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## Hybrid How-To: CB/CD (4G/5G) Accord Chassis with H22 Engine

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Photography by Chris Felser

### What and Why

The V6 Accord is nice. Your mom appreciates it for its torque and creamy-smooth 240 hp, but some of us still believe Honda's heart beats four cylinders at a time. For those like us, the best Accord, the JDM one with H22 power, was right under our noses. Honda built them in Marysville, Ohio, and shipped them home so fast, we never even noticed. From '94 to '97, U.S. VTEC Accords came with an F22B1 with 145 hp and 147 lb-ft of torque, and non-VTEC cars made due with 130 hp (F22B2). A VTEC Prelude of the same vintage came with the stellar H22 at 190 hp and 158 lb-ft of torque.

Lucky for us, Hasport invites both to the party to create a no-brainer engine swap. A 30-percent increase in horsepower and an 8-percent increase in torque is peachy, especially considering that's with a stock H22. The tuning potential of the H22 makes the idea even more enticing--now we have a sleeper. Brian Gillespie and his team at Hasport used their encyclopedic knowledge of all things Honda to iron out the details of the swap and make us believers.

### Swapping an H22 into an earlier chassis

It's actually easier. An OBD I H22 can be swapped into a '90-to-'93 chassis using all the stock engine mounts. The exhaust system is a direct bolt up (aside from being painfully small) with the Prelude's downpipe and cat. Your original fuel rail will work on the H22, and you also won't need to swap the 6 and 11 pin on the ECU. If your oldie has an automatic, you'll need P/N 60831-SM4-300ZZ to mount the manual transmission. On the plus side, the earlier chassis is about 100 pounds lighter, and if you're picky, you can still get four-wheel discs.

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On the minus side...we're stumped.

### Picking the chassis

Accords are easy to find and relatively cheap; they also don't enjoy the same inflated resale value of Civics. There are enough around to be picky. Just in case your mom actually gives you her slushbox Accord, you're still in luck. Honda sells the right-side engine mount bracket you'll need to install the manual transmission.

To narrow the playing field, steer clear of the V6 bodies, which have a longer nose and larger engine bay with different engine mount locations. Interestingly, these bodies are used in touring car racing where the transmission is configured so the axles pass in front of the engine, making a mid-engine car. Hopefully, somebody will try this out and let us know how it worked.

The Accord EX came with rear disc brakes and bigger front discs, as well as bigger anti-roll bars. Bigger brakes are good. The ABS system is totally separate from the ECU or any part of the wiring we're interested in, so if you start with an ABS car, you'll end up with an ABS car.

The mods to the wiring are substantial enough that finding a VTEC Accord is not going to make things much easier. Suitable model years are '90 to '97 (see sidebar). From '94 to '95, OBD I ruled both the Accord and Prelude. They both changed to OBD II in '96. Substantial changes in electronics accompanied the changeover, including the ECU design and wiring. What does this mean for us? If you have a '94-to-'95 Accord (4G), find a '94 to '95 Prelude for a donor. Likewise, a '96-to-'97(5G) Accord should get a '96-to-'97 Prelude engine and ECU.

### What you need from a Prelude

- Engine/trans and all engine mounts
- ECU
- Engine wiring harness
- Half shafts
- All engine accessory drive brackets, P/S pump, alternator
- Catalytic converter, down pipe and header
- Fuel rail from '97 or newer Prelude
- Radiator hoses, heater hoses
- Throttle cables (for non-cruise control applications)

### Picking the engine

Speaking of Preludes, we're looking for VTEC Preludes, 1994 to 1997. There was also the H23A1, a DOHC non-VTEC engine available in the Prelude Si. In the U.S. market, no limited slip was available for any H22, and the gear ratios remained the same for all the engine/trans combinations we're interested in.

The only H22 to avoid is from the Type SH Prelude. The brilliant torque distribution system (an electronically controlled box of clutches bolted to the block that Honda calls ATTS) replaces the intermediate shaft and its mounting bracket. The engine and transmission code to avoid is H22A4 and M2U4, respectively. Again, when someone actually swaps this in

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functionally, let us know.

As another option, the Accord manual transmission will bolt up and has the same internals, apart from slightly taller gearing. Taller gears may be good if you plan on forced induction. Naturally aspirated, though, assume Honda did its homework matching the H22's power output to the transmission gearing and stick with a Prelude transmission.

As this automotive generation gets left in Japan's junkyards, H22s are becoming more common and cheap through engine importers. If you're able to use one, you can enjoy an extra 5 hp with the JDM ECU (find some good gas) and a limited slip. Not all H22s came with limited slips in Japan, so look through the output splines and search for a tranny you can see all the way through. If there's a cross pin in the way, you'll only spin one tire at a time. H22s that come from Japan may be from Accords or Preludes. It doesn't matter much to us, but note the automatic transmission cars had only 180 hp, so beware if someone tries to give you an engine/ECU without its original transmission.

### Engine removal

As preached in previous Hybrid How-To's, arm yourself with a factory service manual. You'll spend less on it than all the parts you'll probably break if you don't use it. The F22 can be removed from either the top or the bottom, but dropping it from the bottom is easier if you have a lift and engine dolly handy.

