Twice The Fun

If one transfer case with proper gearing is a must, then two must be heaven.

By Brian C. Brennan
Photography by the author

With few exceptions, proper gearing, followed by good traction and ample low-end torque, is the magic formula for conquering the vast majority of off-road obstacles. Much has been written about all three, but this article will deal with gearing in a unique way: a dual transfer case to double your pleasure.

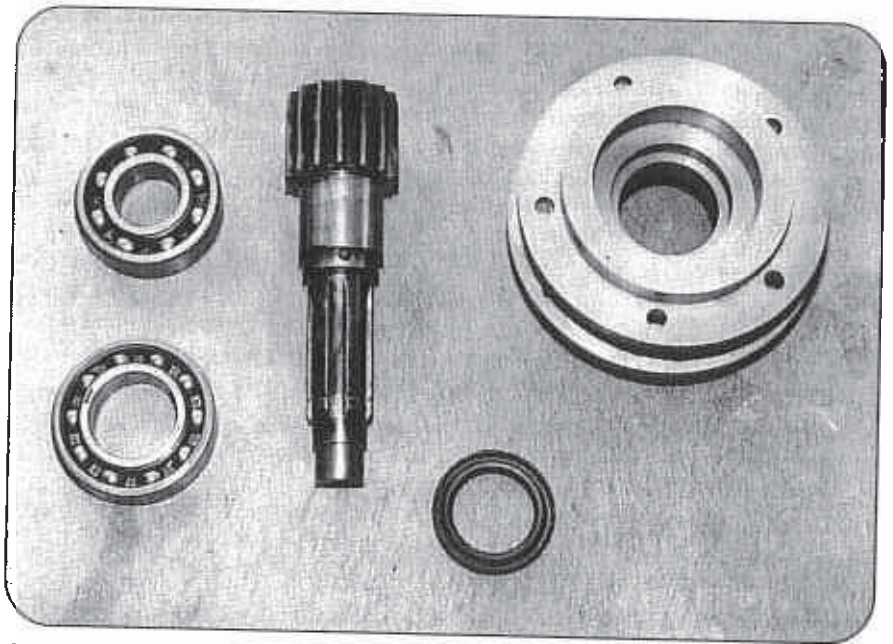
Cold Duck Engineering of Fresno, Calif., offers a conversion that will let you take the single Dana 20 transfer case that you have and mate it to a second Dana 20. (Dana 20 2-speed transfer cases were used from 1966-77 on the vintage early Bronco, with a slight change in the shift mechanism on units made after Nov. 1, 1974.) What's the advantage? Gear reduction of 6.05!

For instance, my Bronco is undergoing a 5.0-liter swap with a Ford AOD. The transfer case is a Bronco Dana 20 2-speed with 2.46:1 and 1.0:1 ratios. (Checking old press kits that I have saved over the years I have also come up with a Dana 20 2-speed from '77 with 2.34:1 and 1.0:1 ratios.) If you have the stock 3-speed manual, your first gear is 2.99:1, while the factory automatic, '73-up is 2.46:1.

Take my AOD with an Art Carr low gearset. I now have a jump from 2.40 to 2.84 in First with 4.56:1 differential gears. Knowing these numbers, my first gear "crawl" ratio will be 2.84 x 5.75 x 4.56 = 74.46. Without the second transfer case, my numbers would be 2.84 x 2.46 x 4.56 = 31.86; good, but a significant drop, and a world of performance difference from what can be.



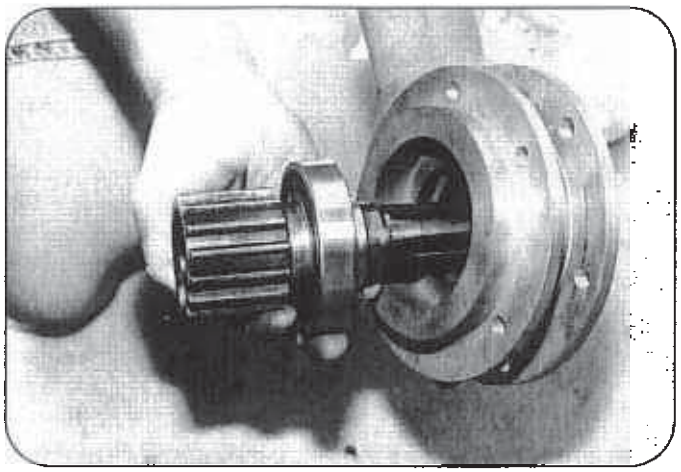
J.R. Coots has his '73 Bronco set up with a C-4 automatic, 4.88 gears and dual Dana 20s. His first gear crawl ratio is 2.46 x 6.05 x 4.88 = 72.62, compared to a "stock" crawl ratio of 29.53—still respectable, but not the cliff-climbing potential offered by the dual transfer cases.



