The Unofficial, Use At Your Own Risk, Tesla Home Made Adapter Document

V3.93 – October 8, 2017

NOTE: The information in this document has been moved over to a web site: CarCharging.US. Please visit that site for the most up to date information. The site also has information for other EVs.

Why Make These?

Two reasons. First Tesla only provides a few adapters and there are many more useful electrical power sources available in the world that you might run into. Second, if you use a Tesla adapter (say for a dryer plug), then the receptacle must be within the length of the Tesla mobile adapter cable which is 20 feet. By making your own adapter, you can use readily available 50 amp extension cords to increase length to the receptacle to 50 feet or more.

Third Party Stores

There are companies that make many useful adapters found in this document, which might be an easy option for those who need an adapter in a hurry without much fuss.

EVSEAdapters is at: https://www.evseadapters.com/
CordDepot is at: http://www.corddepot.com/product-category/electric-vehicle-power/electric-vehicle-adapters/

Important

Using most of these adapters will violate NEC electrical codes, since most of them connect a load that could draw 40 amps to a receptacle rated for less than that – which is why it is imperative you dial down the amps setting in the Tesla before charging (see instructions in the specific adapter sections).

Below, when I give power ratings in kW in brackets, I am only using the amount of current you should be drawing from the adapter (80% of max. rating), not the full receptacle rating. So for instance, the typical home charging installation has a NEMA 14-50, 50A 240V receptacle and you can draw 9.6kW from it (240V x 40A = 9,600 watts).

Tesla Adapters

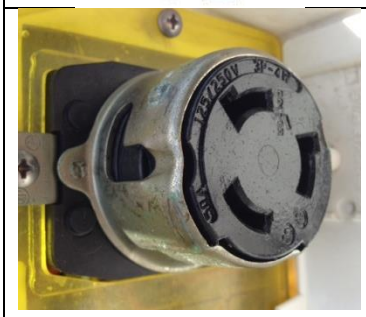
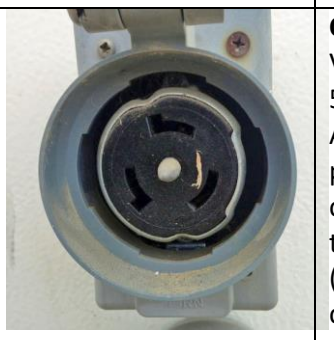
Tesla provides the following adapters with the car:

- NEMA 14-50, a 50A 240V plug (9.6kW)
- NEMA 5-15, 15A, 120V plug (1.4kW) – typical home 120V plug.
- J1772, variable power depending on the charger (Tesla is compatible with most any J1772 charger).

You might be able to buy the following from the Tesla web store or your local Tesla service center (if the web store is out of stock), but be aware than Tesla is sometimes out of stock, sometimes for up to two years(!):

- NEMA 14-30, 30A, 240V (5.7kW) - Modern dryer plug
- NEMA 10-30, 30A, 240V (5.7kW) - Older house dryer plug
- NEMA 5-20, 20A, 120V (1.9kW) – A 20A “household” plug
- NEMA 6-50, 40A, 240V (9.6kW) – Welder plug
- CHAdeMO (DC, up to 50 kW) – One type of public DC fast charging standard

Receptacle Identification

	**NEMA 5-15** Regular household, 120V at 15A		**NEMA 5-20** The horizontal slot in the left slot indicates this can do 20A at 120V, which is 33% more charging capacity than the regular household plug if you use the right adapter.
	**NEMA 14-50** 50A at 240V, this is the standard receptacle recommended for Tesla charging with the UMC. You'll also find them at RV campgrounds where they'll be referred to as "50A connections".		**NEMA 14-30** The blade opposite the round ground is L shaped. 30A at 240V. This is the receptacle modern houses use for dryers.
	**NEMA 14-60** Farm equipment, misc. industrial use. Not very common. 60A at 240V.		**NEMA 10-30** L shaped neutral and two angled blades. 30A at 240V. This is what older houses use for dryers. No ground.
	**NEMA 10-50** Straight shaped neutral and two angled blades. 50A at 240V. Used for older style ranges and welders. No ground.		**TT-30** You'll find these at RV campgrounds, and are commonly referred to as "30A connections". While these are 30A, they are only 120V.
	**NEMA SS2-50** Often used for marine ship to shore power, 50A at 240V.		**CS6365** Very similar to the NEMA SS2-50, but has a spike in the middle. Also called "California style" plugs. These are locking connectors often used for temporary or venue power (large outdoor events) and construction job sites. 50A at 240V.

	**NEMA 6-15** Heavy duty table saw, other misc. equipment. 15A at 240V.		**NEMA 6-20** Often used for motel air conditioners. 20A at 240V.
	**NEMA 6-30** Often used for motel air conditioners. 30A at 240V.		**NEMA 6-50** Often used for arc welders. 50A at 240V.
	**Marine 30A** Used for ship to shore power. Plug compatible with a NEMA L5-30. Locking plug, delivers 30A at 120V.		**NEMA L14-30** Locking plug often used on generators. 30A at 240V.

