 60/5 |
| 12196 | 60/7.5 |
| 12265 | 60/10 |
| 12042 | 65/5 |
| 12053 | 70/5 |
| 12054 | 70/7.5 |
| 12055 | 70/10 |
| 12044 | 75/5 |
| 12046 | 75/7.5 |
| 12084 | 75/10 |
| 12197 | 80/5 |
| 12198 | 80/7.5 |
| 12201 | 80/10 |
| 12202 | 80/12.5 |
| 12129 | 85/5 |
| 12230 | 85/7.5 |
| 12222 | 85/10 |

### 440 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12111 | 10/5 |
| 12118 | 15/5 |
| 12356 | 15/10 |
| 12350 | 17.5/5 |
| 12115 | 20/5 |
| 12354 | 20/7.5 |
| 12351 | 20/10 |
| 12112 | 20/15 |
| 12353 | 25/3 |
| 12355 | 25/4 |
| 12278 | 25/5 |
| 12279 | 25/7.5 |
| 12113 | 25/10 |
| 12114 | 25/15 |
| 12126 | 30/3 |
| 12120 | 30/4 |
| 12281 | 30/5 |
| 12282 | 30/7.5 |
| 12352 | 30/10 |
| 12077 | 35/3 |
| 12070 | 35/4 |
| 12283 | 35/5 |
| 12119 | 35/6 |
| 12284 | 35/7.5 |
| 12091 | 35/10 |
| 12078 | 40/3 |
| 12285 | 40/4 |
| 12286 | 40/5 |
| 12220 | 40/6 |
| 12287 | 40/7.5 |
| 12088 | 40/10 |
| 12079 | 45/3 |
| 12219 | 45/4 |
| 12288 | 45/5 |
| 12127 | 45/6 |
| 12289 | 45/7.5 |
| 12172 | 45/10 |
| 12290 | 50/5 |
| 12291 | 50/7.5 |
| 12124 | 50/10 |
| 12253 | 50/12.5 |
| 12292 | 55/5 |
| 12293 | 55/7.5 |
| 12299 | 55/10 |
| 12160 | 60/3 |
| 12294 | 60/5 |
| 12295 | 60/7.5 |
| 12296 | 60/10 |
| 12161 | 60/12.5 |
| 12358 | 65/5 |
| 12359 | 65/7.5 |
| 12162 | 65/10 |
| 12255 | 70/5 |
| 12166 | 70/7.5 |
| 12169 | 70/10 |
| 12168 | 75/5 |
| 12125 | 75/7.5 |
| 12047 | 75/10 |
| 12257 | 80/5 |
| 12216 | 80/7.5 |
| 12117 | 80/10 |
| 12022 | 85/5 |
| 12020 | 85/7.5 |
| 12001 | 85/10 |

# JARD by MARS RUN CAPACITORS

## SINGLE SECTION

### 370 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12902 | 2 |
| 12903 | 3 |
| 12904 | 4 |
| 12905 | 5 |
| 12906 | 6 |
| 12907 | 7.5 |
| 12908 | 10 |
| 12909 | 12.5 |
| 12910 | 15 |
| 12912 | 17.5 |
| 12914 | 20 |
| 12915 | 25 |
| 12917 | 30 |
| 12918 | 35 |
| 12921 | 40 |
| 12923 | 45 |
| 12925 | 50 |
| 12924 | 55 |
| 12987 | 60 |
| 12988 | 65 |
| 12989 | 70 |
| 12990 | 80 |

### 440 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12926 | 2 |
| 12919 | 2.5 |
| 12927 | 3 |
| 12928 | 4 |
| 12929 | 5 |
| 12930 | 6 |
| 12931 | 7.5 |
| 12932 | 10 |
| 12933 | 12.5 |
| 12934 | 15 |
| 12936 | 17.5 |
| 12937 | 20 |
| 12940 | 25 |
| 12941 | 30 |
| 12943 | 35 |
| 12945 | 40 |
| 12948 | 45 |
| 12949 | 50 |
| 12950 | 55 |
| 12951 | 60 |
| 12952 | 65 |
| 12830 | 70 |
| 12831 | 75 |
| 12840 | 80 |

