March/April 1998 Issue 6

NORTHERN CALIFORNIA ROVER CLUB

Newsletter

Club Information

Any correspondence should be addressed to:

Northern California Rover Club
P.O. Box 14961
Berkeley, CA, 94712-5961

Members are strongly encourage to submit articles, notes or letters for publication.

Club Decals

Additional club decals are currently available for $4 each. The decals are approximately 2 inches by 4 inches and bear the club logo as it appears on the newsletter cover. To obtain additional decals please forward a letter with a mailing address, number of decals desired and a check for the appropriate sum to the club address.

Newsletter Back Issues

Newsletter back issues may be obtained on an as available basis for $1.50 each. The $1.50 includes postage.

Membership Application

A membership application form is located on the rear page of each newsletter. Please feel free to copy this form for anyone you may know who is interested in joining the Northern California Rover Club. Application for membership need not be made using the application form. Membership application should include: Name, Mailing Address (inc. zip code), Telephone Number, Type of Rover owned

Officers

Current club officers are:

President: Bruce Bonar
Vice President: Eric Cope
Secretary: Jeremy Bartlett
Treasurer: Morgan Hannaford
Club Jester: Jim Russell

Cover Photo:

Must be Daniel Cope with dad's car (since Eric would never drive without both hand on the wheel) in the Mendocino National Forest .

Meeting Minutes

March 6th, 1998

At the start of the meeting members were reminded that elections are coming up and anyone wanting to run for a position or nominate someone could still do so. Members were encouraged to consider participating in the club operations.

Many members will have their dues coming up for renewal in the next couple of months. Renewals are the same as the standard dues at $20/year. The club treasurer reported that the club presently has 96 members with funds in the bank of $106. The directory of club members will probably be issued every 6 months depending on changes in membership and modifications to the information in the directory.

Potential fall (November?) club rally locations were discussed. The club decided to focus on the Mendocino National Forest in the Lett's Lake area due to lack of knowledge of Cow Mountain OHV area's variety and the very poor opportunities at Lake Pillsbury. A number of members have volunteered to preliminarily plan a rally and contact forest service officials to discover requirements for approval. Members discussed the possibility of a joint Land Rover 50th anniversary and club rally T-Shirt projected to cost $20.

The upcoming Land Rover meet in Mendocino National forest was discussed. The club decided to hold its next meeting on Saturday morning at 10:00 at the Cedar Camp campground at the meet. It was decided that the club will issue two awards to be annual awards, at the club meeting at the Mendocino meet. These awards will be an award for the most cosmetically interesting vehicle (good, bad, or just plain ugly) - to be known as the Gnarlcissus and an award for the individual showing the most dedication, sacrifice or suffering on behalf of or because of Land Rovers - to be know as "The Prestigious Woody". Any member having any nominations of individuals they believe merit such recognition should submit the nomination before the next club meeting to any of the club officers. The club officers will decide on the winners of the award.

The members discussed holding a picnic style club lawn meet some time in July or August in a park or similar setting near the Bay Area. Such a meet would allow people to socialize and discuss their vehicles without fear (well … almost without fear) of damaging them ☺.

Member were strongly encouraged to contact the National Forest service or their local federal representative regarding the forest services proposed aggressive road closure and modification policy. The members watched videos on winching techniques supplied by WARN and Ramsey winch companies. Bruce Bonar gave a brief lecture on rigging basics.

Direction to the next Meeting

Greetings Land Rover owners.

Allow me to introduce myself: Some call me the prince of darkness, others use more colorful metaphors, alas I am — Joe Lucas.

Of my minions and disciples I am quite fond of those that choose to drive Land Rover products. Why you ask? Because those individuals are making a statement. A statement that they are not afraid of the minor inconveniences that life may bring. In fact, these people - more often than not - encourage tribulation. They acquire an almost perverse joy setting up impossible situations and then attempting to conquer them. I admire this trait.

Thus, I will show my grattitude and reward your unflinching spirit by announcing the —

*****4th ANNUAL JOE LUCAS MENDOCINO NATIONAL FOREST NOT-A-RALLYE*****

DATE:

April 24-26 (last weekend in April, as always)

LOCATION:

East Mendoncino National Forest, Stonyford District this year will be at CEDAR CAMP.

Take I-5 to Maxwell. Gas up in Williams! You have ~50miles to go and head WEST to Lodoga - Stonyford. Go right on Lodoga-Stonyford Rd. Before Stonyford turn left on Goat Mtn Rd. Go right on M-5, CEDAR CAMP will be on the left in about 3-4 miles from M-5 intersection.

Or, if you need supplies in Stonyford (expensive and scarce petrol) you may continue on to M-10.
Stay on M-10 until the M-5 intersection. Go left on M-5.
Shortly after a shallow (hopefully) water crossing CEDAR CAMP will be on your right.

SPECIFICS:

Rain-or-shine, >30 Land Rovers will be there. This is a traditional BYO not-an-event, in the Mendo_Recce spirit.
Full gas tanks-plus recommended.
Don't forget food, water, cooking supplies, camp supplies, garbage bags. Pot luck on Saturday night.
Be prepared to have fun.

May the light shine bright upon you, your family and your Land Rover.

Joe Lucas, Prince of Darkness

NCRC Elections and Candidates

Elections for club officers will be coming up in April. Its not too late to submit your name for the running. Voting will be by mail ballot with ballots sent out in March, so final candidate lists will be required by the end of February. The current officers strongly encourage you to participate and take their place (we're a lazy lot and want to leave the work to others !). Any member is entitled to run for any position but may only hold one position at any time. Members can announce their candidacy at the next two meetings or by mail to the club PO Box.

If you have a particular set of ideas you'd like to see implemented or direction you'd like to see the club head in please consider running and prepare a statement for other club members so they know what you've got in mind. All officer positions will be open for election; these include: President, Vice President, Treasurer, Secretary, and Member at Large.

