Hybrid How-To

Hybrid #8: '86-'89 Acura Integra chassis, B16A engine

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Swap Basics

Chassis: 1986-1989 Acura Integra (DA1 or DA3 chassis)

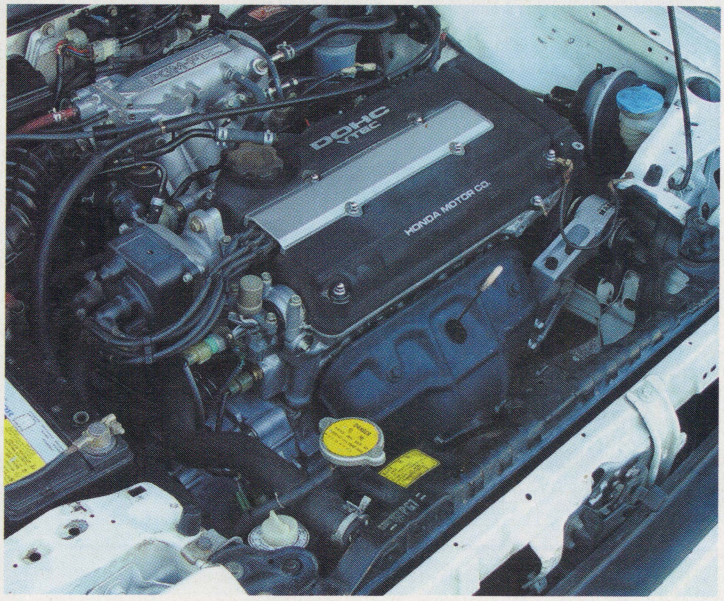
DA1 and DA3 Integras are cheap, simple, and seemingly immune from the Honda fever that keeps older Integras so expensive. Though the chassis is quite basic, with struts and torsion bars up front and a solid beam axle in the back, it still has lively handling.

Engine: Honda B16A

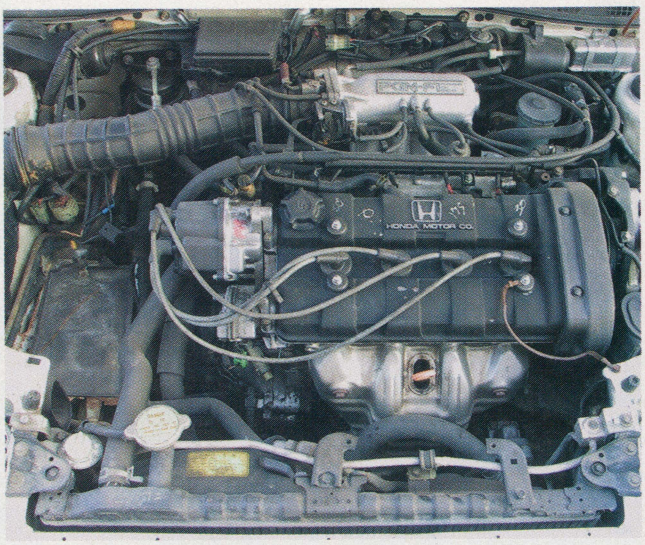
It starts out 42 hp stronger and the tuning options are unlimited. This is the engine.

Concerns:

Power steering won't fit. Air conditioning currently doesn't fit, though Hasport is working on it. Using any B16 other than the '89 to '91 JDM model means more wiring headaches or buying another harness from Hasport.



The B16A (left) is a stronger engine than the Integra's stock D16 (right) and responds better to mods. It's physically larger too, thanks to its larger cylinder bores, and requires some creativity to fit in the early Integra's engine bay.



This dirty, stock D16 will soon be on e-Bay, where it will probably find a new home in an '84-'87 Civic. Aren't Hondas great?

WHAT AND WHY

First-generation Integras aren't commonly hot-rodded. Blame their stock 118-hp, D16 powerplant. This lethargic mill has historically limited what is an otherwise promising vehicle. The first-generation Integra has a tasteful blend of character, good looks, handling, and practicality not found in other Honda/Acura offerings.

OK, let's be honest. The real attraction of first-generation Integras is that they're cheap. Furthermore, they're very common. In fact, Acura has sold more Integras than any other single model in its lineup. Clean, unmolested first-generation Integras in perfect running condition can be found for $2,000 or less. But this swap is not ideally suited for those cars. Durable as their stock D16 engines are, you may be able to find an Integra with a tired engine for a $1,000 or less. Why replace a blown-up stock engine with another stock engine when you can swap in a B16 for not much more cash?