Home Made Adapters

This document describes home made adapters based on the NEMA 14-50 plug/receptacle. For all these home made adapters, you buy a NEMA 14-50 receptacle, wire the receptacle to whatever type of plug you want and then you use the plug/receptacle/wire combo to plug into the Tesla UMC with the NEMA 14-50 adapter. Looks like this:

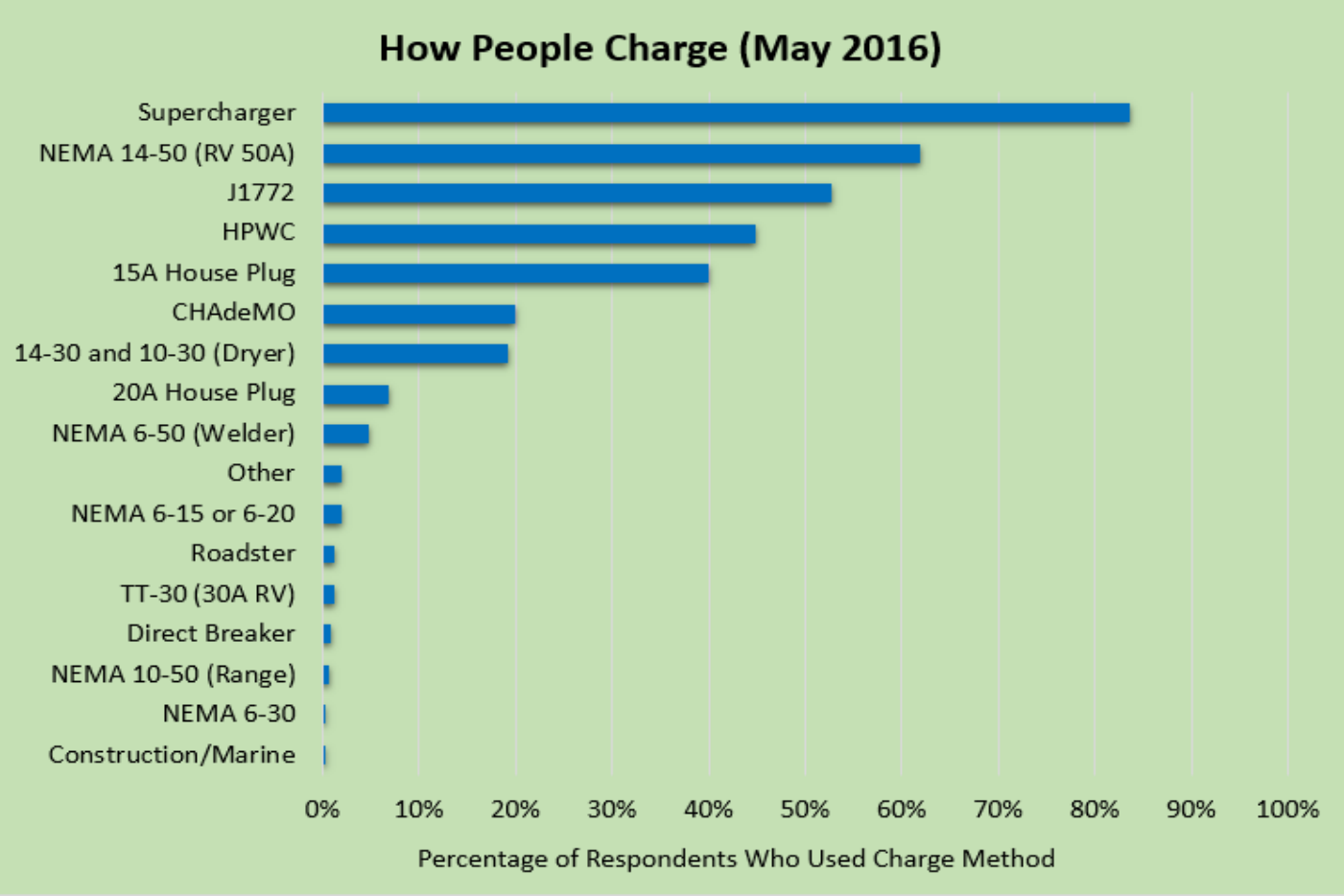
The home made adapter is on the left with the yellow NEMA 14-50 receptacle, wire and yellow adapter plug. The black Tesla NEMA 14-50 adapter and Tesla mobile charger (UMC) are plugged into it.

VERY IMPORTANT: When you do this you are side stepping an important safety feature. With the NEMA 14-50 Tesla adapter, the charger thinks it can draw 40A of current. **MOST** of the home made adapters plug into sockets that deliver **LESS** than 40A. So before you plug everything together, go to your car's charging screen and dial down the amps to the safe level. Failure to do this will result in either a breaker tripping (if you are lucky), or the wiring catching on fire.

ALSO VERY IMPORTANT: These adapters typically should only be used for the Tesla. The problem here is that all these adapters end in a NEMA 14-50 receptacle which is what all modern RVs plug into. If you were to inadvertently use one of these adapters to power your RV, you could very well damage your RV appliances. **DO NOT USE FOR ANYTHING OTHER THAN TESLA CHARGING.**

Survey

In May 2016, I conducted an on-line poll of 317 Tesla owners and asked them what electrical sources they used in the past year. These are the results, with some commentary.



84% of respondents had used a Supercharger, which is a testament to the wide geographic coverage Tesla already has. The J1772 adapter is also heavily used (about 50%) for charging at public chargers.