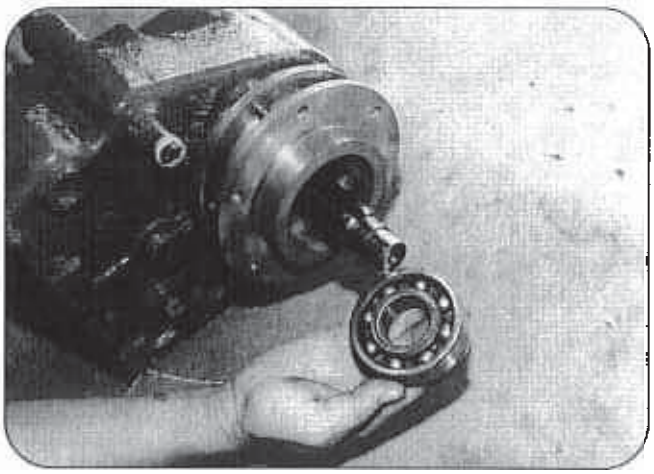
The basic Cold Duck Engineering kit comes with a pair of roller bearings, input/output shaft, adapter seal and the adapter. All that's missing is the hardware and 11 Grade 8 studs with nuts and instruction booklet.

The other obvious benefit to this mondo gearing makes itself known to those without overdrive by running a believable street gear such as 4.11s. Their 4x4 will still perform admirably off-road, yet manage highway speeds without sending the pistons though the cylinder heads.

Ron Coates of Cold Duck explained numerous scenarios that turn your basic rock-crawler into a serious mountain goat. The Holy Grail Project, as it is referred to, comes in one of two kit



One of the roller bearings fits over the input/output shaft and rides on the inside edge of the adapter ring.



A second roller bearing fits over the snout of the input/output shaft, providing support at both ends for the shaft.

forms. The base kit is made up of the adapter (made from steel, not aluminum, to enhance the inherent strength) and seal, roller bearing set, seals, one input/output shaft and hardware consisting of 11 Grade 8 studs with nuts. The input/output shaft, adapter with seal and two roller bearings come as an assembled unit. The deluxe kit includes all pieces contained in the basic kit plus a second transfer case with all the machine work performed, and includes input and rear output gears, intermediate gearset and inspection cover. (You will use your stock case input shaft.) Since shifting your second T-case becomes a concern, Cold Duck does offer an optional ram air kit, requiring 150 psi to operate, with a cab-mounted pushbutton.

Should you opt for the second T-case, be forewarned that the project will require you to shorten the rear driveshaft and lengthen the front, both relatively simple and inexpensive projects. There is some cutting and welding as well as fabricating of secondary shift linkage required. That's why the ram air shifter kit is such a good idea. As for the Bronco itself, it is recommended that you have at least an inch body lift. This eliminates any tunnel modifications that would otherwise have to be performed. You will also need to notch the rear crossmember to allow clearance for the shift rail on the modified case. According to Cold Duck, "Start small and work your way up in size."

If you round up your own second Dana 20, you will have to prep it before starting the assembly process. The disassembly will require that you remove the front output portion of the case. After disassembly, the next decision is where to cut the case to remove the front output gears. Remember, this second case will hang upside down, approximately 150 degrees out of phase, in reference to its "normal" position under the Bronco, and where you make this cut will give you the benefit of gaining some additional room.

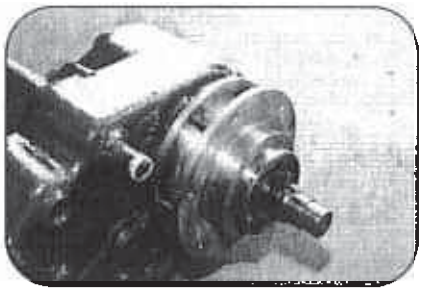
The cut should be as close to a right angle from the inspection cover as possible. According to Cold Duck, there are two important points of concern: "1, make sure the remaining opening in the inspection cover will be large enough to install the gears after case is cut and capped, and, 2, make sure the cut is as square as possible."

Since the case is made from cast metal, the welding should be done by a certified welder.