Current candidates are:
President: Bruce Bonar
Vice President: Eric Cope, Ben Smith
Treasurer: Jeremy Bartlett
Secretary: Mehdi Saghafi
Member at Large: Jim Russell, Morgan Hannaford

Club Calendar

CALENDAR

The following events may be of interest to club members. If you know of any events or wish to lead fellow club members on a trip please contact one of the club officers or send information to the club PO Box. If you are only wanting to make informal contact with other members for a small trip and do not want to lead a fully sanctioned club event you can list your trip under the "Non-Club Events". Get out there with others and have fun!

CLUB EVENTS

First Club Awards and Potluck will occur **April 25** at the **April 25,26 Mendocino National Forest Joe Lucas Not a Rally** (see Non Club Events). The club will be handing out the prestigious "Woody" award for the member showing the greatest spirit of sacrifice.

June (tentative), Ramsy Trail in the Sierra. Possibly also a club drive north to south along the Blue Lake Trail.

July/August (Tentative), Club Picnic / Car Meet at Hollister OHV. This will be a chance to meet other club members at a picnic site with the advantage of off-road course nearby. It is a great opportunity for novices to go through basic off-roading.

October 25 (tentative), Rovers in the City. A tour of San Francisco and environs with activities.

November 7,8 First NCRC Anniversary **Rally**/50th Land Rover Anniversary Rally

Spring 1999 (Yes 1999) Probably **Late March**. **NCRC High/Low Tour**. From the Owens Valley near **Mt. Whitney to Death Valley**. 2 or more days of weekend travel over scenic roads and moderate off-road trails through some dramatic scenery.

WEST COAST NON CLUB EVENTS

April 25,26 Mendocino National Forest Joe Lucas Not a Rally, East side of Mendocino National Forest (OHV Area). An informal but large (40+) gathering of Land/Range Rover owners from across northern California and beyond. THE big event for the general LR community. The gathering usually occurs on the east side of the MNF near the Lett's Lake OHV area. Rumor has it that Cedar Camp will be the meeting camp/location this year. We will confirm this in the next issue.

May 2,3 Esprit de Four Wheel Drive Hands-On-Clinic, Hollister Hills SVRA, An excellent basic course of hands on instruction in 4 wheel driving. 1st come 1st served. $40 / vehicle and 1st driver with $20 for a 2nd driver. (See the copy of the application form in the previous newsletter). Contact Eric Osborne at 510-794-9067 between 9am and 10pm only.

May 16,17 , **Pacific Northwest Team Challenge**, Lee's Camp, Tillamook National Forest (west of Portland) Oregon. An excellent rally featuring clubs and marques from across the pacific northwest. Team registration (2 vehicles) and payment ($50 /vehicle) are required. Contact Doug Shipman at :

May 15-17, LROA 50th Anniversary West Coast Bash, Hollister Hills SRVA Park. Contact Geoff Jackson, event coordinator, 408-574-3798.

June 14 Hayward All British feildmeet and Swapmeet California State University at Hayward. Event Starts at 8 AM with judging of cars at 10:30 AM. Admission to feildmeet is $15.00. For more info call:
510-689-4005 Days
510-228-1672 Evenings

June 25-27, **Solihull Society Rally**, (self titled as the **"National Rally"**) Steam Boat Springs, Colorado. $130 registration. Contact John Wood at 303-774-9225 (or e-mail Jwood@solihullsociety.org for more information. (See also the Solihull Society web page at http://www.solihullsociety.org/rally.htm).

September 5,6?, **Portland Oregon**, **British Car Meet**, with **Pacific Northwest Land Rover 50th Anniversary events**. This event is held at the Portland International Raceway and serves as a focal point for Land Rover owners across the northwest. This large event featuring many marques and usually has an amusing off-road course set up. Contact information to be provided later; on the spot registration is possible.

September,13(?) **Palo Alto British Car Meet**, will probably have some **Land Rover 50th** Anniversary recognition. This large event featuring many marques occurs at the fairgrounds opposite the Stanford Shopping Center. Contact information to be provided later. On the spot "registration" is common.

An After-Market Tach for the NAS D90

By: Bruce Bonar <brbonar@wenet.net>

The installation of a new alternator in my 94 Defender 90 was described in the Jan/Feb 1998 NCRC Newsletter. One of the problems noted in the installation was the effect of the new alternator on the OEM tachometer. I've now solved that problem.

A little background. The Defender tach senses the number of pulses from the alternator to determine the engine RPM. The number of pulses per engine RPM is determined by the number of poles in the alternator and the relative size of the crankshaft pulley to the alternator pulley. The Rover alternator (a Marelli) has 6 poles. The Premier has 7 poles.

The pulley on the new alternator is smaller. The net result was a tach reading 300 rpm higher than true rpm.

I installed a VDO tach, part No. 333-158, which fits perfectly into the 2 1/16" opening where the OEM tach was installed.

The wiring was very straightforward. There are connections for positive (red/white) and negative (black) for the light as well as separate positive (green) and negative (black) connections to power the tachometer. The OEM light is grounded by a lug on the clamp bracket. I installed a female spade connector on this lead so it could be connected to the male spade on the new tachometer light. The output from the Rover alternator is a white wire with a slate stripe. This wire is connected to terminal #2 on the tachometer. There is an excellent wiring diagram with the tachometer.

The advantage of the VDO tach is that there are dip switches to configure the tach to match the # of pulses from the alternator or coil, and a potentiometer to dial it in exactly. I calculated that for my installation there are 24 pulses per revolution and set the dip switches accordingly.

I used a digital optical tachometer to fine-tune the new VDO tach. The OEM tach is a VDO but does not have a potentiometer or other means of calibration.

