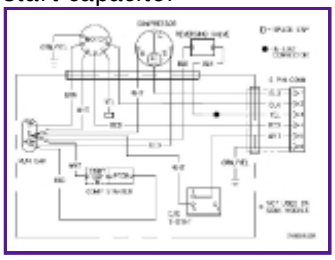
Mod #82: Air Conditioner Hard Start Capacitor

Posted By ModMyRV On May 27, 2009 @ 11:09 am In cooling, featured | 66 Comments

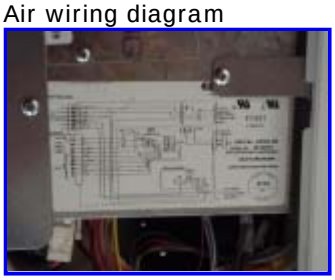
Ever try to start your A/C on a hot day at high altitude with a generator that is supposedly rated to handle the A/C's starting requirements? The generator struggles, goes in to overload, or just plain stalls because it cannot supply the current demands of the A/C's motor fast enough. Stories abound that many are able to start their RV air conditioners using a Honda EU2000 or Yamaha 2400i, or other small wattage generator. How are they able to do this while others can't? Chances are they have modded their RV's air conditioner with a hard start capacitor.

Mod Difficulty:

Supco SPP6E A/C hard start capacitor



Example Dometic Brisk Air wiring diagram



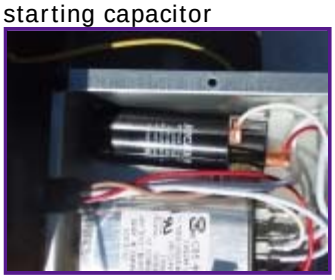
Dometic Brisk Air wiring diagram underneath A/C intake grill

Dometic A/C outside cover - notice all the screws!

Located in the front right of the A/C unit, the utility box contains start and run capacitors

Wiring diagram for A/C compressor motor and blower motor

Close up of capacitors - the shiny one is the motor run capacitor and the black one is the motor starting capacitor



The starting cap is 43-53 uF while the Supco is 88 to 106 uF - theis means more starting power!AC

Typical OEM motor starting capacitor - same as the one shown in the utility box

A typical RV air conditioner will have both a compressor motor starting capacitor and blower motor run capacitor, since they are generally of the Capacitor Start Induction Run (CSIR) 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 mod. 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 mod 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 and provides about twice the current boosting power as the factory start capacitor. If your A/C doesn't have a seperate boost capacitor as shown in the pictures above, it's likely that the run capacitor doubles as the boost capacitor, and also has a Positive Temperature Coefficient Relay (PTCR), a fancy term for the way the capacitor is removed from the circuit once the motor starts. The PTCR is prone to failure which can cause the capacitor to fail, and thus make the compresor motor startup current demands very high or not able start at all. This is the reason Supco makes an electronic version of the PTCR. It is much more reliable and is integrated in to the capacitor packaging.

So now that you know more than you ever wanted to know about starting capacitors, how do you mod your RV with one? It's actually pretty easy. The hardest part is getting on the roof of your RV. To install the capacitor, you must remove the shroud covering the A/C internals. But first, **be sure to disconnect any electrical power from 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 do the job for you. Don't try this mod if you are unsure!

Start by removing the A/C cover. These are typically secured with many screws so use a battery-powered screw gun unless you prefer a hand workout. Locate the utility box containing the motor and/or starting capacitor. On a Dometic brand A/C, it's located near the top right corner and should have a wiring diagram on the outside of it. Remove the screws holding the cover on, then remove the cover. There should be two screws (refer to the pictures above).

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 (not oval-shaped which is the blower motor run capacitor) is the factory starting capacitor. it should have two wires coming from it. If this is the case, simply disconnect the wires leading from the starting capacitor and remove it. The Supco capacitor will be a direct replacement. Connect the two wires from the new capacitor to where the old capacitor wiring was connected.