HPWCs are also often used, by slightly less than half of the respondents, which again shows the reach of Tesla's destination charging program.

Dryer plugs (combined the 10-30 and 14-30) were used by about 20% of all respondents, making them a useful adapter to have.

High speed charging using the CHAdeMO adapter was used by 20% of the respondents.

The household 120V plug was used by a lot of people – about 40% using the Tesla supplied 15A adapter, and 7% of people used the 20A 120V adapter as well.

I personally have adapters for everything on this list (except for the Roadster adapter), mostly because I can't stand the thought of having to compromise a trip when driving my Model S. When I drive to places, I know I can almost guarantee that I can plug into something to charge overnight, and do it at the highest possible charge rate that the place can do.

Dryer Receptacles

These are useful if you are out visiting far away friends or family and want to charge up at their house. There are two types: the older three prong NEMA 10-30, and the newer four prong NEMA 14-30. Both are 240V, 30A, for a de-rated power of 5.7KW, or a bit more than half of what a typical Tesla garage receptacle would give you (the NEMA 14-50). Not bad and will work fine for overnight charging when visiting.

NEMA 14-30

The NEMA 14-30 is easy to make. First, get a NEMA 14-50 receptacle (I bought four of these to make the various adapters below). Here's an amazon link, select the 50A version when adding to cart:

Camco® PowerGrip™ Replacement Receptacle Female
http://www.amazon.com/gp/product/B00192QB9M/ref=oh_details_o04_s02_i00?ie=UTF8&psc=1

And then a NEMA 14-30 plug and cord:

PETRA 90-2028 10-Foot 4-Wire Dryer Cord
http://www.amazon.com/gp/product/B0014KO11O/ref=oh_details_o04_s01_i03?ie=UTF8&psc=1

Making the adapter is straightforward. If you look at the FACE of a NEMA 14-50 RECEPTACLE, the bottom round prong should be connected to ground. The two middle prongs are the two hot 120V connections, each connected to a different phase/leg (for a 240V supply, doesn't matter which hot is which), and the top blade is connected to neutral.

The NEMA 14-30 plug is similar. In this case the round prong is ground, the L shaped one is neutral and the two others are the hots. Use a voltohm meter to determine which wire is which and wire it up. Ground to ground, neutral to neutral and each hot to each hot. You'll have to cut the lugs off the wire if you used the dryer cord from Amazon above, and strip off insulation. For all my adapters, I wound electrical tape around the cord where the NEMA 14-50 receptacle gripped the cord to make sure the strain relief part of the receptacle grabbed the cord tightly. Of course, in actual usage, don't rely on the strain relief and treat these home made adapters with care – you never want a loose wire somewhere as it will heat up and maybe start a fire.

Once you've finished wiring and closed everything up, use the voltohm meter again to test that everything is connected correctly.

When complete, it'll look like this:

As you can see, **I labeled all my adapters with a reminder to set the Tesla car's charging app to maximum 24 amps when using this adapter**. If you have an RV you might also want to label the adapters as **TESLA CHARGING ONLY, NO RV USE.**

NEMA 10-30

This is the one that gives electricians fits because the NEMA 10-30 receptacle has no ground, while the Tesla requires a ground. The NEMA 10-30 has two out of phase 120V hots (for 240V) and a neutral. It turns out that in household wiring, the neutral and ground wires are connected together at the main breaker panel. So the solution is to connect the NEMA 10-30 neutral to the Tesla ground. This will work FOR THIS APPLICATION ONLY. As usual, **never use this adapter for anything else**.

So, as usual, buy a Camco® PowerGrip™ Replacement Receptacle Female
http://www.amazon.com/gp/product/B00192QB9M/ref=oh_details_o04_s02_i00?ie=UTF8&psc=1

And then a NEMA 10-30 plug and cord:

Certified Appliance 90-1024 3-Wire Dryer Cord, 6-Foot, 30A
http://www.amazon.com/Certified-Appliance-90-1024-3-Wire-6-Foot/dp/B00009W3PA

OR

30A 125/250V Dryer Cord [40105]
http://www.cordtec.com/products.asp?id=439

If you look at the FACE of a NEMA 14-50 RECEPTACLE, the bottom round prong should be connected to ground. The two middle prongs are the two hot 120V connections, each connected to a different phase/leg (for a 240V supply, doesn't matter which hot is which), and the top blade is connected to neutral.

The NEMA 10-30 plug has an L shaped neutral prong and two flat blade 120V hot blades. Connect the NEMA 10-30 L shaped neutral prong to the NEMA 14-50 round ground prong. Connect each NEMA 10-30 hot to a different NEMA 14-50 hot. Leave the NEMA 14-50 neutral UNCONNECTED.

You'll have to cut the lugs off the wire if you used the dryer cord from Amazon above, and strip off insulation. For all my adapters, I wound electrical tape around the cord where the NEMA 14-50 receptacle gripped the cord to make sure the strain relief part of the receptacle grabbed the cord tightly. Of course, in actual usage, don't rely on the strain relief and treat these home made adapters with care – you never want a loose wire somewhere as it will heat up and maybe start a fire.

Once you've finished wiring and closed everything up, use the voltohm meter again to test that everything is connected correctly.