WARNING. Be very careful as you pull out the instrument binnacle to access the back of the tachometer. If you pull on the speedometer cable your next purchase may be a VDO programmable speedometer. If this happens to you, don't worry – you can read about that installation in the next newsletter!

~~BLOODY~~ BLEEDING BRAKES - Part 1

By: Jeremy Bartlett

Part 1 of this article covers the basics of flushing or brake bleeding with details of non ABS (Series, Defender and early NAS Range Rover) brake systems; Part 2, (look for it in the next newsletter) will cover the intricacies of bleeding ABS (later Range Rover and Discovery) systems and build on the basics presented here.

If you own your Land Rover long enough and do enough of the work on it yourself you're eventually going to need to bleed or flush your brakes. Flushing is required because over time brake fluid absorbs water and looses effectiveness; under severe degradation brake fluid may absorb enough water to allow vapor formation in the lines leading to soft brakes. When your brake fluid is dark, it's time to change it. The brakes will also need bleeding if you do any work on the system that involves opening the lines. Flushing the brakes is very straightforward although you may be somewhat nervous if you've never done it before. Flushing brakes basically involves changing the brake fluid and driving or drawing the old brake fluid through the brake system from the master cylinder reservoir (photo 1) and out the bleed nipples that are part of all calipers (disc brakes) or cylinders (drum brakes). Photograph 2 shows examples of a bleed nipple or screws.

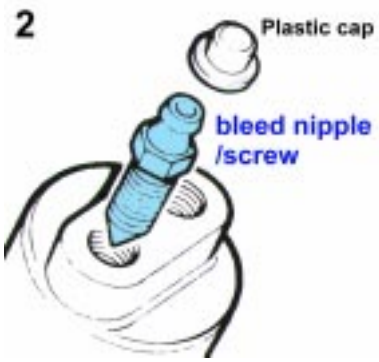
Remember brake fluid is a paint stripper so be careful not to get it on your nicely waxed paint or that original 30 year old paint work with its strenuously earned years of faded patina.

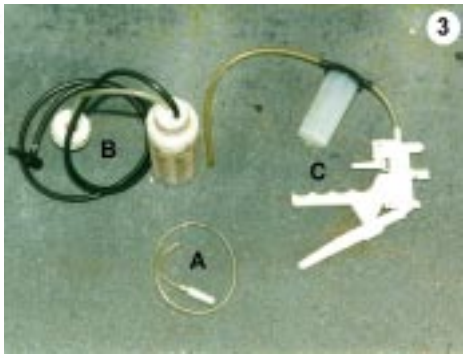
Brake Bleeding Equipment

To bleed Land Rover brakes you will need at least the following:

7/16" wrench/spanner (this works on the bleeding nipples on all the models)
¼" Internal Diameter tubing (about 1 ft) check the tubing to make sure it fits snugly but easily over the bleeding nipple/screw.
turkey baster or similar suction tool
plenty of absorbent rags
(for ABS equipped vehicles (Part 2) a prop to maintain the brake pedal in the down position
new brake fluid (a couple of pints or so)
a small container to collect drained brake fluid

In addition you will need one of the following optional tools available to the DIY'er. The relative merits of these tools are discussed at length below.





Just be careful, follow the procedures, and check the system before you use it. Allow yourself a couple of easy hours for the job. You will need either an assistant or one of the special bleeding tools described below. Any of the bleeding tools described also come with directions. Brake bleeding procedures are also described in books such as the Haynes manuals and the workshop manuals which are recommended reading. By the time you're done, the pedal should be reasonably hard.

1) The simplest of all tools is an assistant. If you lack a simple assistant you will have to purchase or make one of the following bleeders.
2) A one person brake bleeder (photo 3a) and 3' of ¼" hose with a small container (about $10)
3) A small capacity pressure bleeder (photograph 3b) (about $30-$40)
4) A small capacity vacuum bleeder (photograph 3c) (about $30 - $40) with a T-piece for ¼" tubing

For tool maniacs out there, professional pressure bleeders (photo 4) can be found at the more sophisticated auto supply stores but will typically cost $200 or more. I don't recommend them for DIY use because they need a larger volume of fluid than any DIY'er needs and some require pressurized air lines. I think they are really only effective in shop settings where high volume brake bleeding is done.

Bleeding brakes with an assistant is the simplest and hopefully the cheapest way to go but can also be the most time consuming.

The one person brake bleeder is essentially a check valve on the end of a tube. It is attached to the bleed nipple by the hose while immersed in brake fluid in a separate container. You then pump the pedal as if there were an assistant opening and closing the nipple. This tool has the risk of failing when you can't see it with consequent need to re-bleed the system thus wasting your time. In my opinion, it's simple but high risk; personally, I prefer one of the alternatives.

A small capacity pressure bleeder such as the Gunson's runs off tire pressure (about 20psi). The air pressurizes the new brake fluid in the reservoir which in turn is forced into the master cylinder reservoir thus minimizing the risk of running out of fluid as you bleed the system. A variety of caps to match all ranges used on Land Rovers is supplied with the unit which can typically be purchased from British vehicle parts specialists such as MiniMania in Milpitas, CA. I have found this type of bleeder works very well with older Series vehicles. The unit can be used on the more recent models but is pushing its pressure limit. One of this systems drawbacks is that achieving a good seal at the cap can be tricky. I find smearing a small amount of Girling's brake grease on the rubber cap gasket and tube connection helps here. An alternative pressure bleeder can be made using tire valves and spare reservoir caps. Fitting a tire valve to the spare cap will allow you to pressurize the reservoir; however such a set up lacks the fluid supply advantage of the Gunsons. Pressure units have the risk of blowing pressurized brake fluid all over your paint job so some attention is needed. Also don't pressurize the system too high; the limit is about 60 psi and less is better, especially for the modern brake systems with plastic reservoirs.