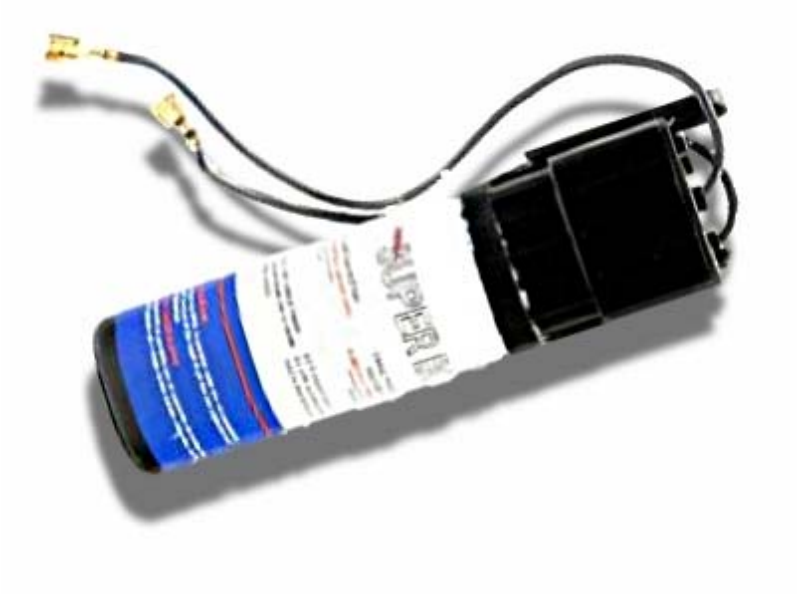
If your A/C does not have a starting capacitor, refer to the Supco wiring recommendations that came with your boost capacitor for the various types of capacitor/wiring configurations. Generally though, the new boost capacitor will be wired in parallel, or "piggy-back", to the motor run capacitor using the supplied jumper terminals. Again, if in doubt, seek the advice of a professional electrican or HVAC technician.

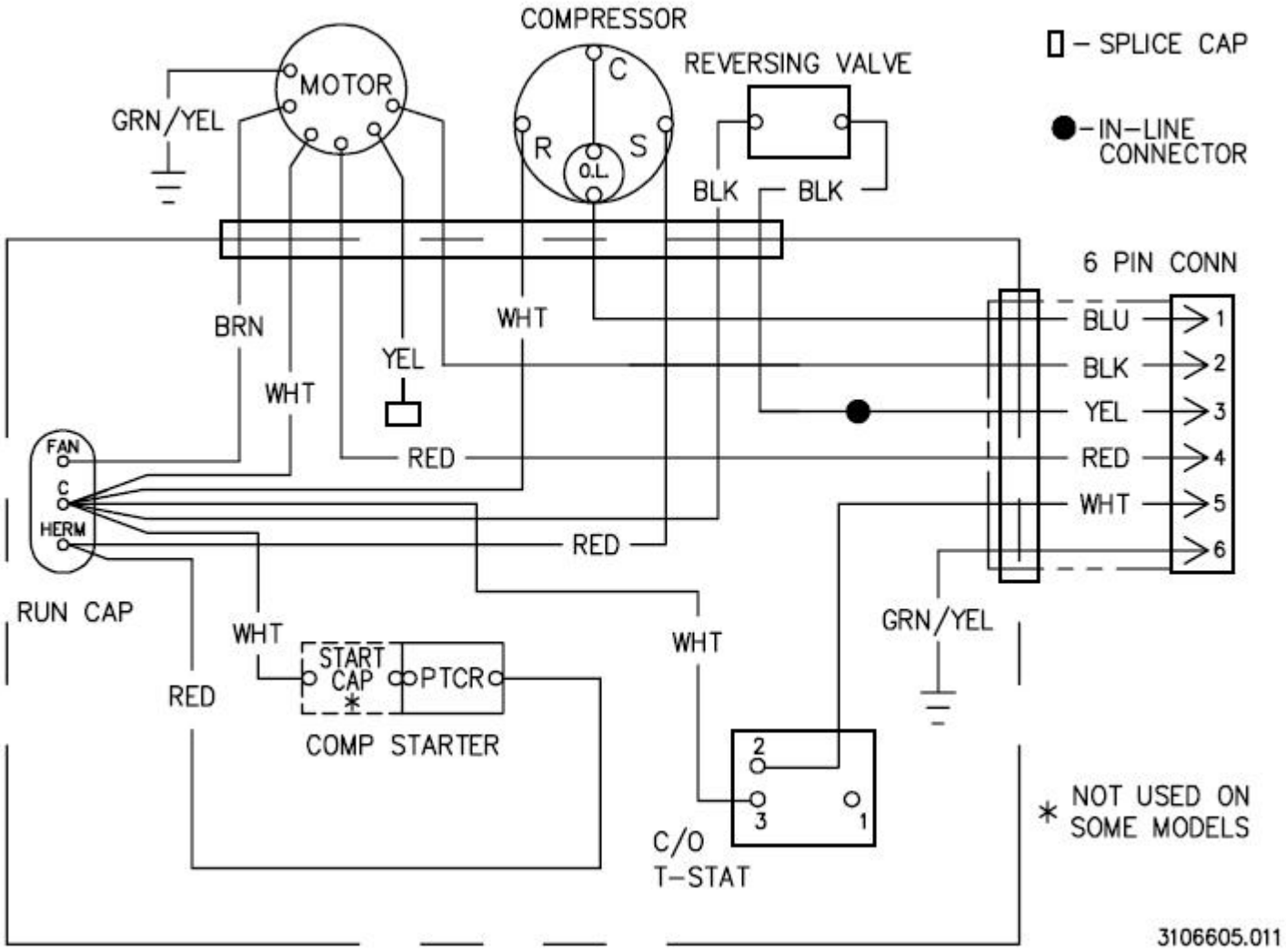
You thought there was more to this mod? Nope. It's really that simple to do. Not only will your A/C start up easier while on shore power without popping the breaker, you stand a much better chance of starting and running the A/C using a smaller generator. If you have questions, feel free to comment below and we will do our best to get you an answer quickly!