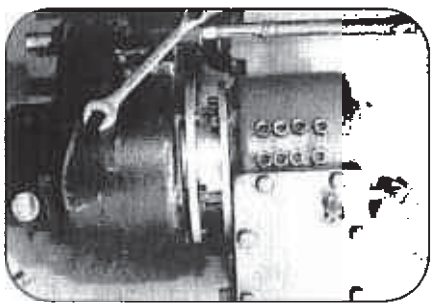
There are a series of points to be followed at this stage, but the instruction manual from Cold Duck describes it best, and they will offer tech help should you need additional explanation.

The only modification to the original transfer case will be to the shifting rails. For those T-cases with a T shifter, the modification is relatively simple. For those with the J shifter, it's a bit more complicated. There are three methods to choose from when performing the modification, and Cold Duck explains your options clearly on this point. It's important to remember that no matter what shift system you have or which choice you select with either shifter, especially the J shifter, the work must be done correctly. If it isn't, you can destroy your transfer case by allowing improperly aligned shifts to occur.

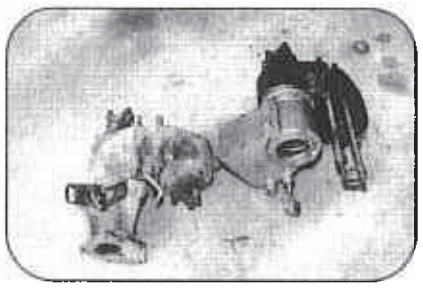
Remember, you are adding an additional 85 lbs. to the drivetrain (plus 2 3/4 pints of fluid per T-case), thus creating additional driveline stress. Cold Duck recommends that, "... modify your skidplate to double as a skidplate and secondary crossmember. What we've done is to move the skidplate back about seven inches, weld some additional crossbeams and gussets into it. We then bolted on an old urethane bodymount



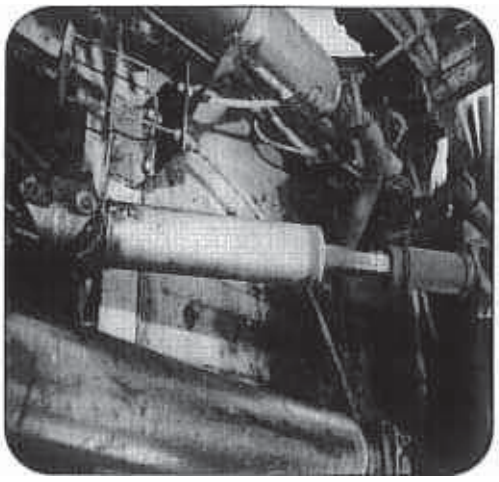
Adapter ring with all roller bearings is in place on one transfer case and ready to be attached to the second Dana 20.



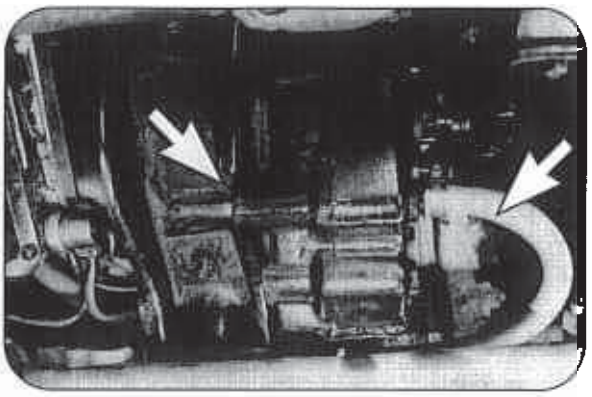
Grade 8 studs with nuts are provided to attach the transfer cases together via the adapter.



The stock case is at left, with modified case to the right ready to be attached. Note that the shift rails have been lengthened.



Both driveshafts will have to be reworked; the front will be lengthened and the rear will be shortened. The amount each will be modified is also a function of just how much vehicle lift and suspension travel you have. Make sure to give your driveshaft shop the right measurements and explain how much suspension travel your Bronco has.



The modified T-case will require that a small notch (arrow) be cut into the crossmember to allow the shift rail to move about freely. Hose (arrow) is set up to operate a ram air with a dash-mounted button that actuates the second transfer case shift function.