Every Honda enthusiast knows that performance parts abound for the B16. Even stock, the B16's 1.6-liter soundly trounces the D16's 1.6-liter by 42 hp and 23 lb-ft of torque. Plus, the B16 offers an additional 2500 rpm to play with, thanks to the VTEC head, much larger ports, bigger cylinder bores and somewhat higher compression ratio (9.2:1 vs. 9.0:1).

In the end, you'll have a very inexpensive, roomy, practical vehicle with a lot more oomph than it originally came with, and tuning potential to spare.

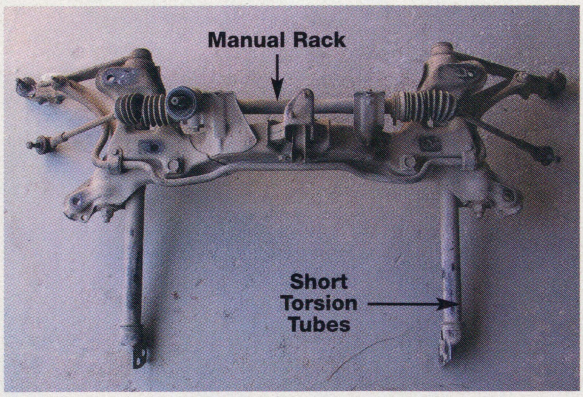
B16A engine, transmission, and harness

Integra ECU-PR3
Intake tube from '90-'91 Integra or XS-I (buy used and save)
'84-'87 Civic front subframe and manual steering rack (optional)
Upper and lower radiator hoses from '92 Integra GS-R (dealer item)
Throttle cable from '92-'93 Integra GS-R (dealer item)
Rear bracket (from engine to transmission) from '99 Civic Si (dealer item)
Hasport shift linkage rods P/N AVBLINK, or do-it-yourself
Hasport B16 engine mount kit P/N AVB1
Hasport sub-harness P/N AVGS-VTEC, or do-it-yourself
Hasport shortened halfshafts P/N AVBAXLES
ECU pin removal tool (dealer item or Hasport)
Gates P/N 040285 accessory drive belt (this is one inch shorter than the stock B16 belt)

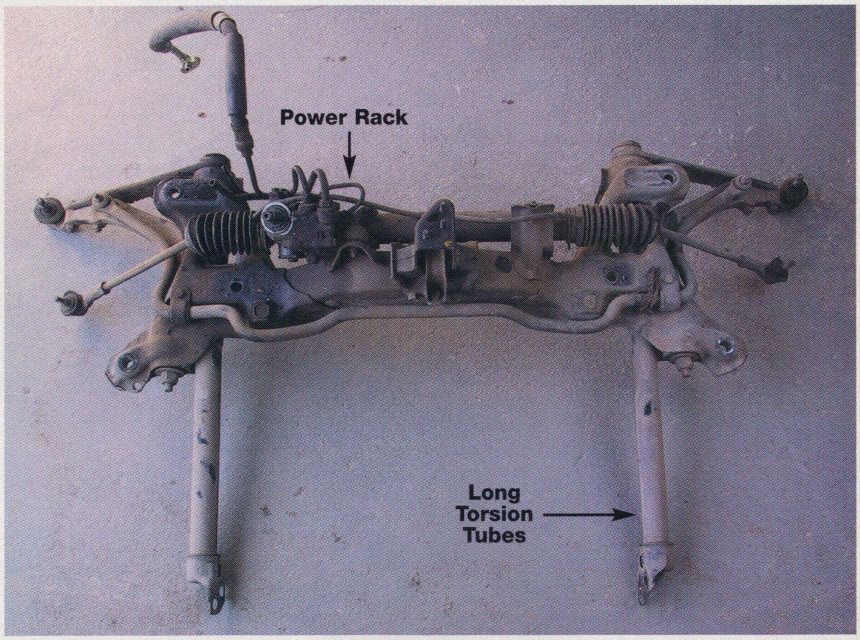
PICKING THE CHASSIS

The first-generation DA1 and DA3 Integra, sold in the U.S. 1986 through 1989, came in two hatchback body styles: a two door (chassis code DA1) and a four door (chassis code DA3). The DA1 has a 96.5-inch wheelbase and weighs 2,326 lbs, while the DA3 has a longer 99.2-inch wheelbase at a slightly porkier 2,390 lbs.