When complete, it'll look like this:

As you can see, **I labeled all my adapters with a reminder to set the Tesla car's charging app to maximum 24 amps when using this adapter**. If you have an RV you might also want to label the adapters as **TESLA CHARGING ONLY, NO RV USE.**

NEMA 10-50

You'll find this receptacle in barns, and older houses, which use them for stoves, among other things. This should be wired just like you would for the NEMA 10-30 plug above. Here's a link to a NEMA 10-50 plug and wire:

Coleman Cable 09014 6/2 and 8/1-Gauge SRDT 50-Amp Range Power Supply Cord, 4-Feet, 3-Wire, 125/250V
http://www.amazon.com/Coleman-Cable-1-Gauge-50-Amp-Supply/dp/B000VU1KC6/ref=sr_1_8?ie=UTF8&qid=1396971555&sr=8-8

If you are handy with a hack saw, you can modify the neutral pin on the NEMA 10-50 plug so that your single adapter would be able to be plugged into BOTH a NEMA 10-30 and a NEMA 10-50 receptacle. The only trick with this, is that you HAVE TO REMEMBER to dial down the amperage in the car to 24 amps when plugging into a NEMA 10-30 receptacle.

Here's what a modified NEMA 10-50 plug looks like.

A ready made modified, universal adapter like this can be bought at EVSEAdapters.com.

You don't need to set the car charging amps to anything different if you use this in a 50A receptacle, as the car will draw 40A since you will be using the Tesla 14-50 adapter.

RV RECEPTACLES

If you find yourself at an RV park in the US, you'll typically find that RVers use one of two different electrical hookups. The "50 AMP" connection is our NEMA 14-50 receptacle, so if your site has one of those, just use the Tesla 14-50 adapter and you're good to go.

The "30 AMP" connection is a unique to the RV world, TT-30. This provides 120V at 30 amps, for a de-rated power of 2.8KW. It will take a while to charge using this (like 6 miles/hour), but if you're stuck at the RV park for a while, it is better than nothing and twice as better as a household plug.

TT-30

Many RV suppliers sell an RV "50 AMP to 30 AMP" adapter cable. **THESE WILL NOT WORK WITH THE TESLA** as they are wired incorrectly for the TESLA. However we can use one of these adapter cables, cut off the NEMA 14-50 end (and throw it out) and make our own Tesla adapter.

So, as usual, buy a Camco® PowerGrip™ Replacement Receptacle Female
http://www.amazon.com/gp/product/B00192QB9M/ref=oh_details_o04_s02_i00?ie=UTF8&psc=1

And then a RV 30 AMP to 50 AMP adapter:

Camco 55185 RV Powergrip 30M/50F Amp 18" Dogbone Electrical Adapter with Handles 125Volts/3750Watts
http://www.amazon.com/gp/product/B000BUQOGI/ref=oh_details_o04_s00_i00?ie=UTF8&psc=1

Cut off the NEMA 14-50 part of the adapter. Carefully strip away the outer insulation trying to not also cut through the inner insulation of one of the wires, to expose the three wires.

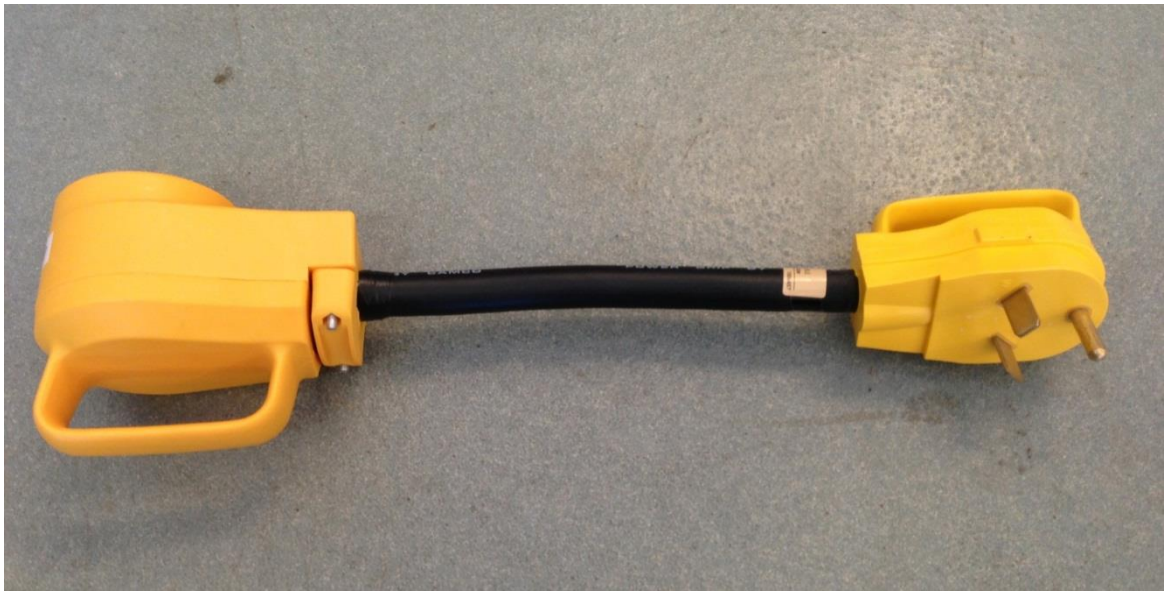
Here's where it gets a bit tricky. If you look at the FACE of a NEMA 14-50 RECEPTACLE, the bottom round prong should be connected to ground. For a 120V supply, Tesla wants the leftmost blade to be connected to the 120V hot, and the rightmost blade to be connected the 120V neutral (note this is opposite to what a typical household receptacle does).