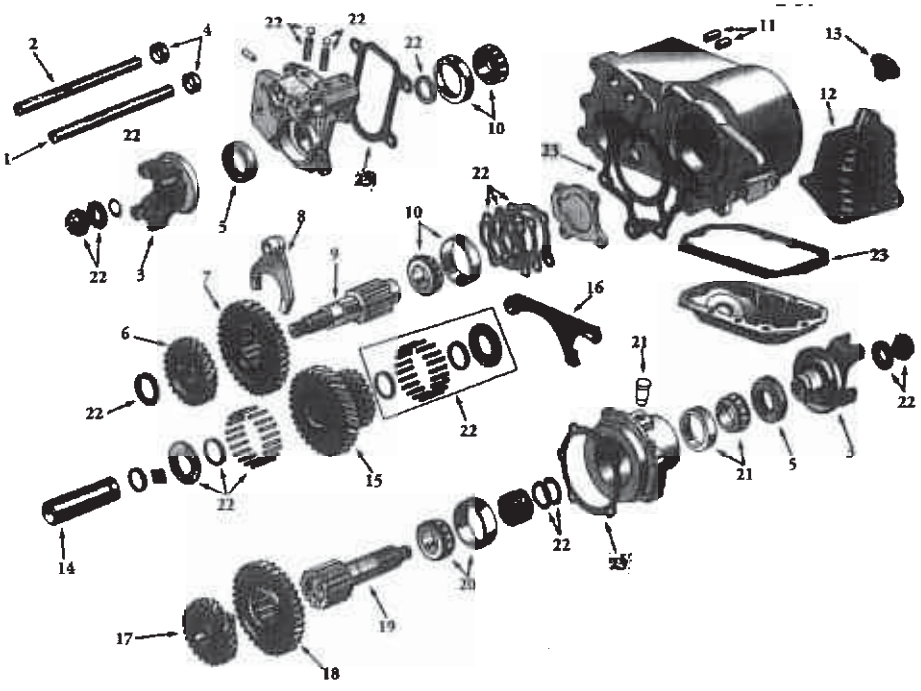
pad to rest between it and the transfer case. When you do this, make sure that your Bronco sits at rest and the transfer case doesn't rest any weight on the skidplate or the urethane bushing. What we are trying to accomplish here is to support the unit only when it flexes downward. If you rest any weight on the skidplate or urethane bushing, you will experience a vibration at higher rpms."

There is another interesting caveat to this conversion. Because of the newly acquired low gear potential, you may find that it's impossible or next to impossible to stop your Bronco in steep uphill or downhill situations while in the lowest gear. In fact, an automatic will exacerbate the problem. In order to stop safely, you may find it necessary to shift to the next higher gear.

Cold Duck also offers a "Bronco Manual" that fully explains numerous tips that can be both performed at home or on the trail. You will find helpful hints on radiator repairs on the trail, hub swaps from Chevy to Ford, axle swaps to gain the strength that comes from larger axles, onboard air compressors, disc brake swaps and really helpful bits of information on making your suspension limber. How would you like to ramp out at a perfect score of 1,000 on the RTI! The manual supplies the part numbers of other manufacturers' components that you will need, making it a relatively easy task to locate your source for components. The "Bronco Manual" is something that should be in every off-road library, especially those of Bronco owners.

If off-roading is your game, then the ability to crawl over any obstacle is part of your game plan. Cold Duck Engineering has come up with a viable means of significantly increasing your overall drive ratios, making your 4x4 even more formidable as it climbs the face of a mountain. And all of this is without compromising the reliability of your existing running gear.