There were two trim levels available in each body style, called RS and LS, and all manual-transmission, first-generation Integras were sold with a non-VTEC 118-hp, 1.6-liter D16 engine. With the exception of the number of doors, the chassis were identical, so take your pick. We performed this swap on an '88 LS four door.



Civic subframe (top) and Integra subframe (bottom). If you want the slower but lighter effort manual steering rack, swap the Integra's longer torsion bars and tubes (arrows) onto the Civic subframe. Otherwise, keep the Integra subframe, drain the power rack, and plug the fittings at the pinion where the hydraulic lines enter the rack.



The driver's side of the inner frame rail, indicated with the cross-hatch pattern, needs a minor attitude adjustment with a hammer so the B16 alternator pulley will have enough clearance. This is pretty typical of B16 swaps in other Hondas.

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PICKING THE ENGINE

The Honda B-series engines that can be used in this swap include the B16A from the Japanese domestic market (JDM) '89-'91 Civic and CRX SiR; the B16A from the JDM '90-'91 Integra XSi and RSi; and the B18A from U.S. '90-'91 Integras. The '92-'93 Japanese and U.S. Integra B16A, B17A, and B18A engines can also be installed, but require electrical adaptations beyond the scope of this swap guide.

In addition to an engine and transmission, you'll need an engine harness and ECU. For this swap, the B16A engine and transmission from a Japanese '91 Integra RSi were purchased from www.jdmcars.com. B16s are very popular and sell quickly from any importer, so be sure to reserve one from the next shipment well in advance of your actual swap date. Be sure your B16 comes with an engine wiring harness as well.

ENGINE REMOVAL AND PREP WORK

For removal of the D16A1, consult Section 5-2 of the factory service manual and follow it word for word. The procedure is very straightforward and the only deviation we recommend is to remove the radiator from the car before removing the engine. You'll be using it with the B16 and will want to avoid punching holes in it.

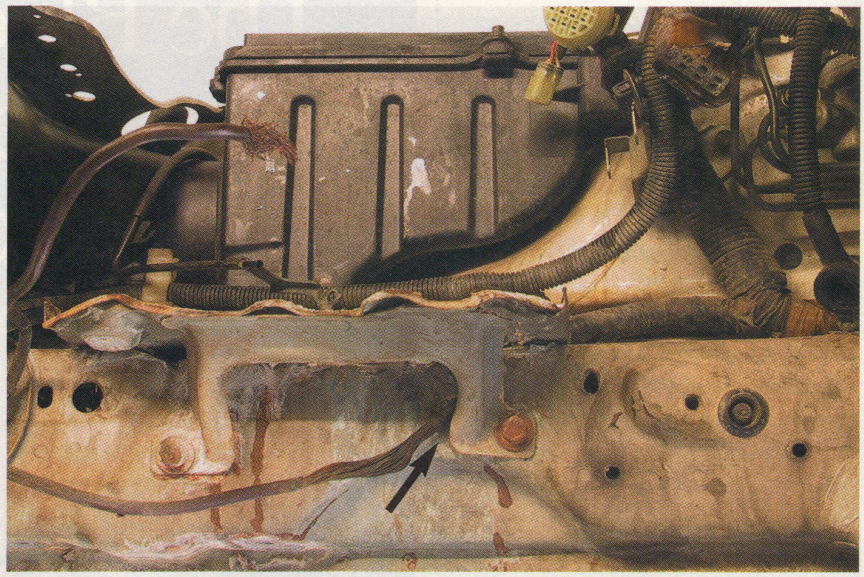
If you tear or otherwise mangle the heater core hoses, replace them. They're re-used with the B16. In fact, just replace them anyway. They're old and crusty, and this is the only time replacing them won't be a pain.