Vacuum units attach at the nipple end of the brake line and suck brake fluid through the system. The Mityvac is a commonly available unit. I believe that these units are not as effective at flushing air from a system that is being bled for reasons other than fluid changing because they tend to expand any vapor in the system and it's difficult to see when the system is bled because air almost always leaks into the low pressure tubing at the junction with the nipple. However, I do like vacuum bleeders for merely drawing old fluid out to change the fluid. They are a little riskier than the pressure bleeders because you can't see the level of fluid in the master cylinder reservoir, so you're at greater risk of running the fluid too low.

Step 1 - Changing Brake Fluid

Enough of the tools… onto the job.
The first step in flushing your brake system is to draw as much of the old fluid out of the reservoir before you bleed the lines. This minimizes the amount of awkward work you have to do.
Most of the brake fluid can be changed by sucking it out of the master cylinder reservoir with a baster or similar suction device (photograph 4). Remembering that brake fluid will blister paint, take care not to allow drops to touch your paint; pad the area with rags that you'll throw out when your done. Once the old fluid is removed add fresh brake fluid. For Series Land Rovers with old hoses use Castrol LTMA 5 (DOT 4 Fluid). The older hoses and seals on Series Land Rovers apparently degrade and leak with other brake fluids. If you have newer replacement hoses installed this is reported to no longer be a problem. Some auto enthusiasts replace their standard brake fluid with silicone (DOT5) fluid although I've yet to meet a Land Rover owner who's done this. A word of warning:

DO NOT replace DOT 4 with DOT 5 on ABS systems Apparently the ability of the DOT 4 to absorb trace amounts of moisture is critical to the integrity of the ABS system.

Unfortunately, replacing the brake fluid in the reservoir is only the start of the process. Bleeding the brakes is necessary because the old fluid still remains in the master cylinder, lines and calipers/cylinders where it will do the most harm.

Step 2 - Bleeding the Lines and Calipers/Cylinders

General Procedure

Although there are some vehicle related specifics, the general procedures are simple. To bleed or flush brakes attach the tubing and 7/16" spanner to the bleeding nipple to be opened after removing the dust cap on the nipple if one is present. As a bit of insurance against intake of air into the system you may partially fill the container used to collect the drained fluid with fresh fluid and place the tubing in it. [Note that placing the tubing into a container partially filled with fluid is described in the manuals as a method to bleed brakes without repeatedly opening and closing the nipple. The theory is that the fluid prevents the intake of air while the pumping forces it out. I've never seen this technique used, however.] Before you start flushing you might want to make sure the nipple is loose prior to bleeding by rapidly cracking it open then shutting it; they can be quite stiff. Now either apply the appropriate bleeding equipment and open the nipple to draw or suck off the fluid or, alternatively use the manual method with an assistant. Slowly apply the brake pedal while your assistant opens the nipple. Before you slowly release the brake pedal, have the assistant close the nipple, otherwise you'll draw air into the brake system. Repeat this procedure to continue flushing fluid until the color changes to that of fresh fluid. Stop periodically to check the fluid level in the reservoir or the pressure bleeder. If the fluid drops too low in the reservoir you can draw air into the system from the top. If you are pumping the brakes with an assistant allow a few seconds between each pedal push to allow the pistons in the cylinders or calipers to complete their travel. This will make the job more efficient.

Series Land-Rover Vehicles Specifics

Bleeding on Series vehicles is basically very straightforward following the general procedure with a few quirks.

For most Series vehicles in the US which have single master cylinder systems the manuals recommend bleeding from the front to the rear in the order from the farthest from the master cylinder to the nearest. For left hand drive that translates to: front right, front left, rear right rear left. In the event that you have a dual system master cylinder bleed in the order: front left, rear right, front right rear left. This dual system order flushes the lines from the secondary master cylinder chamber first. Remember in the case of those brakes (for example 109 front brakes) that have 2 cylinders to bleed the lower cylinder first so that any air does not rise into a previously bled higher cylinder.

Some types of Series vehicles have reputations for being harder to bleed than others, this is particularly true of 109s that have the CB (compression barrel) rather than CV (central valve) type master cylinder. (The photograph shows the external differences)

Land Rover (SIIA manual) goes so far as to recommend jacking up or otherwise tilting up the front of the vehicle to aid in bleeding and recommends pressure bleeders for the CB system. This reputedly helps flush air from the master cylinder. However, if you are merely flushing fluid this should not be a concern.
When pedal bleeding/flushing, Land Rover recommends an unusual pedal stroke for bleeding the CV master cylinder. Use one full downstroke followed by 3 short stroke at the bottom of the pedal travel THEN allow the pedal to return quickly up. Bleeding the CB system uses the standard slow down and slow up stroke.

If you're bleeding a system to try to remove a spongy feel from the brakes due to assumed trapped air and the system remains spongy after bleeding there are some other problems that you should consider, particularly on older vehicles whose brake systems have not been rebuilt. One is that the master cylinder cups ("piston seals") have begun to fail.

Modern Land Rover Brake System Variations

Bleeding some modern Land Rover brake systems can be a bit more complex than their Series predecessors. The details of the bleeding procedures depend on the brake system in place. There are three types of brake systems used in the recent range of Land Rover products available in North America. Details of the more recent Range Rover systems will be described in Part 2. Use the procedure appropriate for your vehicle; if you're going to be bleeding an ABS equipped Range Rover (either "Classic" or MKII) don't rely on the simple procedure described in Part 1 of this article. In some situations you could stress the ABS system valves. When in doubt check the manual.

The three brake systems are:

1) **Integrated 4ch ABS** with a high pressure hydraulic pump, accumulator and electronically controlled valve body (used in '90 - '95Range Rovers and RRMkII). A primary pressurized system covers all four calipers with a secondary hydrostatic system in the front calipers.