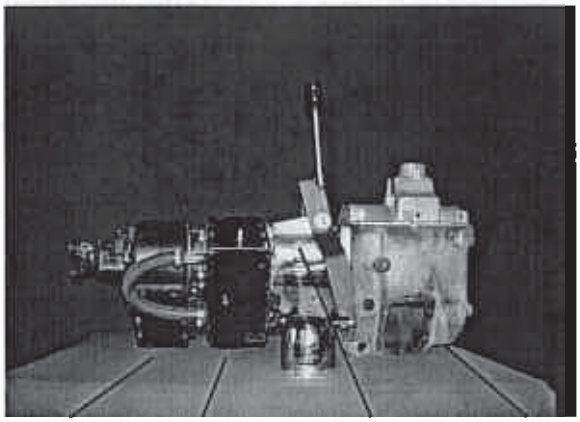
Dana Model 20 Transfer Case



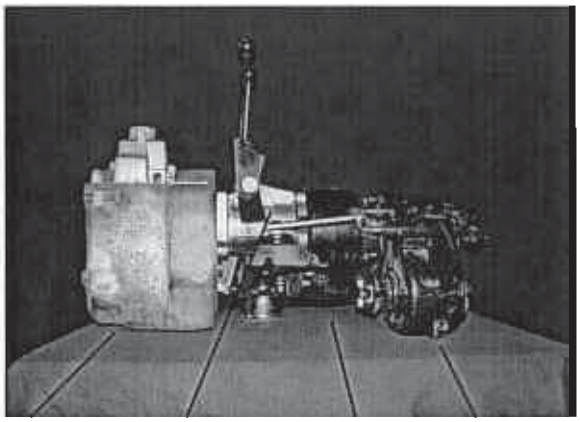
1. Shift rail (left)
2. Shift rail (right)
3. Front or rear yoke (10 spline)
3. Front or rear yoke (26 spline)
4. Oil seal for shift rod (per rod)
5. Oil seal for output shaft (per yoke)
6. Output shaft gear for 18-8-18 (26 teeth)
6. Output shaft gear for 18-8-24 or 18-8-64 (29 teeth)
6. Output shaft gear for 18-8-44 (28 teeth)
7. Sliding gear for 18-8-28 (31 teeth)
7. Sliding gear for 18-8-22 (33 teeth)
8. Shift fork low range
9. Front output shaft for 26 spline
10. Bearing and race set for front output shaft
11. Shift rod cover for thimble (per rod)
12. Transfer case shifter boot (1972-75)
12. Transfer case shifter boot (1976-79)
13. Shift knob with engraved shift pattern
14. Intermediate gear shaft
15. Intermediate gear for 18-5-16 (34-20 teeth)
15. Intermediate gear for 18-5-10 (34-20 teeth)
15. Intermediate gear for 18-5-9 (39-18 teeth)
16. Shift fork for 4-wheel lock (used)
17. Mainshaft gear for 18-8-46 T15 (26 teeth)
17. Mainshaft gear for 18-8-55 T150 (26 teeth)
17. Mainshaft gear for 18-8-49 T14 (26 teeth, 10 spline)
18. Sliding gear for 18-8-26 (31 teeth)
19. Rear output shaft for 26 spline
20. Inner bearing and race set for rear output shaft
21. Outer bearing and race set for rear output shaft
22. Small parts kit (includes all parts numbered 22)
23. Gasket and seal kit

COLD DUCK

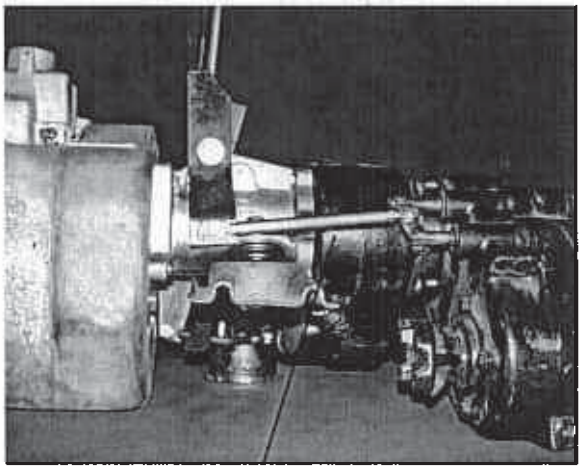
DUAL TRANSFER-CASE



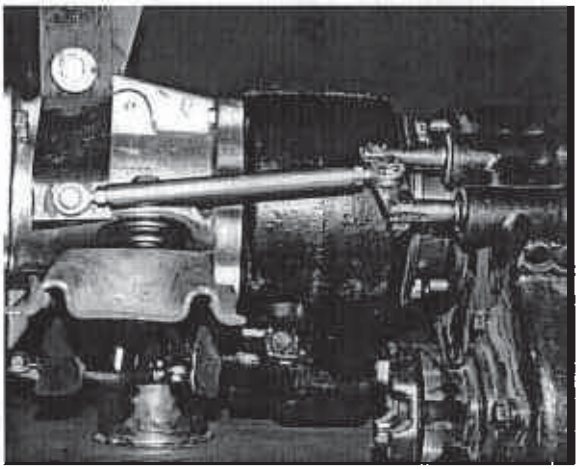
DANA 20, COLD DUCK, ADAPTER HOUSING, NP 435



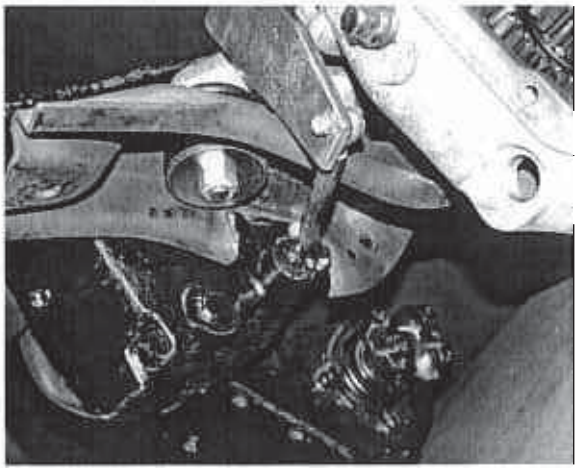
NP 435, ADAPTER HOUSING, COLD DUCK DANA20,