CHASSIS PREP

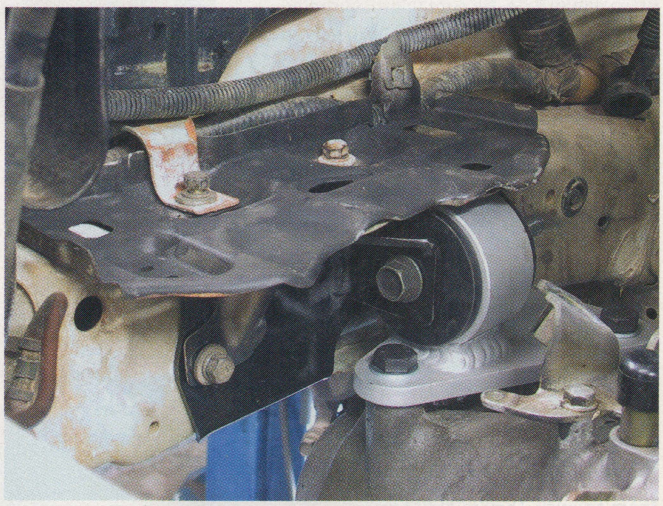
1: Steering

For this swap, you can kiss your power steering goodbye. There isn't enough room in the Integra's engine bay for a B16 and its power steering pump. That's OK, since power steering is for sissies, right?

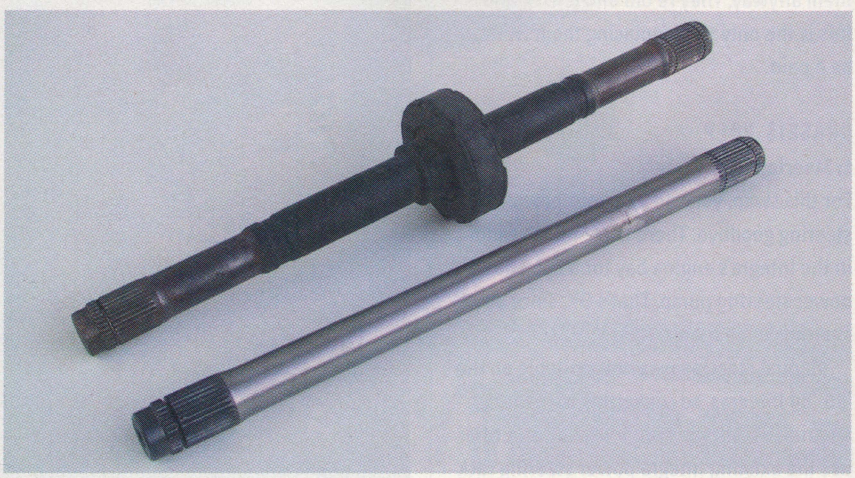
Manual steering was not available on the '86-'89 Integras, so converting to manual steering leaves you with two choices. Either use the existing Integra power steering rack minus the pump or convert to a manual steering rack from a contemporary Civic. The



Unbolt the battery tray and trim off the rear support (arrow). The Hasport transmission mount adapter needs to occupy the same space.



After installing Hasport's engine mount bracket, the amputated battery tray can be reinstalled. When complete, the new engine mount will look like this.



Since the B16 is physically longer than the stock D16, shortened axles are required for packaging. Hasport axles are needed to make the swap. Swap the axles when the engine bay is empty to make your life easier.

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manual steering is a slower ratio, but the converted power steering is higher effort.

If you decide to use the Integra's power rack, be sure to drain all of the fluid out of the rack first. Do this by removing the lines at the rack, turning the steering wheel to both stops and capping off the fittings.

To convert to manual steering, locate a front subframe from an '84-'87 Civic with manual steering. We found ours at Honda Auto Salvage in Phoenix, Ariz. Unbolt the Integra's torsion bars and tubes from the car and retrofit them to the Civic subframe. You cannot use the Civic torsion bars for this swap because they're too short at the ends.

2: Shift Rods

Because the B16's transmission is different than the stock Integra transmission, the two rods of the stock shift linkage must be removed and lengthened. The change rod is lengthened by 0.25 inches, while the compensator rod is lengthened by 0.50 inches. Try your skill with a miter box and welder or you can source pre-lengthened shift linkage rods from Hasport.

3: Frame Rail Modification

The B16's protruding alternator pulley is the bane of a B16 swap, interfering with the driver's-side inner frame rail. Luckily, the frame rail can be gently massaged to provide clearance for it. Half an inch of massaging is plenty.