2) **Automatic ABS** working in conjunction with vacuum servo-power system (Discovery '94-97)

3) **Conventional/Non ABS** - conventional power assisted with a pressure conscious reducing valve. This system is present on 87 through 89 Range Rovers (and the '91 year Hunter) and D90/110 ('93-7) models. This conventional system is actually subdivided into Range Rover and Defender systems by differences in the piping that have some effect on bleeding procedures.

3a) Conventional/Non-ABS (Defender 90/110)

The Defender system is somewhat simpler having only 1

Before bleeding the system loosen the brake failure warning switch!

nipple per caliper for the D90s (no secondary circuit). It can be bled essentially just like the Series vehicles. The front calipers should be bled first (this is the secondary circuit on this system). The manuals for power brake systems state that it might be handy to have the engine running to help with the bleeding. I'd advise against this; you're really only likely to burn yourself on the exhaust at best.

3b) Conventional/Non-ABS (Early RR "Classic")

The hydraulic system in the early NAS RRs includes two completely independent sections. The upper pistons in the front calipers form the primary section, and the lower pistons in the front calipers together with the rear calipers comprise the secondary section. When bleeding any part of the secondary section almost full brake travel will be available. When bleeding the primary section only partial (about ½) brake pedal travel will be available.

To make matters a little more complex the earliest '87 RRs had a different master cylinder (AP) than all the others (Lucas/Girling). For the early '87 models,

This prevents a shuttle valve in the brake system from exposing the switch to pressure variations that could cause damage. The location of the switch is shown in photograph a. Disconnect the wires from the switch. Unscrew the switch and insert the "C" washer between the switch and the master cylinder. When you're finished bleeding don't forget to reverse this and tighten the switch to a mere 1 ft-lb. Otherwise the bleeding procedure is identical.

When bleeding the brake system start with the rear caliper furthest from the master cylinder then move to the next rear caliper. The rear calipers will have only one bleed nipple each near the top of the caliper. These are straightforward. Then move to the front calipers and start with the one furthest from the master cylinder. The primary circuit nipple is the one at the top of the caliper. There are also two others, one on each side; these are the secondary circuit nipples. Simultaneously bleed the primary nipple and the secondary circuit nipple on the same side of the caliper as the primary circuit. This is very tricky to do with an assistant and is best accomplished using a pressure bleeder with two pieces of tubing. A vacuum bleeder can be used with a T-piece connector for the tubing. Then bleed the remaining secondary nipple. Finally bleed the caliper closest to the master cylinder. Tighten the bleed screws to about 8 ft-lbs.

End of part 1.

Hi-Lift Jack Roof Rack Mounting

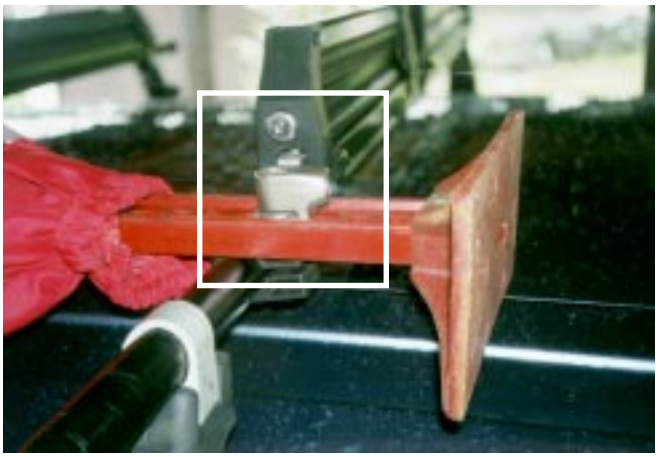
By: Kevin Kelly

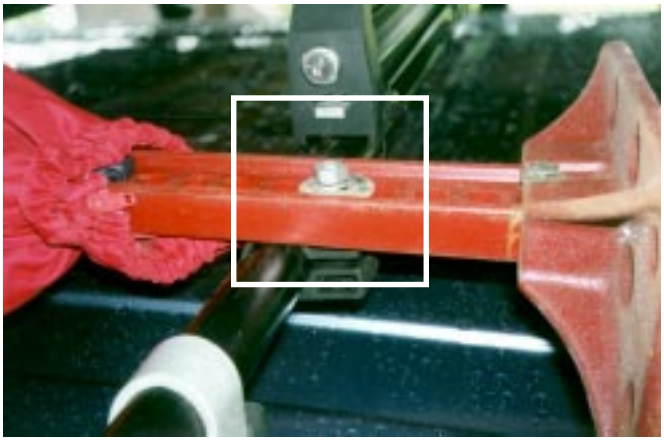
For those Land Rover Owners with Yakima, Thule, or other multi-sport roof rack mounting a Hi-Lift Jack is quick and easy (see photos).

The only things necessary to securely attach a jack to most roof racks are a couple of big washers (assuming you can use the plastic clips, nuts, bolts, and lock washers from another rack accessory).

Since not everyone is honest it is a good idea to lock a Hi-Lift to the vehicle if it will be left unattended for long periods of time. A simple bike cable works well to lock it to the racks, and a pair of Yakima Accessory Lock Housings works even better (see photo).

To protect the Hi-Lift jack mechanism from rain, snow and dirt while on the roof try covering it with an old ski boot gaiter or a ski binding cover.





END

Land Rover Tire Size

By: Morgan Hannaford

Land Rover owners talk a lot about their vehicles, especially anything that will enhance on or off-road performance. One question that comes up repeatedly at gatherings and on e-mail lists is "how big of a tire can I fit on my Land Rover?" Large tires seem to be the identifying feature of extremely capable off-highway vehicles. Photos found in any of the major 4x4 magazines showcase vehicles with highly modified suspension components to fit huge tires. Land Rover approached the off-road capability issue from another angle; if you can keep all four tires on the ground, there is a reduced need for all that rubber. Thus, even stock leaf-sprung Series Rovers have significantly better suspension travel than even modified competitor 4x4s. The tires that come stock on Land Rovers are a compromise. The advantages of fitting large tires include increased clearance under the axles and body work, and better traction and control in difficult terrain. However, large diameter tires will raise the vehicle's center of gravity (increasing the risk of roll over), put more strain on the drive line components, reduce fuel economy, give a "looser" ride on the road, and are more expensive.