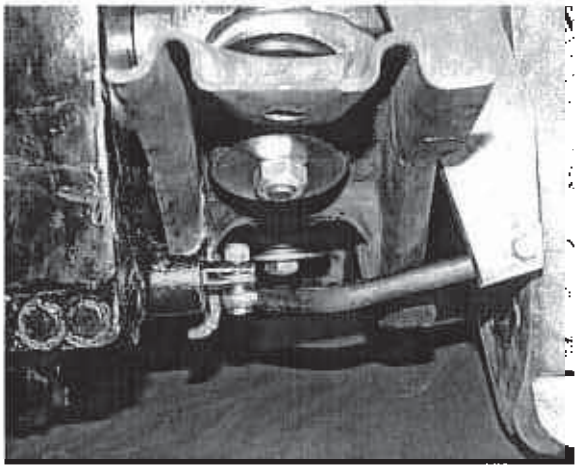
DANA 20 SHIFTER LINKAGE



DANA 20 SHIFTER LINKAGE

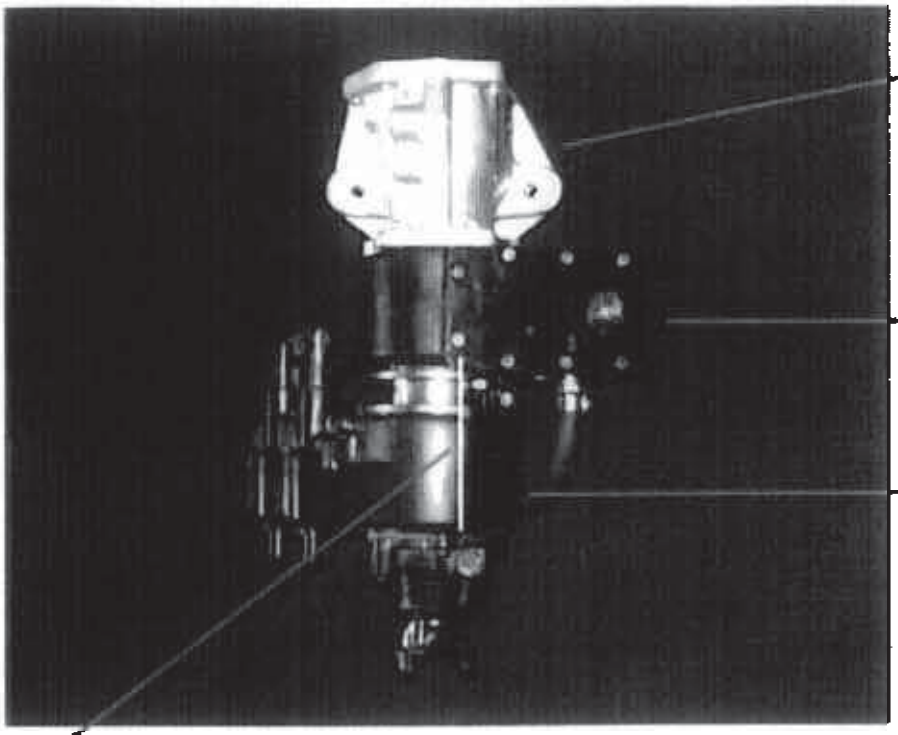


COLD DUCK SHIFTER LINKAGE



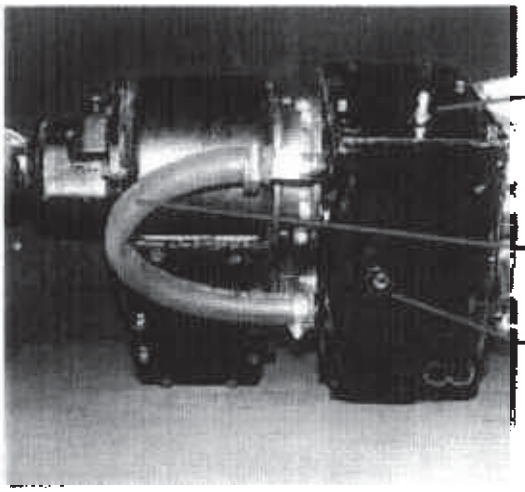