The TT-30 PLUG has a round shaped ground prong. If you place that round ground prong on top, and have the PLUG facing you, the bottom left angled blade is the neutral (sometimes labeled W on the plug), and the bottom right angled blade is the 120V hot.

Connect the TT-30 round ground prong to the NEMA 14-50 round ground prong. Connect the TT-30 hot to the leftmost NEMA 14-50 blade when looking at the front of the NEMA 14-50 receptacle, assuming ground is at the bottom. Connect the TT-30 neutral to the rightmost NEMA 14-50 blade when looking at the front of the NEMA 14-50 receptacle, assuming ground is at the bottom. Leave the NEMA 14-50 neutral UNCONNECTED.

Label it with a reminder to set the Tesla car's charging app to maximum 24 amps. If you have an RV you might also want to label the adapters as **TESLA CHARGING ONLY, NO RV USE.** Actually, this adapter should especially be labeled with that warning as both of these plugs/receptacles ARE used in RV parks and adapters that look just like this (but are wired differently) are used all the time in RV parks.

This is what it'll look like finished.



For Earlier Model S: 20A Maximum for 120V supplies

If you have a 2013 or earlier build of a Tesla Model S, the maximum current the car draws is 20A on a 120V supply, even if you set it for 24A. Teslas built from about 2014 onwards do not have this limitation and can charge at 24A or higher at 120V.

Combining 120V supplies for 240V

There is a way to double your charge rate when you have 120V supplies (either through TT-30s or regular household 120V plugs). If you can find two receptacles that are fed from the two different 120V legs of the breaker box, then you could combine the 120V hots to make a 240V output at whatever amperage rating is for the plug (de-rated 24A for TT-30 and 12A for 5-15 and 16A for 5-20). This would double your charge rate for 120V sources.

HOWEVER, making such an adapter is NOT straightforward and REQUIRES the use of relays for shock safety. You might think it would just be a matter of connecting hots from each plug into a receptacle, BUT THIS WILL RESULT IN AN IMMEDIATE SHOCK HAZARD WHEN CONNECTED TO A TESLA VEHICLE. The Tesla UMC will complete a circuit and when you go to unplug one of the two 120V plugs from the wall, the PLUG will have 120V on it from the other plug that is still plugged into the wall. Obviously PLUGS should never have electricity on them unless safely plugged into a receptacle, so this is a major safety hazard.

This thread discusses a safe circuit to build to make such an adapter, but I won't be discussing it in this document since such a project requires much more sophistication than these simple adapters.

https://teslamotorsclub.com/tmc/threads/generating-220v-from-110v-on-the-go-or-in-a-host-garage-overnight.14460/

Companies exist that sell products to do this (for household plugs), search for Quick 220 and the like.

NEMA 6-50

Tesla is no longer selling a NEMA 6-50 adapter. If you want to use a 6-50 receptacle with your UMC, your only choice is to build an adapter yourself, or buy one from here: http://www.corddepot.com/shop/ev-products/

The 6-50 is a three wire plug – two hots and one ground. The 14-50 has these plus a neutral, which allows the 14-50 to deliver both 120V and 240V, while the 6-50 can only deliver 240V.

To make an adapter going from a 6-50 male plug to a 14-50 female receptacle, you have to leave off the 14-50 neutral connection in the adapter. This will work **ONLY FOR TESLA CHARGING** since the Tesla 14-50 adapter ignores the neutral. But please mark this adapter as to be only used for Tesla charging as other 14-50 devices (such as RVs) will not work with this adapter.

There is no good pigtail or molded plug assembly that I could find for the 6-50, only relatively expensive 25' 6-50 extension cords. So the most efficient way to make an adapter is to go to your local home improvement store and buy a NEMA 6-50 plug. Here's one from Amazon that you can also buy at Home Depot:

http://www.amazon.com/Cooper-Wiring-S42-SP-L-Commercial-6-50-NEMA/dp/B000VL6X22/ref=sr_1_1?ie=UTF8&qid=1398320988&sr=8-1

While at Home Depot, buy a short length (like three feet) of SOOW 6/3 wire (or any 3 connector cable rated for 50A). Then buy a NEMA 14-50 receptacle, like this one:

http://www.amazon.com/gp/product/B00192QB9M/ref=oh_details_o04_s02_i00?ie=UTF8&psc=1

Wire the ground of the 6-50 (round pin) to the ground of the 14-50 (round socket). Wire each of the two 6-50 hots to each of the 14-50 hots (doesn't matter which 6-50 hot goes to which 14-50 hot). On the 14-50, if the round ground is oriented up or down, the hots are the two blades in the middle. Leave the last 14-50 blade, the neutral, which is opposite of the round ground, unconnected. Mark FOR TESLA CHARGING ONLY.

