

Diesel Swaps



Building the Ultimate Trail Rig

BRONCO

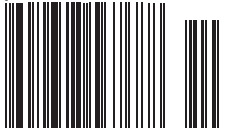
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Jon & Rhonda Barricklow's Diesel Powered
Heavy Horse

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Heavy Horse

BY JON & RHONDA BARRICKLOW, JB CUSTOM FABRICATION, OREGON

“WE THOUGHT IT SOUNDED SIMPLE ENOUGH, BUILD A NEW BRONCO, KEEP IT SIMPLE, NOTHIN’ TOO SHINY, NOTHIN’ TOO FANCY, (SO MUCH FOR THAT)”



Every once in a while, I make the mistake of saying “anything worth doing, is worth over doing”. Sometimes I say it loud enough for some else to hear me. That’s when the trouble starts.

A few years back we picked up a spare Bronco for a future project, we just didn’t know how much rust came with it.

While waiting for inspiration and seeing all the great things that had been done to Broncos to improve their looks and performance, we made a list of all the things that were important to incorporate our new Bronco.

We thought it sounded simple enough, build a new Bronco, keep it simple, nothin’ too shiny, nothin’ too fancy, (so much for that). We knew we would have to start with a Bronco that is in real bad shape, something that was defiled to the point that anything we did would make it better.

The requirements were simple, it had to be different, very different, but must maintain the Classic Bronco lines as much as possible, Exo-cage (removable for body removal / repair, if needed), hard top, heat, glass in the windows, lockable, large axles, extended wheelbase, tires over 37", air, hydraulic winches, selectable lockers, very low geared but still able to run at highway speeds, ample storage for tools. Oh yah, streetable, (IE: licensed and insured).

With all that in mind, and a rusty ‘66 waiting for new lease on life, the late nights in the shop turned to early mornings.

the goods

The first order of business was rust removal and disassembly of the Bronco...not expecting the mess I found. Once done cutting the rust from the body, what was left could be lifted with two hands. My wife asked "How much of the Bronco are you going to use", I could only respond, "The title?"

Now it was time to build! The door hinge plates and striker posts were replaced,



the floor and firewall were rebuilt with 1/8" steel tread plate. The tub and top were shortened 42" to make a cab. To build the rear of the cab we used the original liftgate,



the top and bottom of the tailgate to build the back and new tail light housings that were welded up and shortened to make the cab corners.



After my wife had done her magic on the body, she sprayed it in several coats of Diamont urethane, single stage matte black

on the exterior, and Mid-Valley Linex in Salem. sprayed the interior.

With the cab squared away we started on the frame. The original frame was cut just behind the center body mount, all of the front suspension mounting points were removed and a new back half was fabricat-

ed with 3" x 4" x 3/16" rectangular tube, above the level of the original frame to accommodate the four link suspension and the portal axles.



JON & RHONDA BARRICKLOW JB CUSTOM FABRICATION 1966 BRONCO STATION WAGON

Engine:
1984 Cummins 4BTA
Holset H1C/E hybrid turbocharger w/ 12cm exhaust housing
3200rpm governor spring
POD injectors
VE injection pump w/ re-clocked fuel pin
Charge air cooler from 99' Freightliner MT35
Bendix air compressor
Vickers hydraulic pump for the power steering/winch's output

Transmission:
Ford ZF 5-speed (5.72-2.94-1.26-1-0.67 ratios)

Transfer case:
Stak 3-speed "B type" w/ overdrive, and driveline brake (4.33 - 1 - 0.79 ratios)

Axles:
Mercedes Unimog 404 portal
7.56 gearing
8 lug disc brake conversions from Exaxt axle
Air-actuated lockers made in-house

Wheels / tires:
H1 military surplus steel rims w/ poly inserts
rock rings
Interco IROK 39.5 radials

Suspension:
110" WB

Front:
3-link with panhard bar
Fox 2", 14" coilovers
Fox nitrogen bumpstops
hydraulic ram assist steering

Rear:
4-link double triangulated
Fox 2", 14" coilovers
Fox nitrogen bumpstops
electrically actuated turning brakes

Interior:
Autometer gauges, including electronic speedometer mounted into stock cluster
Beard extra wide suspension seats
Crow 4-point harnesses
Sony CD / Infinity speakers
Cobra CB

Paint:
RM Diamont single stage matte black urethane

Other stuff:
Mile Marker hydraulic winches 10.5k front, 9k rear
Spare driveline
Tuffy security glovebox
Fulltime compressed air (125 psi)
On-board nitrogen tank (for making adjustments to shocks, bumpstops)
Slide-out tool boxes under both seats
20gal Jaz fuel cell

For an engine, we wanted serious low-end grunt. The choice was easy: diesel. The choice of which diesel was easy: Cummins 4BT. The Cummins 4BT is a very simple durable motor, is well supported as it shares many parts with the 6BT motors on the Dodge trucks, and weighs about the same as a big block. The 4BT is plentiful due to its use as a re-power motor in delivery vans such as bread trucks. Starting in the 80's, fleets that had gasoline delivery vans started re-powering their vans with Cummins re-power kits. These kits came set up to drop into the vans with no modifications. If the



van originally had a Ford gasoline motor, the Cummins kit would come set up for a Ford transmission, clutch, throttle cable, power steering, etc. For our application we wanted to use a Ford ZF five speed, so we bought a motor that had a T-19 behind it, and it was a simple bolt-up to the ZF.