COLD DUCK SHIFTER LINKAGE

COLD DUCK ALIGNMENT

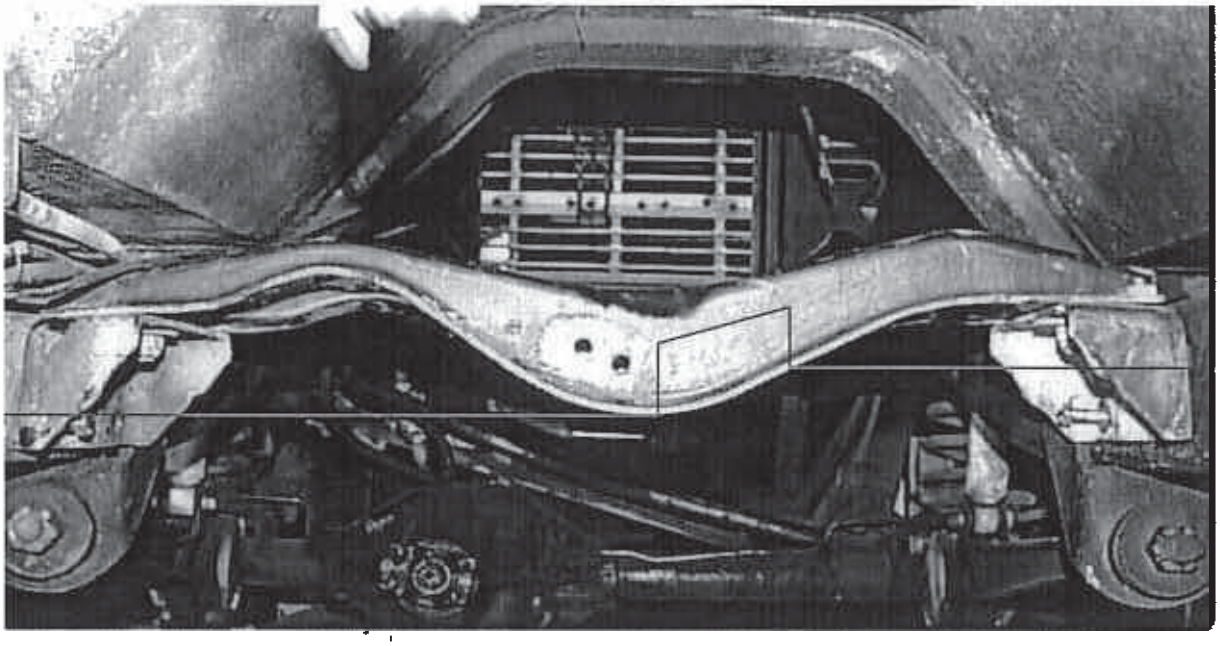


NOTE THE ALIGNMENT OF THE INSPECTION PLATE ON THE COLD DUCK WITH THE BREATHER ON THE DANA 20.