### 370 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12992 | 2 |
| 12993 | 3 |
| 12994 | 4 |
| 12995 | 5 |
| 12996 | 6 |
| 12997 | 7.5 |
| 12998 | 10 |
| 12999 | 12.5 |
| 12710 | 15 |
| 12911 | 16 |
| 12712 | 17.5 |
| 12714 | 20 |
| 12715 | 25 |
| 12717 | 30 |
| 12718 | 35 |
| 12721 | 40 |
| 12723 | 45 |
| 12725 | 50 |
| 12726 | 55 |
| 12727 | 60 |
| 12828 | 65 |
| 12729 | 70 |
| 12899 | 80 |
| 12916 | 100 |

### 440 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12802 | 2 |
| 12803 | 3 |
| 12804 | 4 |
| 12805 | 5 |
| 12806 | 6 |
| 12807 | 7.5 |
| 12732 | 10 |
| 12733 | 12.5 |
| 12734 | 15 |
| 12736 | 17.5 |
| 12737 | 20 |
| 12740 | 25 |
| 12741 | 30 |
| 12743 | 35 |
| 12745 | 40 |
| 12748 | 45 |
| 12751 | 50 |
| 12752 | 55 |
| 12754 | 60 |
| 12657 | 65 |
| 12758 | 70 |
| 12759 | 80 |
| 12868 | 90 |

## DUAL SECTION

### 370 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12841 | 15/3 |
| 12956 | 15/4 |
| 12957 | 15/5 |
| 12958 | 15/10 |
| 12959 | 17.5/4 |
| 12960 | 17.5/5 |
| 12961 | 20/3 |
| 12962 | 20/4 |
| 12963 | 20/5 |
| 12864 | 20/10 |
| 12964 | 20/15 |
| 12842 | 25/3 |
| 12965 | 25/4 |
| 12966 | 25/5 |
| 12843 | 25/7.5 |
| 12832 | 25/8 |
| 12867 | 25/10 |
| 12833 | 25/15 |
| 12844 | 30/3 |
| 12845 | 30/4 |
| 12969 | 30/5 |
| 12846 | 30/7.5 |
| 12847 | 30/10 |
| 12848 | 35/3 |
| 12971 | 35/4 |
| 12972 | 35/5 |
| 12849 | 35/7.5 |
| 12850 | 35/10 |
| 12851 | 40/3 |
| 12858 | 40/4 |
| 12871 | 40/5 |
| 12852 | 40/7.5 |
| 12834 | 40/10 |
| 12874 | 45/5 |
| 12853 | 45/7.5 |
| 12836 | 45/10 |
| 12837 | 45/15 |
| 12838 | 50/5 |
| 12854 | 55/5 |
| 12855 | 55/7.5 |
| 12839 | 60/5 |
| 12856 | 60/7.5 |
| 12857 | 60/10 |
| 12859 | 65/5 |
| 12863 | 80/5 |
| 12817 | 80/7.5 |

### 440 Volt Oval

| MARS No. | Microfarad |
|---|---|
| 12765 | 10/5 |
| 12770 | 15/4 |
| 12771 | 15/5 |
| 12777 | 15/10 |
| 12880 | 20/5 |
| 12983 | 20/15 |
| 12884 | 25/5 |
| 12882 | 25/7.5 |
| 12883 | 25/10 |
| 12886 | 25/15 |
| 12881 | 30/4 |
| 12887 | 30/5 |
| 12982 | 30/7.5 |
| 12835 | 30/10 |
| 12985 | 35/3 |
| 12879 | 35/4 |
| 12885 | 35/5 |
| 12888 | 35/7.5 |
| 12876 | 35/8.5 |
| 12772 | 35/10 |
| 12877 | 40/3 |
| 12986 | 40/5 |
| 12889 | 40/7.5 |
| 12773 | 40/10 |
| 12890 | 45/5 |
| 12774 | 45/7.5 |
| 12808 | 50/5 |
| 12913 | 50/7.5 |
| 12775 | 55/5 |
| 12822 | 55/10 |
| 12809 | 60/5 |
| 12776 | 60/7.5 |
| 12810 | 65/10 |
| 12815 | 80/5 |
| 12898 | 80/7.5 |