After doing a little research and talking to people that know quite a bit about these torquey little motors I realized that there is quite a bit that can be done to them to unlock their potential. Snappy throttle response and 35lbs of boost was obtained



by keeping the 12cm exhaust turbine of the stock H1C turbo and marrying it to compressor housing from an E series turbo. The result was a turbo that was too large to fit in the stock location, so the exhaust manifold had to be flipped upside down, and the turbo has to be run as a "high mount" above the motor. Prince Of Darkness (Lucus) injectors replaced the stock injectors, and a



3200 RPM governor spring replaced the stock 2800 RPM spring. Once the parts were replaced, the fuel pin was re-clocked and injection pump volume was increased up to accommodate the new boost and fuel flow.

The turbo's new home on the top of the motor meant it needed new oil feed and return lines, and the intake manifold to be customized. The air intake and the manifold



were fabricated out of 304 stainless steel.

Air and hydraulic power sources were the next things to tackle. A quick trip to a local truck wrecking yard yielded a Bendix air compressor that would run off of the cam drive of the 4BT, and we had a local hydraulic rebuilder built us a hydraulic pump to our specs that would couple



straight to the air pump and allow us the correct pressure and volume to run the winches and the power steering.

With the motor now done we started the search for a ZF five speed. And we joined in on a mass-buy for a StaK "B box"

three speed transfer case with parking brake.

The axles we chose to use are Mercedes Unimog 404, with 7.56 gearing they would get us down low. We used the



axles at their full width, the front knuckles were rotated four degrees to correct the pinion angle, and electric line-locks were added to each side of the rear axle to use as turning brakes. The upgrade to disc brakes and eight lug hubs allowed us to use H1 HUMMVE wheels without back space modifications. The differential locks in



Unimog axles are designed to be cable operated. With an air source it made sense to use small air rams to actuate to lockers.

Suspension, we chose Fox coil-overs partially because I like the idea of stainless shafts that will not rust or pit. We went with 14" front and rear, valved at 70/30. Air



bump-stops were mounted on both ends with the front set close to the axles to double as sway control (since this thing has the weight bias of a lawn dart).

A double triangulated four-link design was used in the rear and three link with a track bar in the front. We started with a radius arm suspension in the front have



since upgraded. Links are 1026 DOM, lowers are 2.25" x .438, uppers are 1.50" x .250. All have Chromalloy inserts and F&K Bearings' alloy spherical rod ends.

With all of the major components coming together, test fitting body and frame, motor and running gear purchased, it was time to start putting things together permanently. First the motor. Just by their nature being a four cylinder diesel, they can shake. We used the liquid-filled motor mounts



from a P30 van. These come highly recommended for 4BT swaps. The cab and body, including the core support, sits on 3" of lift attached in the original locations with urethane bushings. No part of the body or cab directly contacts the frame or the exo-cage, resulting in a very comfortable level of vibration and road noise.

The exo-cage itself is made from 1.750" X .120 DOM and HREW. It is attached to allow removal of individual sections or the entire thing. Between the down tubes on the front and rear of the exo are



Mile Marker hydraulic winches, 10,500lb front and 9,000 rear, spooled with Masterpull liquid crystal winch rope.

Inside the cab: gauges, tunes, and the common comforts of a normal vehicle were



the next things on the list. We had to have heat so we did a factory heater motor fan swap to increase the airflow. To further enhance the comfort, Beard extra wide sus-



pension seats with Crow 4-point harnesses were installed on custom mounts that contain slide-out toolboxes.

Gauges needed to find a home, the stock abused dash was gutted and the center



section was replaced by a hinged aluminum panel containing all of the fuses, most of the switches, and a few of the less important gauges. The more important gauges were installed on the "O.S." bar that runs along the top of the dash. Wanting to keep the stock gauge cluster, an Autometer electronic speedometer was grafted into the stock cluster to work with the StaK transfer case electronic pulse output.

After approximately \$35k and 1200+hours building this thing, it was now time for the best part: gettin' everything dialed in on the trails. 🚙



MPH / Ratio Calculation Dif. ratio = 7.56

	low (4.33)					med (1.0)					high (0.79)				
Ford ZF 5-speed transmission gear	first 5.72	second 2.94	third 1.26	fourth 1	fifth .76	first 5.72	second 2.94	third 1.26	fourth 1	fifth .76	first 5.72	second 2.94	third 1.26	fourth 1	fifth .76
RPM 900	0.56 MPH	1.09	2.56	3.23	4.25	2.44	4.76	11.1	13.9	18.41	3.09	6.02	14	17.7	23.3
1000	0.62 MPH	1.22	2.85	3.59	4.72	2.71	5.28	12.3	15.5	20.4	3.44	6.69	15.6	19.6	25.8
2000	1.25 MPH	2.44	5.7	7.18	9.45	5.43	10.5	24.6	31.1	40.9	6.88	13.3	31.2	39.3	51.9
2800	1.75 MPH	3.42	7.98	10	13.2	7.6	14.8	35.5	43.5	57.2	9.63	18.7	43.7	55.1	72.5
3200	2 MPH	3.9	9.12	11.4	15.12	8.69	16.92	39.49	49.7	65.4	11	21.4	49.9	62.9	82.8
Ratio	187.24	96.24	41.24	32.73	24.87	43.24	22.22	9.52	7.56	5.74	34.16	17.55	7.52	5.97	4.53