PASSENGER SIDE VIEW

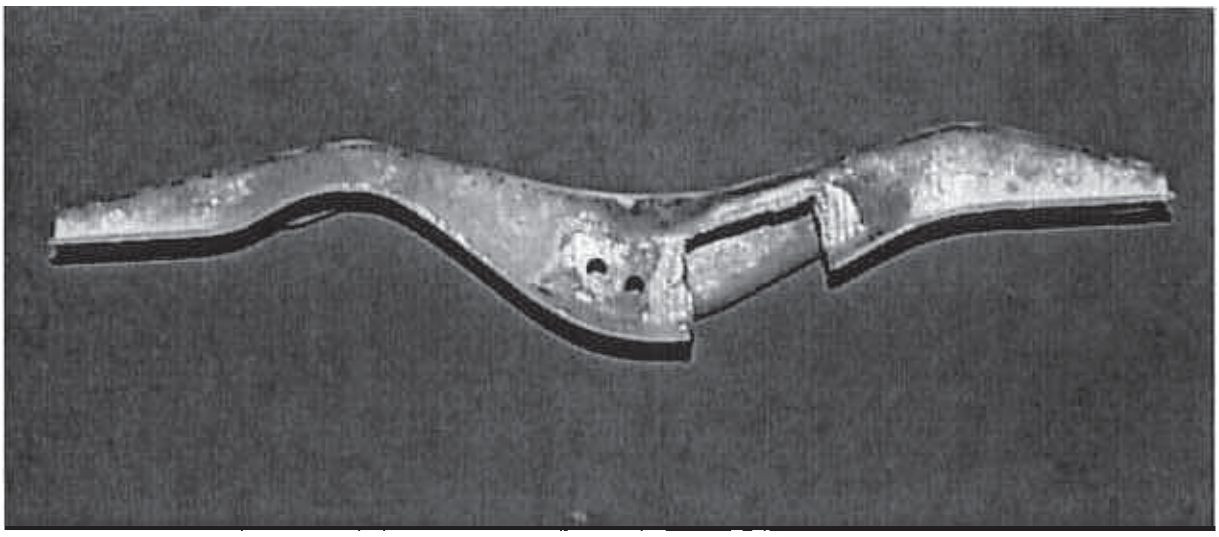


CROSS MEMBER NOTCH



MARK FROM DRIVER SIDE FRAME 13-3/4"

MARK FROM PASSENGER SIDE OF FRAME 8-1/4"



COLD DUCK SHIFTER LINKAGE

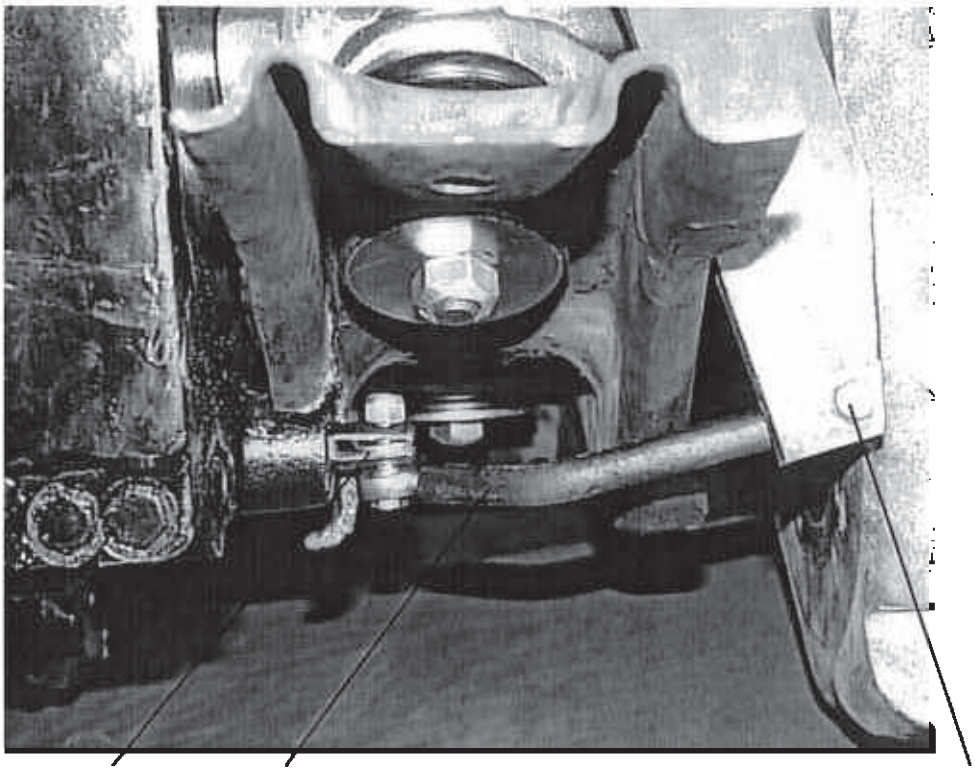


FIG. 1 (SHIFT RAIL)

FIG. 2 (SHIFT LINKAGE)

FIG. 3 (SHIFTER)

INSIDE THE GAP OF THE COLD DUCK SHIFT RAIL YOU WILL HAVE TO PLACE 3 EA. 1/4" WASHERS AS SHOWN IN FIG.1. THE LINKAGE IS FASTENED BY 1/4-28" X 1-1/2" BOLTS (FIG. 1 AND FIG. 3).
PLACE 1EA. 1/4" WASHER IN BETWEEN THE HEIM JOINT AND THE SHIFT RAIL . ALSO 1 EA. 1/4" WASHER IN BETWEEN THE LOCK NUT AND SHIFT RAIL.
THE SMALL LENGTH END OF THE BEND GOES TOWARDS (FIG. 2) THE COLD DUCK BOLTING ON TO THE BOTTOM SIDE OF THE SHIFT RAIL. (FIG. 1). THE SHIFTER END OF THE LINKAGE BOLTS ONTO THE INSIDE OF THE SHIFTER. (FIG.3)