Adding a Hard Start Capacitor to your Rooftop RV A/C

There are two reasons for wanting to make this change. One - it is easier on the A/C for startup. Some RV parks may have sketchy electrical supply prone to low voltage. Two - it may allow you to run your A/C on less generator than you thought. This is very important, especially if you like to dry camp and you need your A/C.

Have you ever tried to start your A/C on a hot day, possibly at high altitude, with a generator that is supposedly rated to handle the A/C's starting requirements? The generator struggles, goes into overload or stalls because it cannot supply the current demands of the A/C's motor fast enough. Have you ever heard that someone started and ran their A/C with a 2000 to 2400 watt generator? Chances are that they have modified their RV air conditioner with a hard start capacitor.

Once you sort out what you have and what you need to make the modification, the job is actually fairly simple. The typical RVair conditioner will have both a compressor motor starting capacitor and a blower motor run capacitor since they are generally of the Capacitor Start Induction Run (CISR) type. The other less common type is the Permanent Split Capacitor (PSC) arrangement, which is not usually used in an RV application. Even if your A/C has a starting capacitor, you can still benefit from this modification. Most stock starting capacitors are a bit undersized and replacing it with a larger boost capacitor can help, especially if you are trying to start your A/C using a small generator. For those whose A/C has no starting capacitor from the factory, this modification will really help with compressor motor startup current demands.

The recommended (and most popular) starting capacitor for a 13,500–15,000 BTU RV A/C is the Supco SPP6E boost capacitor. This capacitor has an electronic disconnect (Positive Temperature Coefficient Relay [PTCR] which provides about twice the current boosting power as the factory start capacitor. This electronic disconnect has proven to be more reliable than the relay disconnect type of boost capacitor. If your A/C doesn't have a separate boost capacitor with PTCR, it is likely that the run capacitor doubles as the boost capacitor, and also has PTCR relay. The PTCR allows a boost of current to the compressor when it first starts up and then the PTCR heats up and changes its resistance to close off the extra current because it is no longer required. The compressor only needs the extra power to get started; after that the stock run capacitor is plenty and having too much boost can overheat the compressor. If your A/C doesn't have a separate boost capacitor, the Supco SPP6 can still help. See further on for instructions.

The actual modification is actually pretty easy. The hardest part is getting on the roof of your RV. To install the hard start capacitor, you must remove the shroud covering the AC. FIRST, be sure to disconnect any electrical power to the RV. You will be working with AC wiring which, if energized, can kill you. If in doubt, consult a qualified electrician to either assist or to do the job for you. Don't try this modification if you are unsure.

Start by removing the plastic/fiber- glass A/C cover. You will need a bat- tery-powered screw gun with a Phillips tip and possibly a hex drive tip. Locate the metal utility box containing the motor and/or starting capacitor. There should be a wiring diagram on the outside of the utility box. Remove the screws holding the metal cover on, then remove the cover. There should be two to four screws.

NOTE: Before touching any of the wiring connected to startup or motor run capacitors, you should discharge the capacitors. You can discharge a capacitor by shorting its terminals. Some do this by

placing a screwdriver blade across the terminals. Another way is to use a high-wattage resistor to short the terminals. You can find one at your local electronics store.

A/C with starting capacitor: After the cover is removed, you should see either one or two cylindrical looking parts with several wires running to them. If there are two, then the one that is usually black and totally round is the factory starting capacitor. There may be an oval capacitor that is the blower motor run capacitor. The factory starting capacitor (43–53 micro farads [uF]) should have two wires coming from it. Simply disconnect the wires leading from the starting capacitor and remove it. The Supco capacitor (88–106 micro farads [uF]) will be a direct replacement. Connect the two wires from the new capacitor to where the old capacitor wiring was connected. Both wires are black and can go on either terminal.

A/C without starting capacitor: If your A/C does not have a starting capacitor, refer to the Supco wiring recommendations that come with the Supco boost capacitor for the various types of capacitor/wiring configurations. Generally, the new boost capacitor will be wired in parallel, or "piggy-back", to the motor run capacitor using the supplied jumper terminals (one wire each side) without removing any original wires. Both wires are black and can go on ei- ther terminal. Again, if in doubt, seek the advice or a professional electrician or HVAC technician.

With or without a starting capacitor, the finished product and arrangement will look the same. Replace the top when done.

That is all there is to this mod. Not only will your A/C start up easier while on shore power without popping the breaker, you stand a much better chance of starting and running the A/C using a smaller generator. Compare the price of the hard start capacitor (about $10 to $20) to the price of an additional generator ($1000 and up). If you have questions or if you would like to see pictures, feel free to email us at the technical help committee.

If you are testing out your new boost capacitor, be sure to allow several min- utes between startups of your A/C. This ensures that pressures within theA/C sys- tem equalize and the compressor motor will start much easier. If it is particularly hot out, the A/C system will have very high pressure on one side of the system after shutdown. You may have to wait as long as five minutes before cycling the A/C.

Feedback: June 2016 *Blue Beret,* adding a Hard Start Capacitor

We have a 2013 Flying Cloud with a Dometic 651816 series Penguin II Heat Pump/Air Conditioner. I had occasion today to dig into it due to a problem we're having.

I went back to your article in the June 2016 *Blue Beret*, thinking a Hard Start Cap might help our problem. Turns out, our model of A/C already has a PTCR and a Start Cap, so buying the Supco SPP6 would get us nothing. Based on the instructions, it could cause trouble for the unwary if they ended up with two PTCRs in their start circuit, since with two resistors, start current would be reduced.

Response to Feedback:

I urge you to include a brief disclaimer on what vintage equipment you are referring to when writing articles like these, or sanity check against newer as well as older models.

Thank your for the feedback.

We are sorry if we caused any confusion, we definitely want to provide info that is clear and pays attention to detail. It is always difficult trying to cover a product built for so many years and not knowing what upgrades that may have or may not have been made.

The Supco SPP6 is a start capacitor – it is not a resistor. A capacitor just stores a charge until there is a demand for it – like starting the motor. Higher capacitance provides more boost on start-up. That is the reason that this replacement can help with start-up.

If someone already has a PTCR and a Start Cap, then the question would then come down to what the values in Micro Farads these existing devices have. Chances are that the stock Start Cap is of lower value than the Supco SPP6.

The higher capacitance provides the better start up and is easier on the motor. Again one would have to compare the Micro Farad value of the existing start cap versus the Supco and either stay with the original capacitor or remove it and install the newer and higher value one. We had hoped the instructions in our article were clear that one is either adding a capacitor or replacing a capacitor – one shouldn't end up with more than they need if they follow the outlined steps.

I hope this helps explain a little better. Thank you for giving us a chance to respond