The trick is to keep the A/C system intact and in the car (including the compressor) during the swap to avoid having to refill it. With the compressor removed from the engine, string it to the lower radiator support to keep it out of harm's way.

Keep in mind that a lot of pieces are being reused, so time is well spent making sure you have everything unhooked before you move the engine. Removing the radiator will make the engine compartment less cramped, especially if you're working through the top of the engine compartment. Honda radiators have plastic end tanks that won't hold up to a swinging engine. One tap and they're toast.

Our swap victim was a very sleepy-looking '94 LX with a five-speed. Our H22 came complete from HAP Recycling, and it was from a '94 Prelude--perfect. With the two engines sitting side by side, you'll be able to quickly piece together all the right bits.

### Engine Mounts

Getting the H22 bolted in will require cutting, tweaking and general rearrangement of the stock left-side mount, or the purchase of Hasport's part for this swap. The Hasport part is solid aluminum and comes with a polyurethane bushing, which reduces engine movement, but increases vibration compared to stock rubber. The other three mounts are based on original parts. It's a good time to consider the original mounts you're re-installing (hint, buy new mounts). A few decent launches will finish off any old and cracked mounts and it's too easy of a job to pass up while the engine is out. You'll have to use the softer Accord front mount because the stiffer Prelude mount is the wrong height--bummer. Either the Accord or the Prelude rear bracket and mount set (no mixing and matching between

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them) can be used, but the Prelude parts are stiffer and a wiser choice. If your car started as an automatic, you'll need to weld in a manual transmission bracket (Honda P/N 60831-SV4-970ZZ) to the right side frame rail in place of the automatic part. Or just put the project on hold until January 2004, when Hasport produces a mount that will adapt the auto's frame rail bracket to a manual transmission.

## Wiring

To prep the wiring harness, there's enough soldering to kill half your brain cells and plenty of work to stress out the survivors. Hasport also makes one that's plug-and-drive. If you go the easy way, you'll get a modified Accord harness and a separate subharness, which connects the unique VTEC guts to the H22 ECU. To tackle it yourself, get the two engines side by side, add a tasty beverage and get familiar with these mods.

- The oil pressure sender wire, while still using the Accord plug, gets extended 5 inches to reach the H22's sender.
- The electronic air control valve is located near the middle of the fuel rail on the H22 rather than near the throttle position sensor on the F22. To accommodate, the EACV plug and its yellow/black and blue/yellow wires get moved to the center of the injector harness.
- The vehicle speed sensor plug gets moved from the front to the back on the engine, near the O2 sensor plug. Same wires, different location to fit around the H22.
- Because the distributor is closer to the coil on the Accord vs. the H22, the coil, EGR, and fan switch circuits need lengthening. While on the EGR wires, change the connector from the Accord's 3 pin square connector to the Prelude's round one. You can keep the same pins, but swap out the plastic connector.
- The intake air temperature sender is located at the end of the intake manifold on the H22 vs. the middle of it on the F22. Extend its red/yellow and green/white wires to fit.
- If your car didn't come with VTEC, you'll need to add the wiring for the air intake bypass (AIB), knock sensor, VTEC oil pressure sensor and VTEC solenoid. If your car was an EX, you will only need to add the wiring for the IAB and the knock sensor.
- The knock sensor circuit (red/blue), which isn't there on the stock F22, is added at the same break out as the oil pressure sending wire by using the pigtail from the Prelude harness. This wire connects to the subharness and then to ECU pin D3.
- The H22's AIB circuit that opens the short, high-rpm runners in the intake manifold also gets added by tapping the black/yellow wire from the H22's plug to the same color wire that goes to the distributor in the Accord's harness. This simply supplies power to the AIB solenoid. The pink signal wire goes from the AIB solenoid back to the subharness/ECU at pin A17.
- The VTEC oil pressure switch wiring will already exist on Accord EXs, but the rest of us need to add the circuit. The plug from the H22 and its light blue wire gets routed to pin D6 on the ECU. The black/red wire from the switch goes to ground.
- To hook up the VTEC solenoid, connect its green/yellow to pin A4 on the ECU.
- In a futile attempt to throw us off, Honda switched the EGR solenoid valve wire and the O2 sensor heater wire on the ECU's A connector (pins 6 and 11) on the Prelude as compared to the Accord. Swap these two pins in the under-dash connector and thank the engineers for their effort.

## Engine accessories

Getting the engine dressed with the right combination of parts will be easy if you have everything in front of you outside of the car. So resist the temptation to install the engine before you have a game plan of which parts to use. For engine accessories, it's all H22 except for the Accord A/C compressor and compressor bracket. Mixing Prelude and Accord accessories makes either accessory drive belt unusable, but NAPA part number 25-060425 is slightly smaller (42.5 inches, six rib) and works great.

The Accord's high-pressure power steering line will need to be cobbled to fit the H22's pump. Replace a few inches of the Accord's line with a piece you cut from the Prelude's. Remember, this is the high-pressure side of the pump, which can run at about 400 times the pressure of the engine oiling system, so it's not a connection to be made with hose clamps. Brazing or welding required.