### 370 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12701 | 15/3 |
| 12702 | 15/4 |
| 12703 | 15/5 |
| 12704 | 15/10 |
| 12705 | 17.5/4 |
| 12706 | 17.5/5 |
| 12707 | 20/4 |
| 12760 | 20/5 |
| 12716 | 20/7.5 |
| 12708 | 20/10 |
| 12709 | 20/15 |
| 12711 | 25/3 |
| 12875 | 25/4 |
| 12761 | 25/5 |
| 12762 | 25/7.5 |
| 12713 | 25/10 |
| 12720 | 30/3 |
| 12763 | 30/4 |
| 12764 | 30/5 |
| 12724 | 30/7.5 |
| 12728 | 30/10 |
| 12939 | 30/15 |
| 12730 | 35/3 |
| 12731 | 35/4 |
| 12766 | 35/5 |
| 12735 | 35/7.5 |
| 12738 | 35/10 |
| 12739 | 40/3 |
| 12767 | 40/4 |
| 12878 | 40/5 |
| 12768 | 40/7.5 |
| 12746 | 40/10 |
| 12747 | 45/3 |
| 12947 | 45/4 |
| 12769 | 45/5 |
| 12749 | 45/7.5 |
| 12750 | 45/10 |
| 12753 | 50/3 |
| 12755 | 50/5 |
| 12825 | 50/7.5 |
| 12757 | 50/10 |
| 12893 | 55/5 |
| 12894 | 55/7.5 |
| 12967 | 55/10 |
| 12976 | 60/3 |
| 12895 | 60/5 |
| 12896 | 60/7.5 |
| 12865 | 60/10 |
| 12742 | 65/5 |
| 12953 | 70/5 |
| 12954 | 70/7.5 |
| 12955 | 70/10 |
| 12744 | 75/5 |
| 12946 | 75/7.5 |
| 12984 | 75/10 |
| 12897 | 80/5 |
| 12819 | 80/7.5 |
| 12824 | 80/10 |
| 12722 | 80/12.5 |
| 12829 | 85/5 |
| 12756 | 85/7.5 |
| 12922 | 85/10 |

### 440 Volt Round

| MARS No. | Microfarad |
|---|---|
| 12811 | 10/5 |
| 12818 | 15/5 |
| 12656 | 15/10 |
| 12650 | 17.5/5 |
| 12780 | 20/5 |
| 12654 | 20/7.5 |
| 12651 | 20/10 |
| 12812 | 20/15 |
| 12653 | 25/3 |
| 12655 | 25/4 |
| 12778 | 25/5 |
| 12779 | 25/7.5 |
| 12813 | 25/10 |
| 12814 | 25/15 |
| 12826 | 30/3 |
| 12820 | 30/4 |
| 12781 | 30/5 |
| 12782 | 30/7.5 |
| 12652 | 30/10 |
| 12977 | 35/3 |
| 12870 | 35/4 |
| 12783 | 35/5 |
| 12784 | 35/7.5 |
| 12797 | 35/10 |
| 12978 | 40/3 |
| 12785 | 40/4 |
| 12786 | 40/5 |
| 12920 | 40/6 |
| 12787 | 40/7.5 |
| 12798 | 40/10 |
| 12979 | 45/3 |
| 12891 | 45/4 |
| 12788 | 45/5 |
| 12827 | 45/6 |
| 12789 | 45/7.5 |
| 12872 | 45/10 |
| 12790 | 50/5 |
| 12791 | 50/7.5 |
| 12892 | 50/10 |
| 12719 | 50/12.5 |
| 12792 | 55/5 |
| 12793 | 55/7.5 |
| 12799 | 55/10 |
| 12860 | 60/3 |
| 12794 | 60/5 |
| 12795 | 60/7.5 |
| 12796 | 60/10 |
| 12861 | 60/12.5 |
| 12742 | 65/5 |
| 12659 | 65/7.5 |
| 12862 | 65/10 |
| 12823 | 70/5 |
| 12866 | 70/7.5 |
| 12869 | 70/10 |
| 12968 | 75/5 |
| 12901 | 75/7.5 |
| 12935 | 75/10 |
| 12801 | 80/5 |
| 12816 | 80/7.5 |
| 12821 | 80/10 |
| 12938 | 85/5 |
| 12942 | 85/7.5 |
| 12944 | 85/10 |