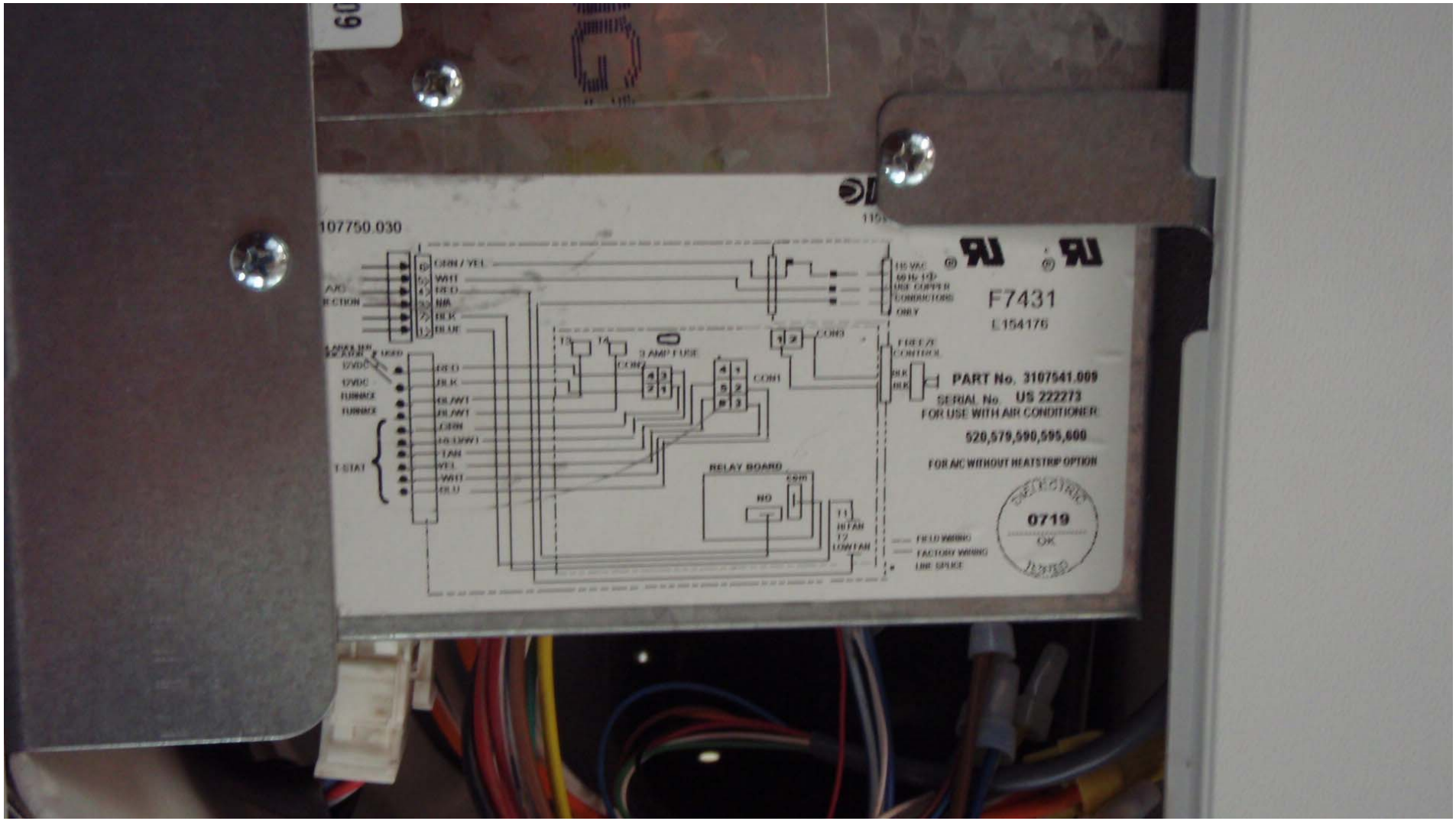
If you are testing out your new boost capacitor, be sure you allow several minutes between startups of your A/C. This ensures that pressures within the A/C system equalize and the compressor motor will start *much* easier. If it's particulary hot out, the A/C system will have very high pressure on one side of the system after shutdown. You may have to wait as long as 5 minutes before cycling the A/C.