Some words about 6-50 adapter alternatives:

Some people have been using a 6-50 receptacle in their garage to charge their cars using the UMC. In the event your 6-50 adapter breaks, the most straightforward thing to do would be to make a 6-50 to 14-50 adapter as outlined above, and then use the Tesla 14-50 adapter.

Another alternative is to purchase a HPWC, and direct wire it (or via a 6-50 plug and pigtail) to the 6-50 in the garage. This HPWC has dip switches that can be set to tell it that you have a 40A supply. The HPWC only needs the three wires that the 6-50 has. Using a HPWC has the advantage of freeing up your UMC to be left in your car, so you'll never forget it, and the HPWC is a more robust EVSE than the UMC and adapter combination.

DO NOT do a quick and dirty conversion of the 6-50 receptacle into a 14-50 receptacle UNLESS you pull another wire for the 14-50 neutral connection. Some people may think to hook the 6-50 ground to the 14-50 neutral, or to not hook the 14-50 neutral at all. Both hacks have problems. A 14-50 receptacle is a common RV shore power plug, and if an RV were to plug into such a receptacle that didn't have a neutral connected, it could cause damage to the RV's appliances. Conversely, if you connected the ground to the neutral, your bare ground wire could be carrying current, which is not safe. You may know the receptacle is not properly wired, but you may sell the house, get hit by a bus, whatever, and someone else may try to use the 14-50 receptacle and get a nasty surprise.

Marine and Temporary Power

If you take a long trip to your or a friend's boat dock, this will come in useful. Many marinas have these 50A 240V receptacles for ship to shore power. The plug is a NEMA SS2-50. The interesting thing about this plug is that it is almost identical to the plug used for large venue temporary power. I've been to outdoor events where these plugs are literally all over the place. The temporary power plug is the CS6365 also known as a California Style plug. The only difference between it and the NEMA SS2-50 is the addition of a center pin.

It turns out that a company makes a ready made adapter that will plug into EITHER the NEMA SS2-50 or a CS6365 and adapts it to a NEMA 14-50. How's that for convenient? Here's the link:

http://www.amazon.com/dp/B00BHGY95S

Note if you are planning on charging at a marina, check to see what kind of receptacles they have ahead of time. Like RV camp sites, a given marina might only have 30A connections instead of the bigger 50A connections. The 30A connection could be a TT-30 (see RV section for adapter) or a 30A 120V twist lock (adapter left as an exercise for the reader, but available for purchase here: http://www.corddepot.com/shop/power-adapter/l5-30p-14-50r-ev-adapter-cord/).

BTW, the 50A adapter is a big adapter – these are beefy plugs.

No labels are needed as this adapter connects the same voltage and amp rating.

NEMA 5-20

OK, now we are getting to plugs that are less likely to be used, but what the heck, you've gone this far! Actually, I was up skiing recently and I noticed that the parking garage had one of these NEMA 5-20 plugs (and I've seen them in newer rental condos), so these do come in handy, especially in garages when there is nothing else available.

The typical household plug is a NEMA 5-15 that is rated for 120V at 15A. The NEMA 5-20 is slightly different. It is rated for 120V at 20A and looks like this:

Notice the horizontal notch on the leftmost blade. So instead of being able to draw a de-rated 12A, this plug would enable you to draw a de-rated 16A. You actually get more than the 33% charge increase you'd think you would get since the car uses some power for the computer, so you actually get a 43% boost in charging capacity with this plug. Instead of a most likely 3 miles/hour charge, you'd get 4 or 5 miles/hour.

Tesla now sells an adapter for the 5-20, so you don't need to build your own. I'll leave the instructions in this document in case you do want to build your own adapter to take advantage of using a 50A extension cord. I've used my Tesla 5-20 adapter several times now in rented condos – I highly recommend purchasing the Tesla 5-20 adapter.

As usual, buy a Camco® PowerGrip™ Replacement Receptacle Female
http://www.amazon.com/gp/product/B00192QB9M/ref=oh_details_o04_s02_i00?ie=UTF8&psc=1

And then a NEMA 5-20 adapter:

Tripp Lite P044-06I 6 inch 12AWG Heavy Duty Power Adapter cord (NEMA-L5-20R to NEMA-5-20P)
http://www.amazon.com/gp/product/B000VHAQ2Y/ref=oh_details_o03_s00_i00?ie=UTF8&psc=1

Again, I just cut off the receptacle end, and just keep the NEMA 5-20 plug end and cord. Carefully strip away the outer insulation trying to not also cut through the inner insulation of one of the wires, to expose the three wires.

If you look at the FACE of a NEMA 14-50 RECEPTACLE, the bottom round prong should be connected to ground. For a 120V supply, Tesla wants the leftmost blade to be connected to the 120V hot, and the rightmost blade to be connected the 120V neutral (note this is opposite to what a typical household receptacle does).

The NEMA 5-20 PLUG has a round shaped ground prong. If you place that round ground prong on BOTTOM facing you, the right horizontal blade is the neutral, and the bottom left vertical blade is the 120V hot.

Connect the NEMA 5-20 round ground prong to the NEMA 14-50 round ground prong. Connect the NEMA 5-20 hot to the leftmost NEMA 14-50 blade when looking at the front of the NEMA 14-50 receptacle, assuming ground is at the bottom. Connect the NEMA 5-20 neutral to the rightmost NEMA 14-50 blade when looking at the front of the NEMA 14-50 receptacle, assuming ground is at the bottom. Leave the NEMA 14-50 neutral UNCONNECTED.