4: Transmission Mount Bracket

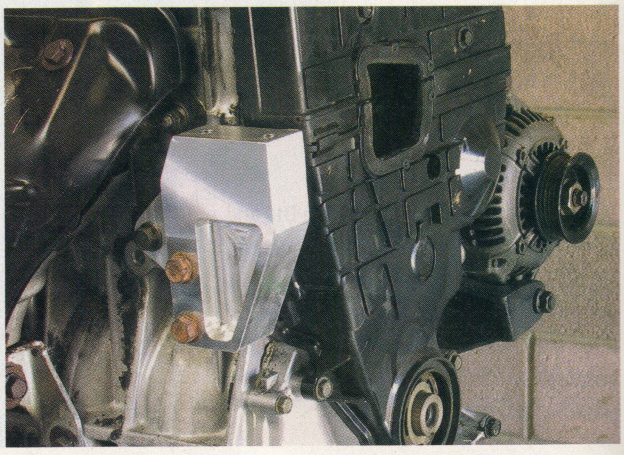
Installation of Hasport's B16-specific engine mount bracket means trimming the Integra's battery tray. The engine mount on the driver's side requires no such molestation and instead uses a Hasport adapter to pick up the stock bracket already located on the chassis.

5: Axles

The B16 is a longer engine than the D16 and, as a result, the stock Integra axles must be made shorter to make everything fit. Luckily, Hasport has shorter axles available. Put the Integra CV joints on the shorter shafts and install them into the steering knuckle prior to installing the B16.

We replaced all the stock engine mounts (like the one on the left) with sexy polyurethane. Without them, there would be a lot of welding in this story.

The stock B16 engine mount under the timing belt cover can be tossed. It is not essential that you plug the remaining hole but it will help keep your timing belt clean and healthy.



Bolt on the new engine mount adapter to the side of the block where the air conditioning compressor bracket would normally go (bottom).

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6: Exhaust

After the swap is done, the B16's exhaust flange will end up slightly towards the front of the car and won't quite reach the rest of the Integra's stock exhaust. To take advantage of the B16's higher-flowing nature, you should toss the stock exhaust while you're doing the chassis prep and fabricate a larger-diameter, high-performance exhaust after the swap is complete.

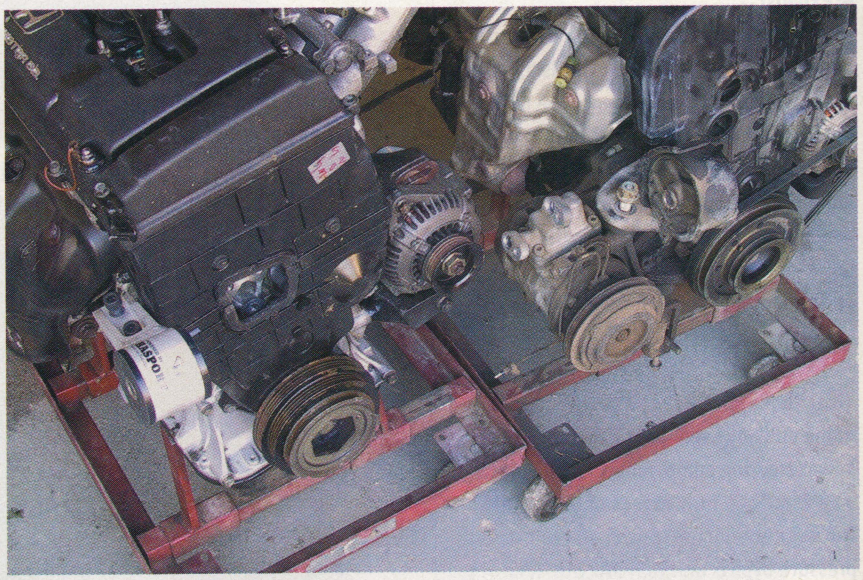
ENGINE PREP

In the unlikely event your B16 came with a power steering pump, remove it and put it on e-Bay. Then turn your attention to the B16's speed-sensitive power steering assist pressure bypass unit (SSPSAPBU). It is located on the top of the transmission and reduces the amount of steering assist as the vehicle speeds up. Just loop the tubes protruding from the bypass unit together with a piece of hose.