Before touching any of the wiring connected to startup or motor run capacitors, you should discharge them. Capacitors are electricity storing devices and can provide a nasty shock if it is you that provides the discharge path. You can discharge a capacitor by shorting it's terminals. Some do this by placing a screwdriver blade across the terminals. While this works, you may arc the screwdriver to the terminals, making it difficult to remove the screwdriver. Another way is to use a high-wattage resistor to short the terminals. You can find one of these at your local electronics store.

ModMyRV recommends these parts for this mod:
Supco SPP6 Hard Start Assist PTC Capacitor Combination, Voltage (VAC) 90 - 277




COMPRESSOR
MOTOR
GRN/YEL
C
R
S
O.L.
REVERSING VALVE
BLK
BLK
– SPLICE CAP
– IN–LINE CONNECTOR
6 PIN CONN
BRN
WHT
YEL
WHT
BLU
BLK
YEL
RED
WHT
1
2
3
4
5
6
FAN
C
HERM
RED
RED
WHT
RUN CAP
WHT
START CAP
PTCR
COMP STARTER
RED
WHT
GRN/YEL
2
3
1
C/O T–STAT
* NOT USED ON SOME MODELS
3106605.011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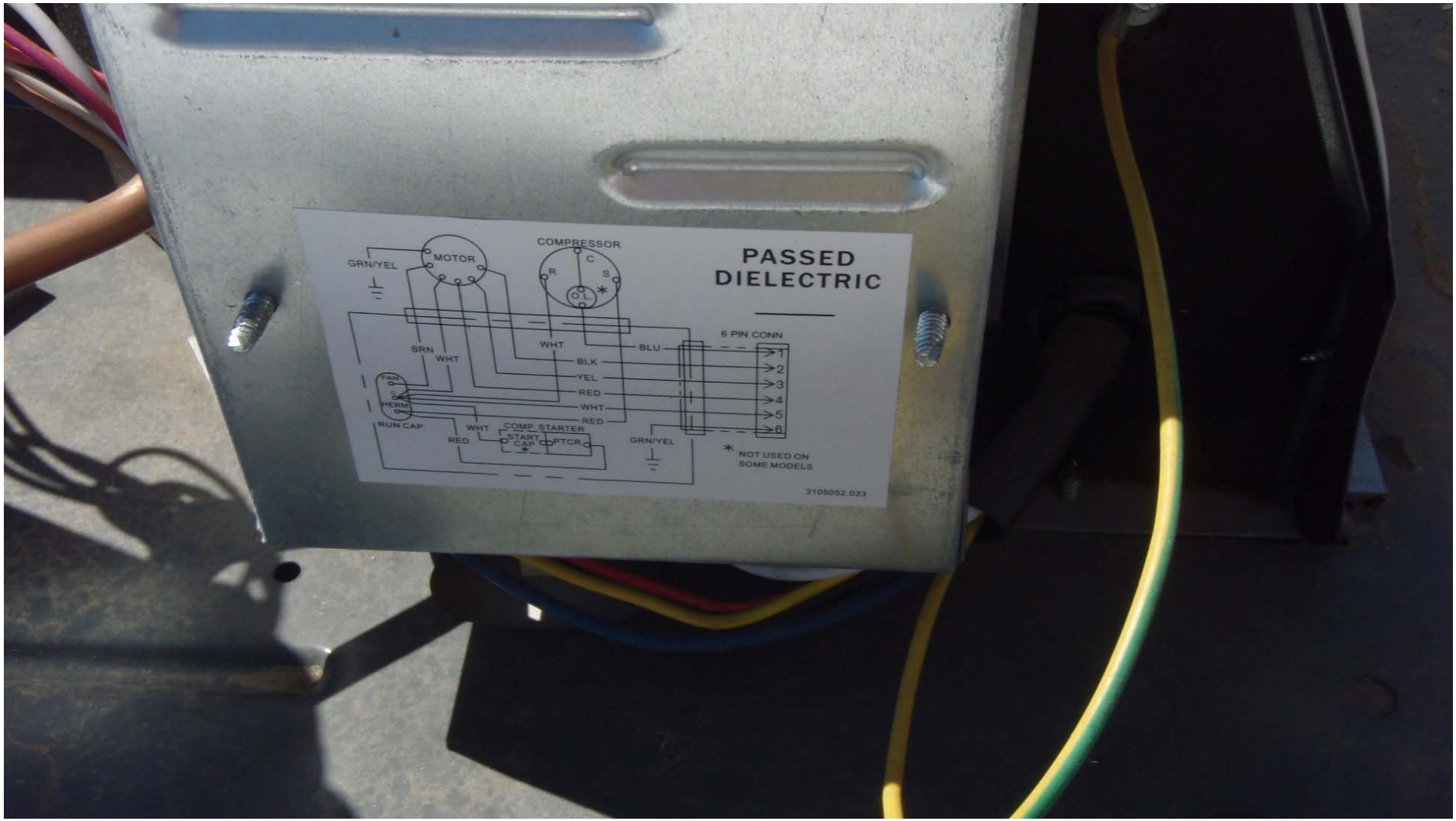
F7431
E154176
PART No. 3107541.009
SERIAL No US 222273
FOR USE WITH AIR CONDITIONER
520,579,590,595,600
FOR A/C WITHOUT HEATSTRIP OPTION
RELAY BOARD
3 AMP FUSE
T-STAT
0719
OK


WARNING
WARNING
DIELECTRIC


PASSED
DIELECTRIC
COMPRESSOR
MOTOR
GRN/YEL
C
R
S
O.L.
6 PIN CONN
BRN
WHT
WHT
BLU
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YEL
RED
WHT
RED
FAN
HERM
RUN CAP
WHT
COMP. STARTER
START CAP
PTCR
RED
GRN/YEL
1
2
3
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* NOT USED ON SOME MODELS
3105052.033


C65
3100248.586
1-11D65T370A45U020
(45+5)uF±5%
E237947
Protected
370VAC
50/60Hz
P2 10000AFC
-40℃TO70℃ NO PCB
MADE IN CHINA
2007.07.02


RICHEY
C65
3100248.5
1-11D65T370A45U0
(45+5)uF±5
E237947
Protected
370VA
50/60
P2 10000A
-40℃TO70℃ NO PC
MADE IN CHINA
2007.07.02


ASSEMBLED IN MEXICO 04-07-05
250V
65 C
50-60Hz