### **Drivetrain**

As mentioned previously, the transmissions are similar, so the Accord clutch slave connection and shifter cables fit without modification. Don't you love how Honda makes this easy?

The Prelude half shafts are stronger and should be considered a necessity if you plan to use the extra power. The Accord's inner CV joint has a splined shaft that engages an internally splined section of the half shaft. The Prelude's assembly has a male spline on the half shaft that engages the beefy CV joint casing, a stronger design. Apart from this difference, the sets are dimensionally the same and you'll have no trouble using the Prelude parts in the Accord knuckles and hubs.

### **Exhaust**

The exhaust system is another example of the great planning (or maybe just laziness) of Honda engineers. How many engine swaps are out there where you can use all OEM parts? The Prelude already comes with a nicely made 4-2-1 header. Using the Prelude downpipe and cat, the rest of the exhaust system from a '90 to '93 Accord will bolt up.

Another option for the exhaust system is to use the Prelude SH header, which comes with an adaptor that allows you to use the original ('94 to '97) exhaust system. With either approach, plenty of shops can supply a freer flowing system so the H22's high end isn't snuffed out.

### **Intake**

The Accord throttle body is smaller than the Prelude part, so all that work you just did will be gasping for air right about when the VTEC switches. The Accord's throttle body works fine for regular sedan driving. The H22 will breathe deeper, especially at high revs where the Accord engine never ventured. If you don't need cruise control, you can use the Prelude throttle body and Prelude cables.

Unlike the Accord throttle body's integrated MAP sensor, the Prelude's sensor is mounted on the firewall in a mystery box. Use a MAP from a '90 to '93 Civic DX mounted to the firewall in place of the Prelude mystery box (which has other emissions control functions we don't need). You'll need to extend the MAP connector lead from the engine harness and come up with a piece of vacuum hose to make it all work.

To keep the cruise control, stay with an Accord-like throttle body and cables. No engine swap can be emotionally complete without a hacksaw, drill and file--here's your chance. You'll need a bracket to bolt the Accord's cable support to the H22's intake manifold. Look at the photo to see our masterpiece. A bored-out throttle body will actually be put to good use here, so send the Accord piece off to meet the machinist. To finish it off, you'll probably want something bigger and shinier for the intake tube. If it will fit the Accord, it will fit this hybrid.

If you marked the vacuum system out well before you plucked the F22, you'll know how to connect it to the H22. Use the vacuum system on the H22 as is, but connect the appropriate tubes to the existing ports in the engine bay.

### Fuel system

When you try to hook up the fuel line, you'll notice the Accord's rubber line bolts onto the opposite side of the fuel rail as the Prelude. Fortunately, a '97 or newer Prelude fuel rail will marry the fuel systems. The part number from the dealer is 16610-PT3-A00.

### Cooling

Heater hoses from a '96 Prelude are slightly longer than earlier Prelude or Accord pieces and will fit better. Similarly, Prelude radiator hoses are required to match up the H22. The radiator that came with the Accord will be big enough for the H22 in stock form. The H22A Accord radiator, used in JDM applications, is slightly thicker than the North American five-speed Accord radiator. The thicker radiator was also used in North American automatic transmission cars if you're going for authenticity.

### Bury that tach

The H22 wakes up the Accord in the same way a set of secondaries did to your father's Oldsmobile. There are no annoying vibrations or driveability problems (none were expected, but this is still a full engine/trans swap). The party starts quickly at 5200 rpm (the H22's VTEC engagement rpm) and 45 extra hp transform the Accord into something much more entertaining than the dealer ever sold. With a rev range to 8200 rpm, you can completely bury the tach (which redlines at 6200 on our '94) and watch your back seat drivers duck for cover. Isn't this what engine swaps are all about?

### Swap Basics

#### •Chassis

Sure, it used to be your mom's car, but Mom didn't know what she had. Double wishbones up front, lots of links in back and enough room to haul all your friends away from the scene of the crime. All it really needs is a screaming VTEC soul. It wasn't a Go-kart from the factory, but the foundation is there. Endless chassis upgrades available for the Accord will help keep the horsepower pulling in the right direction. As one of the best-selling cars in North America since it debuted, you won't have to look far for a project car.

#### •Engine

The H22 is the dream of every B16 owner wheezing through the small end of the tach. OK, the H22 still isn't a torque monster, but with all that

displacement, it can't help but make some. The magic is at the big end, where VTEC flow and big displacement combine for a 45-hp bump more than what your mom had. Of course, being a Honda engine, there are more performance parts than you could fit in an Accord's trunk, and just the suggestion of boost is enough to make an H22 shred tires.

- Concerns

- If you need a CARB-legal swap, find a Prelude donor car of the same generation as your Accord.
- With comparatively fewer VTEC Preludes made, and fewer wrecked, you might have to let your fingers do some walking.
- The H22, at 385 pounds for the engine, trans and axles, will add between 45 and 65 pounds to the nose of the car, depending on what your Accord had to begin with. Unless understeer is your game, you'll want to put the nose on a diet or pick from one of the many suspension options that grace these pages to support the added weight.











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