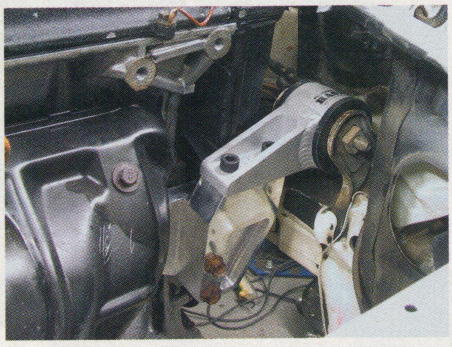
Chances are your B16 didn't come with an A/C compressor, either. This is fine since it's not compatible with this swap anyway. Install the Hasport engine mount adapter on the front side of the block where the

Swapping in the Early Cars ('86-'87)

This swap applies to the '88-'89 Integra LS. Since the '86-'87 Integra used a simpler batch-fire injection strategy, it lacks the electronic sophistication of the later cars. Fortunately, Hasport makes a replacement engine harness specifically for the earlier cars, which includes additional wires for the ignitor signal, memory for the ECU, "Cylinder #1" sensor, electronic air control valve (EACV; for idle air control), and the vehicle speed sensor. You can eliminate the need for the vehicle speed sensor by getting a Z-Dyne ECU instead.

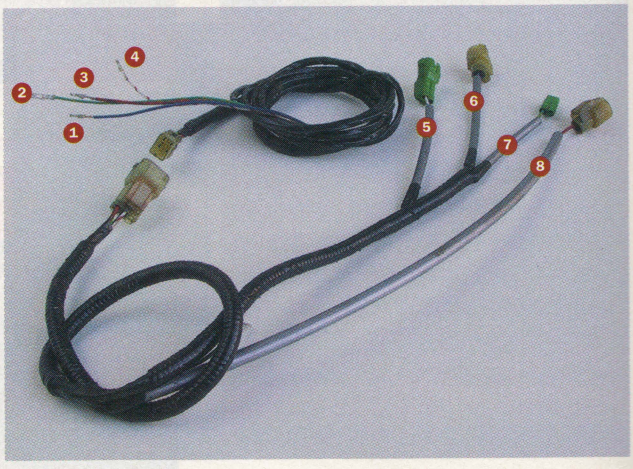


The B16 engine on the left is almost ready to install. The new engine mount and adapter is in place and the old mount is gone. Time for a slightly shorter alternator belt (Gates P/N 040285). This will give us extra clearance in the area of the car's frame that we bashed with a hammer.



The new engine mount bolts into the stock bracket located on the Integra's frame rail.

This is the sub-harness. The unlabeled connector mounts at the shock tower, just like the stock harness does.
#1: In the ECU connector, the blue wire goes to pin B5 for the VTEC oil pressure switch
#2: The green wire with yellow stripe goes to pin A8 for the VTEC solenoid
#3: The red wire with blue stripe goes to pin B19 for the knock sensor
#4: This white wire with red stripe goes to pin C8 for the second oxygen sensor
#5: On the engine side, connect this two-pin green shell to the second oxygen sensor located in the exhaust manifold
#6: Attach this one-pin connector to the VTEC oil pressure sensor
#7: Attach this green one-pin connector to the VTEC solenoid
#8: Attach this connector to the knock sensor



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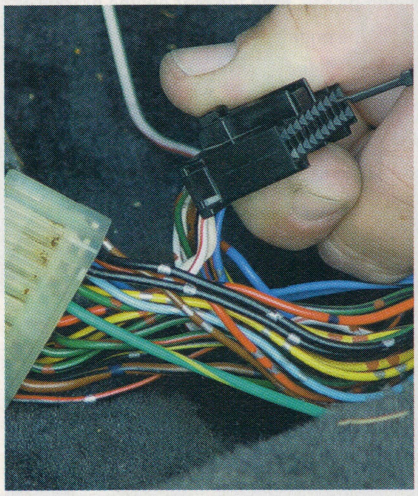
compressor's mounting bracket normally goes. The adapter we used is incompatible with A/C, though Hasport is working on a different mounting arrangement that allows the use of A/C. These revised mounts should be available by the time you read this.

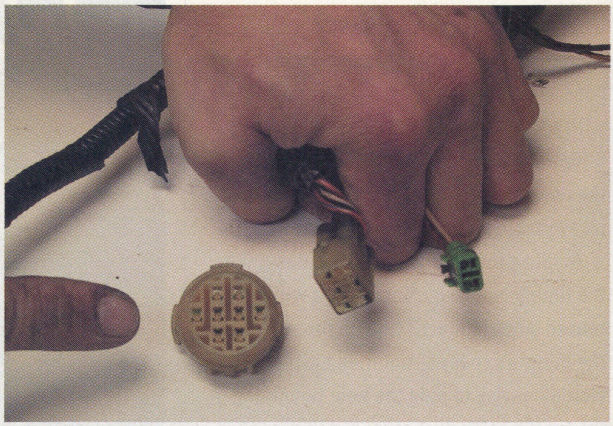
Remove the engine mount located under the timing belt cover. This mount will not be reused since it doesn't line up properly with the Integra's chassis-mounted bracket. It would be wise to plug the hole remaining in the timing belt's dust cover but this isn't essential. Bolt the '99 Civic Si engine mount bracket to the rear of the block and transmission.