Vehicle design and availability of after-market parts limit the size of tire that can be put onto a Land Rover. With deep enough pockets, and experimentation, Land Rovers can be modified into the "monster truck" category. The purpose of this article is to summarize the largest practical size tire that can be put on a Land Rover with little or no modifications. Two things limit tire size: Clearance in the wheel wells and wheel size. Any modification that reduces the superb articulation of the Land Rover suspension will do more harm than good for general off-road capability and comfort. Suspension lifts will allow larger tires to fit while maintaining full axle travel, but this falls outside the realm of practical upgrades. Stock Land Rover wheels are fairly narrow, limiting mountable tire width. Wider after market wheels can be purchased from suppliers in UK, or one company in the U.S. (American Racing).

Reading Tire Size

Several different size codes can be found on tire side-walls. The most common in the U. S. is the P-metric system, where the three numbers give the carcass width, aspect ration, and rim size (in that order). For example the Discovery comes stock with 235-70-R16 tires; this breaks down to 235 mm wide – 70% aspect (height of tire from the rim is 70% of width, or approximately 164 mm) – and made to fit a 16 inch wheel. To determine diameter you double the tire height (for top and bottom) and add the rim with (for the example above diameter is roughly 28.9 inches). Another popular sizing system is made for off-road vehicle tires, sometimes called "floatation sizing". This three-number system simply identifies the diameter, the carcass width, and the rim size (all in inches). So, a 33-9.5-15 tire is 33 inches tall, 9.5 inches wide and made for a 15 inch rim. Finally, there is a two-number system that gives the tread width and rim diameter assuming an 85% aspect ratio. The NAS Defender 110 came with 7.50 x 16 tires. The first number is a measure of the tread width, the tire is actually about 9 inches wide.

The table below is a summary of tire sizes (diameter and width) that I typically find on Land Rover vehicles. The sizes are from several sources, including tire company web pages. Diameter will vary by up to 1", depending on the manufacturer, and are generally optimistic. Actual tire width varies by the width of the rim it is mounted on.

33-10.5-16

Size	Tire Diameter	Tire Width	Rim width
225-75-16	29.2"	8.9"	6 – 7"
235-70-16	28.9"	9.3"	6 – 7"
7.50 x 16	32"	8.9"	5.5 – 7"
235-85-16	31.8"	9.3"	6 – 7"
265-75-16	31.5"	10.5"	6 – 7"
255-85-16	33.3"	10.5"	6 – 7"
235-75-15	28.8"	9.3	6 – 7"
33-9.5-15	32.8"	9.9"	6 – 7"

33-10.5-16 on D90

Technical Information

Land Rover Tire Size

Series 88 and 109

Most 88s imported after 1965 came standard with 6"x 15" wheels. All 109s had 16" wheels, early models were only 5" wide and later wheels where 5.5" wide. Many 88s have been refitted with 5.5 x 16" 109 rims, usually with a 7.50 x 16 or 235-85-16 tire. Although narrow, these tires are quite tall. In some cases tire stores have refused to mount 235-85-16 tires on the 5.5" Land Rover rims, claiming they were too narrow. I did not encounter this problem when purchasing mine. A taller or wider tire will cause problems in the rear on full spring articulation, usually rubbing in the wheel well, and in the front by limiting turning radius. Some 88 owners have mounted 265-75-16 (stock D90) tires. However, because of the extra width a wider wheel should also be used. One solution is the 6.5 x 16" NAS D110/D130 steel rim. Alternatively, 7 x 16" white-spoke wheels can be purchased from UK suppliers. For 88 owners with the stock 15" rims an effective option is the 33-9.5-15 tire sold by BF Goodrich. The 88s I have seen with this tire also had 109 1-ton shackles fitted, adding 2" of lift, to prevent rubbing on extreme articulation.

Defender 90 and 110

The NAS D110 came with 7.50 x 16 tires mounted on steel 6.5 x 16" rims (borrowed from the D130). These rims are plenty wide to mount the 235-85-16 or 265-75-16 (stock D90) tires. The U.S. D90s came stock with impressively large tires mounted on alloy rims. Several D90 owners have upgraded to 255-85-16 tires, adding about 1.5" of diameter. Some of these D90 owners found that the outer side-walk rubbed the plastic eyebrow on extreme articulation. This was fixed with minor trimming on the inside lip of the eyebrow.

Slight trimming of rear wheel arch

Discovery

The Discovery's stock tires, although large compared to similar sport utility vehicles, do not seem to complement the awesome suspension travel and off-highway capability of the vehicle. Many Disco owners have "fixed" this by upgrading to 235-85-16 tires, adding approximately 3" to the tire diameter (1.5" more clearance under the axle!"). A slight modification to the rear fender arch has to be done, which includes grinding away a triangle about 1" wide by 3" long. This modification is invisible if properly done and touched up with paint. For comparison, the Discos used in the Camel Trophy were shod with 7.00 x 16 mud tires.

Range Rover

Unfortunately, Range Rover owners have fewer options when it comes to adding larger tires. The Range Rover wheel wells are smaller than the Disco, causing any significant increase in tire size to limit the suspension travel. The largest size I have observed fitted, without a suspension lift, are 225-75-16 tires.

The table below is a summary of tire size by vehicle type.