# START CAPACITORS

## MARS Blue Box

### SINGLE SECTION

#### 165 Volts AC

| MARS No. | Microfarad |
|---|---|
| 11075 | 72-88 |
| 11076 | 88-108 |
| 11077 | 108-130 |
| 11031 | 124-149 |
| 11032 | 145-175 |
| 11033 | 161-193 |
| 11034 | 189-227 |
| 11078 | 216-259 |
| 11035 | 233-292 |
| 11036 | 270-324 |
| 11079 | 340-408 |
| 11080 | 378-455 |
| 11037 | 400-480 |
| 11081 | 540-648 |
| 11082 | 710-850 |
| 11083 | 810-972 |

#### 330 Volts AC

| MARS No. | Microfarad |
|---|---|
| 11055 | 21-25 |
| 11056 | 25-30 |
| 11057 | 30-36 |
| 11058 | 36-43 |
| 11059 | 43-56 |
| 11060 | 56-72 |
| 11160 | 64-77 |
| 11061 | 72-88 |
| 11062 | 88-108 |
| 11063 | 108-130 |
| 11064 | 130-156 |
| 11165 | 124-156 |
| 11092 | 135-162 |
| 11066 | 145-175 |
| 11067 | 161-193 |
| 11068 | 189-227 |
| 11069 | 216-259 |
| 11070 | 270-324 |
| 11093 | 300-360 |

### DUAL SECTION

#### 110/125 Dual Voltage AC

| MARS No. | Microfarad |
|---|---|
| 11002 | 21-25 |
| 11003 | 25-30 |
| 11004 | 30-36 |
| 11005 | 36-43 |
| 11006 | 43-56 |
| 11007 | 56-72 |
| 11008 | 72-88 |
| 11009 | 88-108 |
| 11010 | 108-130 |
| 11112 | 124-156 |
| 11011 | 130-156 |
| 11013 | 145-175 |
| 11014 | 161-193 |
| 11015 | 189-227 |
| 11016 | 200-240 |
| 11017 | 216-259 |
| 11018 | 233-292 |
| 11019 | 270-324 |
| 11020 | 300-360 |
| 11021 | 324-388 |
| 11022 | 340-408 |
| 11023 | 378-440 |
| 11024 | 400-480 |
| 11071 | 430-516 |
| 11025 | 460-552 |
| 11026 | 540-648 |
| 11027 | 590-708 |
| 11047 | 645-774 |
| 11028 | 708-850 |
| 11072 | 815-970 |
| 11029 | 829-995 |
| 11073 | 850-1020 |
| 11030 | 1000-1200 |
| 11074 | 1290-1548 |

#### 220/250 Dual Voltage AC

| MARS No. | Microfarad |
|---|---|
| 11038 | 21-25 |
| 11039 | 25-30 |
| 11040 | 30-36 |
| 11041 | 36-43 |
| 11042 | 43-56 |
| 11043 | 56-72 |
| 11084 | 59-71 |
| 11137 | 64-77 |
| 11044 | 72-88 |
| 11045 | 88-108 |
| 11046 | 108-130 |
| 11148 | 124-156 |
| 11049 | 145-175 |
| 11050 | 161-193 |
| 11051 | 189-227 |
| 11052 | 216-259 |
| 11053 | 233-292 |
| 11054 | 270-324 |
| 11085 | 280-336 |
| 11086 | 320-384 |
| 11087 | 340-408 |
| 11088 | 378-455 |
| 11089 | 400-480 |
| 11090 | 430-516 |
| 11091 | 630-750 |

## JARD by MARS

### SINGLE SECTION

#### 165 Volts AC

| MARS No. | Microfarad |
|---|---|
| 11975 | 72-88 |
| 11976 | 88-108 |
| 11977 | 108-130 |
| 11931 | 124-149 |
| 11932 | 145-175 |
| 11933 | 161-193 |
| 11934 | 189-227 |
| 11978 | 216-259 |
| 11935 | 233-292 |
| 11936 | 270-324 |
| 11979 | 340-408 |
| 11980 | 378-455 |
| 11994 | 400-480 |
| 11981 | 540-648 |
| 11982 | 710-850 |
| 11983 | 810-972 |

#### 330 Volts AC

| MARS No. | Microfarad |
|---|---|
| 11955 | 21-25 |
| 11956 | 25-30 |
| 11957 | 30-36 |
| 11958 | 36-43 |
| 11959 | 43-56 |
| 11995 | 56-72 |
| 11960 | 64-77 |
| 11961 | 72-88 |
| 11962 | 88-108 |
| 11963 | 108-130 |
| 11964 | 130-156 |
| 11965 | 124-156 |
| 11992 | 135-162 |
| 11966 | 145-175 |
| 11967 | 161-193 |
| 11968 | 189-227 |
| 11969 | 216-259 |
| 11970 | 270-324 |
| 11993 | 300-360 |