You'll also need a sub-harness, which goes between the B16 engine harness and the Integra's chassis harness. Hasport to the rescue again. At the engine end, the sub-harness grabs the B16's knock sensor, VTEC solenoid, VTEC oil pressure sensor, second O_2 sensor, and an engine ground.

The other end of the sub-harness goes through the firewall to the stock Integra ECU connector. It's a lot easier to feed the sub-harness through the firewall when the B16 is still sitting on the garage floor. Disconnect your stock ECU under the passenger seat and give it to your dog to chew on. It won't be used in this swap. The ECU connector has empty pins you'll remove and replace with the ones on the sub-harness. Then snap the Integra ECU into the connector and reinstall.



A pin extractor tool will make swapping wires in the ECU plug much easier. A paperclip will work, but not very well.



The two connectors on the right are on the stock Integra engine harness. The green connector (far right) is for the number one cylinder sensor. With your pin removal tool (or paper clip), de-pin this connector and rewire to the round, eight-pin connector from the B16's engine harness (left). Examining the mating wires at the B16 distributor, match up the new wires like this:
The orange wire from the connector you just de-pinned goes to the blue wire with green stripe.
The white wire from the connector you just de-pinned goes to the green wire with yellow stripe.
Now, de-pin the six-pin connector (middle). All the colors of this connector correspond exactly to those coming from the B16's distributor. Note, however, that there are two white wires. Pay attention here. One of the white wires is slightly thicker. This one is for the igniter. The thinner is for the crank angle sensor. If you mix these wires, you will burn up the igniter.

Modifying the harness is where this swap gets tricky. The Integra's engine harness has two connectors coming off of the distributor: one connector for the TDC sensor, crank angle, number one cylinder sensor and igniter signals; the other a two-pin connector for the coil power and tachometer signal. There's also another connector at the end of the exhaust cam for the number one cylinder sensor. The B16, however, consolidates the three connectors into a single eight-pin connector. Just remove the pins from the B16 engine harness to rescue the round eight-pin connector shell that mates with the distributor.

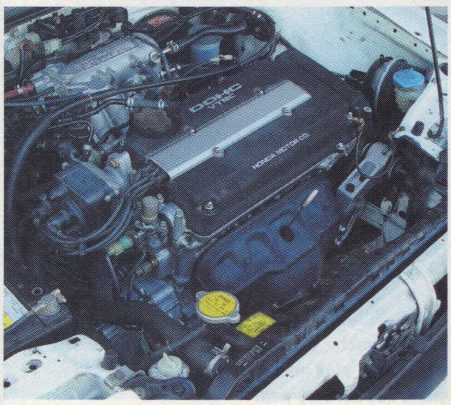
Then, de-pin the six-pin connector and two connectors on the exhaust cam on the D16 harness. Shuffle the appropriate pins from the two connectors on the D16 engine harness into the single, eight-pin B16 connector shell (see photo and caption).

Since the B16's alternator will be a cozy fit against the firewall and inner frame rail, a one-inch shorter accessory drive belt helps pull the alternator away from the chassis.

ENGINE INSTALLATION

The process of bolting in the B16 is no different than that of any other engine. Be careful, as the B16 is a tight fit in the confines of the Integra's engine bay. Feed the rear engine bracket at the transmission into place first. After this is lined up, the engine should drop into position fairly easily. Then, simply reverse the factory removal procedure.

As usual, pay attention to crusty old coolant hoses, fuel lines, vacuum lines and electrical connectors. Replace the upper and lower radiator hoses with those from a '92 Integra GS-R since the D16 hoses won't fit correctly on the B16. The stock throttle cable won't fit correctly either, so retrofit one from a '92-'93 Integra GS-R.



After the engine is bolted down by its mounts and the wiring is in place, the intake snorkus from a '90-'91 Integra XSi or RSi will connect the B16's throttle body to your stock Integra airbox.

Start the engine and away you go. We're pretty happy with our uncommon, common Honda. ■