	Stock	No Modification	Comments
88 and **109** w/5.5x16" rims	7.50 x 16	235-85-16	
88 and **109** w/6.5x16" rims	265-75-16		
88 w/6x15" rims	235-75-15	33-9.5-15	Shackle lift recommended
Defender 90	265-75-16	255-85-16, 33-10.5-16	Slight trimming of eyebrow may be necessary
Defender 110	7.50 x 16	235-85-16 265-75-16/ 255-85-16	Same as D90 for largest size
Discovery	235-70-16	238-85-16	Slight trimming of rear wheel arch required
Range Rover	215-75-16	225-75-16	

END

Trip Report

Ft. Hunter-Ligget Area - A weekend in the forest with BUBBA!

As told by Tony McCauley, Ben Mitchell and assembled by Tom Walsh.

Prologue, (Tom Walsh)
This trip report includes the introduction of a new name for a vehicle that many of us have rode with on the trail, but never really existed. To this vehicle's credit: I have never seen it get stuck! I have seen it almost stuck, heck I've been even hoping a few times it would get stuck (just to get the opportunity to pull it out!). This probably had to do with both the driver and the vehicle! The Driver: Eric Cope, The Vehicle: a forward control now named "BUBBA", [which stands for: Big Ugly Box (with a) British Accent.]

Arrival and Saturday, (Tony McCauley)
For me, Land Rover trips don't ever start right when you leave home or work, That is just the beginning of another joust with the bay area traffic scene complete with the mini vans doing forty in the fast lane, the slammed Acuras doing ninety in the slow lane, and the real estate agents making deals on their cel phones while changing lanes. All this with me in an under-powered, noisy, non air conditioned, non power steering, manual transmission equipped aluminum biscuit tin on wheels.
So this trip really started soon after I turned onto Jolon Road. Forty minutes or so later I turned into the Naciamento Campground. For a moment I was confused by a large rectangular window illuminated by fluorescent light. What was a Winnebago doing in a Rover campsite? But it was only Eric in his off-road hotel suite. John D had arrived early and built a great fire out of wet wood using his extensive woodcraft knowledge and some chemical accelerants I think.
John, Eric and I sat around the fire, ten feet from the rushing creek and talked about other trips, and a 200' tree that needed to be cleared from a trail up in the Sierras, and our plans for the rest of our lives, and finally we went to bed, wondering if everyone else had flaked at the last minute.
The next morning there were four more Rovers there. The morning was sunny but cool. Someone poked Johns fire into life and we had a lazy breakfast while preparing to leave soon, but not soon enough to miss a meeting with smoky the rent-a-ranger who told us more than we ever wanted to know about some forest adventure permit that went into effect last summer and that we needed one to go where we were going. He also collected twenty dollars for our campsite.
Shortly after, we were on our way, and soon turned south off the paved road on to The Old Coast Trail which runs along the crest of the Coast range, at this point. We caught occasional glimpses of the Ocean and met a few other vehicles coming towards us. This road seemed to me to be in very good shape considering all the rain of this winter. About half way to The Plasket Creek Road we turned East onto Three Mile Road, and started to descend. Not to far down this road we came to a large yellow art installation (a gate ? nah, there was a clear road around it !). Simple yet elegant. Form following function. After admiring it briefly we decided to take a convenient if somewhat steep bypass and continue down the hill.

It looked as if we were the first vehicles down this road in a while, and soon enough we came to an oak tree blocking the way to prove it. It took about forty minutes to cut and winch this tree off the road. The first real obstacle on this trip. Meanwhile I walked down the hill to see what was ahead. At the bottom of the section we were on was a rushing stream to cross with some holes about three feet deep right where ones tires would want to go. While other people sawed and winched I threw boulders in the holes.

Tom in his Disco made it across without much problem. Ben in his 90 made it. With a little hand signaling from Tom I made it in my series IIa. Derek took a different line and slid both right tires into the sink holes. Ben volunteered to pull him out and disappeared to get his truck. After he didn't return I went up to see what was keeping him. And the answer was that hiding under the innocent green field right where Ben tried to turn around was an extra helping of super gooey bottomless El Nino mud. Even with his lockers locked he was churning, but not getting anywhere. Luckily Ben now has conveniently mounted D rings and my truck was parked in just the

Trip Report

Ft. Hunter-Ligget Area - A weekend in the forest with BUBBA!

right place to winch him right back on to the trail with no problems. A little tug pulled Derek out of the creek, Brian made it on his own, and Eric crossed while saying that he hoped we found some “challenging” trails later

A few more trees to move, a few semi steep pitches and we were back at the Naciamento - Furgeson Road. In about a mile we turned off on a little road that paralleled the Naciamento river heading for the “Palisades”. It was obvious that the river had been way higher very recently, and it wasn’t long before Tom who was in the lead found a place where the river had carved away the road. Tom’s progress stopped abruptly part way across about a thirty inch drop-off. It looked very dramatic as he got air-born for a moment and almost end-overed before coming to an abrupt stop. It is a good thing his air bags are disconnected, but with a little digging, a little tugging, and a little slamming down on his rear bumper/skid plate, we were on the way again.

We spent the rest of the afternoon weaving back and forth along the river, crossing occasionally at some shallow spots, and there weren’t many! The shallow spots were deep enough to put waves over my hood and water under my doors. The next time I will take the time to put the fording plug in, as my clutch was temporarily stuck to the flywheel the next morning. But no one flamed out and had to be ignominiously dragged out of the water. It was during one of these crossings that I noticed Tom’s wife had switched vehicles and was riding in the tall vehicle (BUBBA) - way above the water.

Just about dark we gave up on finding the road to “the palisades”, and Eric found a beautiful campspot right along the river, nice flat sand, plenty of firewood, no bugs, what more could you ask for. The only problem was that if you were in the back of the column there was this stream crossing that was now churned into a real trap. Tom pulled me through. I pulled Derek through. I tried to pull Brian’s yellow 90 through, but he was really bogged. It took a good hard tug from Ben and me at the same time

Trip Report

Ft. Hunter-Ligget Area - A weekend in the forest with BUBBA!

to break him free.
Once that was done in short order there was a fire, and the welcome smell of dinner cooking. Especially welcome since we had never stopped for lunch - probably because we were having too much fun. It was a beautiful starry night. John went on several wood gathering trips and we sat around enjoying the evening.