### DUAL SECTION

#### 110/125 Dual Voltage AC

| MARS No. | Microfarad |
|---|---|
| 11902 | 21-25 |
| 11903 | 25-30 |
| 11904 | 30-36 |
| 11905 | 36-43 |
| 11906 | 43-56 |
| 11907 | 56-67 |
| 11908 | 72-88 |
| 11909 | 88-108 |
| 11910 | 108-130 |
| 11912 | 124-156 |
| 11911 | 130-156 |
| 11913 | 145-175 |
| 11914 | 161-193 |
| 11915 | 189-227 |
| 11916 | 200-240 |
| 11917 | 216-259 |
| 11918 | 233-292 |
| 11919 | 270-324 |
| 11920 | 300-360 |
| 11921 | 324-388 |
| 11922 | 340-408 |
| 11923 | 378-440 |
| 11924 | 400-480 |
| 11971 | 430-516 |
| 11925 | 460-552 |
| 11926 | 540-648 |
| 11927 | 590-708 |
| 11947 | 645-774 |
| 11928 | 708-850 |
| 11972 | 815-970 |
| 11929 | 829-995 |
| 11973 | 850-1020 |
| 11930 | 1000-1200 |
| 11974 | 1290-1548 |

#### 220/250 Dual Voltage AC

| MARS No. | Microfarad |
|---|---|
| 11938 | 21-25 |
| 11939 | 25-30 |
| 11940 | 30-36 |
| 11941 | 36-43 |
| 11942 | 43-56 |
| 11943 | 56-72 |
| 11984 | 59-71 |
| 11937 | 64-77 |
| 11944 | 72-88 |
| 11945 | 88-108 |
| 11946 | 108-130 |
| 11948 | 124-156 |
| 11949 | 145-175 |
| 11950 | 161-193 |
| 11951 | 189-227 |
| 11952 | 216-259 |
| 11953 | 233-292 |
| 11954 | 270-324 |
| 11985 | 280-336 |
| 11986 | 320-384 |
| 11987 | 340-408 |
| 11988 | 378-455 |
| 11989 | 400-480 |
| 11990 | 430-516 |
| 11991 | 630-750 |

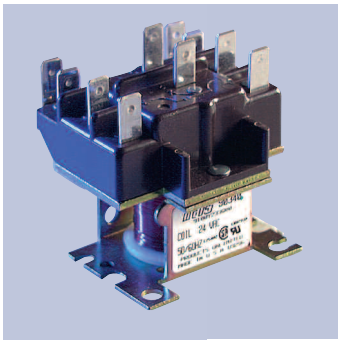
## TURBO® 200

**Universal Run & Start Capacitor Replacement**

One model covers a range of single and dual mfd ratings.

| MARS # | Description | Microfarad |
|---|---|---|
| 12100 | TURBO® 200 mini | 2.5 mfd - 12.5 mfd, 370V or 440V |
| 12200 | TURBO® 200 | 2.5 mfd - 67.5 mfd, 370V or 440V |
| 12300 | TURBO® 200 X | 5.0 mfd - 97.5 mfd, 370V or 440V |
| 11200 | Turbolytic™ 50 Universal Motor Start Capacitor | 23 mfd - 302 mfd, 125V to 330V |
| 11100 | Turbolytic™ JR | 23 mfd - 208 mfd, 125V to 330V |

# Why Choose MARS?





## The Leading Brands You Trust For...

- Quality
- Innovation
- Design
- Leadership

MARS has been serving the HVAC/R market since 1946 and is proud to present the most complete motor and accessory product offering to serve your needs. Our capabilities include:

- Consolidation - One Stop Shop
- Over 14,000 combinable products
- Value-added sales support and services
- Industry leading brands
- Award winning distribution facilities
- +97% order fill rate
- Billing accuracy
- Bilingual Website
- Training Focused
- EDI capabilities

Thank you for your business !

⚠ **WARNING:**
Cancer and Reproductive Harm
www.P65Warnings.ca.gov