This is what it'll look like finished. Label it with a reminder to set the Tesla car's charging app to maximum 16 amps. If you have an RV you might also want to label the adapters as **TESLA CHARGING ONLY, NO RV USE.**

That second pigtail is a NEMA 5-20 to NEMA 5-15 adapter. Sometimes in homes, you have plugs that are connected to 20A breakers, have 20A wiring, but the electrician put in a 15A plug. In theory, you could use that pigtail to draw 16A from such a plug, but now you are pushing it since the wall socket isn't rated for 16A. If you want this last pigtail, you can get it here:

Conntek 1F515520 1-Foot 15-Amp to 20-Amp Power Adapter Cord NEMA 5-15P to 5-15/20R 1F515520
http://www.amazon.com/gp/product/B00439KIF6/ref=oh_details_o04_s01_i00?ie=UTF8&psc=1

Motel Air Conditioners

Some motels have plug in air conditioners that use a NEMA 6-20 plug. **This is a 240V, 20A receptacle**. Other people have reported seeing these plugs in condos and garages sometimes. You could charge from this at 16A, for a power of 3.8kW, not bad in a pinch for overnight. I bought a 6' NEMA 6-20 plug to IEC for $17 from Stay On-Line:

http://www.stayonline.com/detail.aspx?id=26629

To make the adapter, I just cut off the IEC female end, strip back the outer cord insulation, being careful to not nick the inner wires. That Stay Online cable had black, white and green wires. I used a voltohm meter to verify the green wire was connected to the ground plug on the 6-20 plug. If you look at the FACE of a NEMA 14-50 RECEPTACLE, the bottom round prong should be connected to ground. The two middle prongs are the two hot 120V connections, each connected to a different phase (for a 240V supply, doesn't matter which hot is which), and the top blade is connected to neutral. So connect the ground wire (green) to the NEMA 14-50 ground, and then the other two wires to either middle blade of the 14-50 receptacle. Leave the neutral unconnected.

For all my adapters, I wound electrical tape around the cord where the NEMA 14-50 receptacle gripped the cord to make sure the strain relief part of the receptacle grabbed the cord tightly. Of course, in actual usage, don't rely on the strain relief and treat these home made adapters with care – you never want a loose wire somewhere as it will heat up and maybe start a fire. Once you've finished wiring and closed everything up, use the voltohm meter again to test that everything is connected correctly.

When complete, it'll look like this:

I labeled this adapter with a reminder to set the Tesla car's charging app to maximum 16 amps. If you have an RV you might also want to label the adapters as **TESLA CHARGING ONLY, NO RV USE.**

NOTE: With the Tesla NEMA 5-20 adapter, you can make a NEMA 6-20 to NEMA 5-20 adapter. The nice thing about this adapter is that you won't have to manually set the charging current down since both the NEMA 5-20 and NEMA 6-20 charge at the same amps (16A). You can use the following parts to make this adapter.

Female 5-20 receptacle:

http://www.amazon.com/gp/product/B004285E6Q/ref=oh_details_o09_s00_i00?ie=UTF8&psc=1

NEMA 6-20 cord:

http://www.amazon.com/Coleman-Cable-9-Feet-Appliance-Conditioning/dp/B000BQU0V2

Just chop off the female receptacle end of the cord and wire it into the NEMA 5-20.

NEMA 14-60

The 14-60 really isn't very common. Having said that, there is an easy way to adapt to it without buying anything at all.

The only difference between the NEMA 14-50 plug that Tesla provides an adapter for, and the NEMA 14-60 is the orientation of the neutral blade. Knowing that the Tesla UMC completely ignores the neutral connection of any adapter, this make for an easy solution: Cut off the neutral blade of your NEMA 14-50 adapter. I did this with my NEMA 14-50 adapter by holding it in a bench vise and using a sawzall with a metal cutting blade. Very quick, and the result is below:

Rather than modifying your Tesla NEMA 14-50 adapter, you could instead modify a 50A NEMA 14-50 extension cord. That would allow you to plug into NEMA 14-60s farther away. However if you do that, you will never be able to use the NEMA 14-50 extension cord as an RV extension cord.

Even though the 14-60 plug can deliver 60A, Tesla's UMC is limited to 40A, so it would draw the equivalent of what it can draw on a regular NEMA 14-50 plug which is 40A.

Note that once you have a modified NEMA 14-xx plug, you can use it in three different NEMA receptacles – a NEMA 14-60, 14-50 and the 14-30, often used for dryers. HOWEVER, remember to dial down the amperage to 24A if you do plug such a modified plug into a NEMA 14-30, since the Tesla NEMA 14-50 adapter will try to draw 40A unless told to draw less. There is no need to restrict amperage settings for the NEMA 14-50 and 14-60 receptacles, of course.

Generator Plug

OK, one last one. This adapter you can just buy, no need to make anything. It connects to a 240V, 30A plug commonly found on generators.

Conntek RV Generator Adapter with 30 Amp 4 Prong Locking Male Plug To RV 50 Amp Female Connector
http://www.amazon.com/gp/product/B003PY5BVG/ref=oh_details_o02_s00_i00?ie=UTF8&psc=1

Looks like this:

Label it to take a maximum of 24A.

NEMA 14-50 Extension Cord

Final thing to have with you, a nice 50A extension cord with NEMA 14-50 ends.

Camco RV 55195 50 Amp 30' Extension Cord with Handle
http://www.amazon.com/gp/product/B0024ECIP0/ref=oh_details_o04_s01_i01?ie=UTF8&psc=1

This rather heavy extension cord comes with its own carrying handle (almost a necessity!).

There is also another 30’ cord which may be less stiff (it is lighter, 20 pounds versus 30 for the one above):

Conntek 15306 RV 50-Amp 30-Feet Extension Cord with Ergo Grip and Power Indicator
http://www.amazon.com/Conntek-15306-30-Feet-Extension-Indicator/dp/B00F17QD9O

Alternatively, you can build your own extension cord. Since the Tesla UMC completely ignores the neutral connection, building your own cord has the advantage that you can build it with three wires instead of four used in the cords above (just connect the two hots and the ground). This will make your extension cord lighter and less unwieldy. To make your own, I would just head to your local home improvement store and buy 6-3 SOOW cord. This is rated for 50A, is supple, and can take a lot of abuse. If you do build such an extension cord, make sure to NEVER USE IT WITH AN RV since it doesn’t have a neutral.

Make Your UMC Longer

Instead of buying a bulky 30’ extension cord, the folks at Quick Charge Power (http://www.quickchargepower.com/) will modify your existing Tesla UMC and give it a 50’ cord instead of the 20’ cord it comes with. They charge $299 + $20 shipping. You ship them your UMC (so I’d probably only do this if I had an extra one!), they modify it, then ship it back. Contact them directly via their website.

J1772 Extension Cord Adapter

This is an interesting adapter. Suppose you need to charge at a public J1772 charger and when you arrive you find the parking spot ICEd or otherwise blocked (ICEing is where a gas powered car decides to park in the EV charging spot you really need to use). Public J1772 chargers typically have a longish cord ending in a J1772 handle/plug which you use in conjunction with your J1772 adapter to plug into your car. If the cord can't reach, here is product that can help you.

You plug the J1772 handle into one side and your UMC with NEMA 14-50 adapter on the other side giving you a nice extension cord from the public charger. You can buy this product for approx. $230 from Modular Ev Power.

J1772 Extension Cord

EVSEAdapters.com also sells a J1772 extension cord, except theirs is actually an extension cord.

A Word About GFCI Receptacles

GFCI receptacles or breakers are often found on garage and outdoor receptacles and sometimes on 240V circuits like NEMA 6-20. They trip if they detect very small currents leaking from the hot wire(s) to ground, aiming to protect humans from shocks in fault situations.

GFCI Receptacle

Note the test and reset buttons.

GFCI Breakers

Note the reset button.

It turns out that the Tesla UMC actually does leak a tiny bit of current to ground when it first starts charging as a test to make sure the ground pin is actually connected to a useful ground. The UMC test leaks a small enough or quick enough current such that it won't trip a properly functioning GFCI. But older and weaker GFCIs have been known to trip right at the start of charging – weak GFCIs can also trip during charging as well.

If this happens to you, replace the GFCI receptacle or breaker, and your charging problems should go away.

A word about Fast DC Chargers (CHAdeMo, etc.)

All the adapters listed in this document are suited to destination or overnight charging. They don't pump enough power into your car to be used during the day while making a trip without having to wait a long time.

High power DC chargers, however, are fast enough to give you anywhere from 135 to 300 miles of charge per hour of charging. This is fast enough to have no compromise long distance trips if you plan your snack/lunch/nature break stops around these charging locations.

Tesla's Superchargers are the fastest, most reliable, and most available (as in not having to wait for a charger to become free) fast DC chargers.

However, there are two other fast DC charger standards: CHAdeMO and SAE Combo (also known as Combined Charging System, or CCS).

As of early 2015, Tesla is shipping a $450 adapter allowing your car to charge from CHAdeMO stations. CHAdeMO will typically charge your car at around 135 miles per hour of charging. You can look for CHAdeMO stations along your route at http://www.plugshare.com. PlugShare has a filter to view only fast DC chargers. Check the PlugShare comments to see how available and reliable the station is, and if you do use the station, return the favor by posting a quick comment back.

Tesla has no adapter nor any announced plans to support CCS, which, as of early 2016, isn't an issue as almost all CCS stations in the US are twinned with a CHAdeMO connector.

Before you use a third party fast charging station be aware that many of them require payment and membership to a charger network. Chargepoint, eVgo and Blink are three common payment networks. Check the comments on PlugShare to see if a payment network is required for the units you might use.

Conclusions

That's it! Hope you find this document useful. Making these adapters was a fun little project for me, and it's nice knowing that when I go out on long trips, I'll have the ability to have a Plan B and a Plan C should I get into a tight spot.

If you find yourself in San Diego, and want to do something different, consider going for a horseback trail ride at my barn: www.willowcreekstables.com – please just reserve ahead of time for the trail ride. And yes, we have a high powered 48A J1772 public charger (11.5 kW) free for anyone to use!