Sunday Morning [Tom Walsh]
We headed out Sunday morning in search of the Palisades, and to try and take one of the hundreds of trails on the map that would lead us towards Hearst Castle. We found the Palisades and stopped to admire it for a few moments (no swimming this time, the water was high, swift and cold!). Eventually we came across an old Army Corp of Engineers built bridge spanning the Naciamento river. The entrance to the bridge was a large rocky step plateau with a steep camber to one side. Unfortunately, the bridge was gated. Since that road would lead us to our goal, we opted to head toward an area shown as marshy and wet and full of trails. On our way we had to remove a fallen tree, We then found a nice muddy off cambered valley that led to a steep uphill, being in the lead, I took it first. I decided to take it real slow to keep traction (its always a guess in mud like this), well that didn't work! I kept sliding deeper into the "V" of the gully. Eventually John Baudendistal pulled me back out of it, and I used the other method and powered through it. I had slurried it up for others. John made it through smartly, possibly Ben, the others needed a pull I think. BUBBA made his approach, he faltered a bit, fell into the same "V" I did (I thought finally! This rig is mortal!). Well with 36" tires, he stuck it in reverse, backed out of the "V", tried it again and made it! We ate lunch at flat opening above the obstacle.

Sunday afternoon [Ben Mitchell]
Being the first to navigate a particular challenge has its advantages and disadvantages. Tom Walsh should be able to provide ample visual evidence of what can happen to the point man when he ventures over an unstable bit of road and ends up airborne. This would be one of the disadvantages. One of the advantages is that you usually get to cross things before they get all torn up, nasty, and impassable.
We were all in good spirits, and we'd just had lunch 5 minutes before we came to another obstacle, it was a great opportunity to practice vehicle recovery and whatnot. We came to a small creek which had washed a 4' ledge into the existing roadway. We improvised our way through a meadow to a point where the creek could be crossed. As luck would have it, I was the first person to try. I figured that the best approach would be to try walking up the far bank slowly so as not to tear up the ground that much for those after me. That approach left me spinning all four wheels in no time. So I backed up to the far bank and tried the power approach. It took some real wheel spinning, but I made it up. In the process however, I dug some pretty nasty ruts that would only get worse as others came behind me. With the exception of the BUBBA, which can be eliminated from the pool as an unstoppable freak vehicle J, I think I had to tow every one of the remaining 6 vehicles up the slope although Tom came within a foot of the top! By the time we were done

Trip Report

Ft. Hunter-Ligget Area - A weekend in the forest with BUBBA!

with that, we definitely had the system down.
After this obstacle we decided to head towards the road home:
“Well, I guess we’re back on the main drag.”
“Yep, time to head for home...that was a good stretch right there, though.”
“Yep, we’ll be back.”
I had this conversation, or some variant thereof, with Eric Cope at around 3:00 on Sunday afternoon. 20 minutes later my my vehicle was in a very deep, very muddy rut, listing about 30 degrees to starboard and spinning all four wheels. Guess we weren’t back on the main drag yet! Here’s what happened. After we dragged everyone up the last muddy slope and back onto what we thought was the main road, I ended up in the point position. There were a few slick spots where water from previous rains had pooled and mudded up the road, but it wasn’t too bad (although several folks in the end of the convoy got stuck after we slurried it up I heard). After heading down a rather steep (but dry) hill, I came upon a section which had been severely rutted by running water, with the ruts running sort of diagonally down the road from left to right. It looked like I could probably make it through though by driving down a ways on the right, crossing the ruts on a pretty sharp angle, and then continuing the rest of the way on the left. No such luck. As it turned out, I got my front wheels across, but the right rear stuck, and in trying to grind my way up, I merely slid my front end around and the right front sank in, too. I was listing badly and going nowhere. Bummer.
So Tom Walsh came down in the Lt. Brigade and we strapped up. I got a hell of a ride out of that one. I was having no small degree of difficulty monitoring what he was doing and my own driving, but when I finally felt I was free of the mess, I went ahead and depressed the clutch, figuring he must have stopped and that I’d roll to a stop, too. Uh uh. I kept going. Uphill. Pretty fast. Guess he was still towing me, eh? Turned out he hadn’t wanted to stop because he started to sink in, too. Fun, fun, fun. So about 100 yds uphill of where I’d originally been lodged, we finally rolled to a stop, free of the goo and no worse for the wear. Yeeeeee Hawwwww!
After this ordeal, Tom and I decided to recce a little way down the road on foot to see if it was worth trying to pass this section. Things looked pretty good, so we got on the radio and had Eric Cope come down in the BUBBA to try to make it through what my D90 hadn’t been able to navigate. Of course it could. That thing is unstoppable. It’s a tractor. Anyway, the path of choice seemed to be a rut crossing further up the road and out into a meadow (treading lightly all the way, mind you). I tried following in BUBBA’s footsteps and again became well and goodly stuck. My entire driver side front tire (a 33" tire at that) was submerged. I had to dig for about 15 minutes and we were then able to position BUBBA to pull me forward to safety.

After this, we pretty much decided that the meadow was nice, but not that nice, so we pulled everyone out into it way up high and bypassed this rutted section entirely. Nobody else got stuck in this particular location - or for the rest of the day for that matter.

We finally got back to the main road and headed for home!

End

Classified Adds

Classified are run free of charge for any club member. Submit any information on items for sale or wanted to the editors along with contact information.

For Sale
Folding side steps for Series vehicles (1 pair). Asking $50. Complete series differential, 4.77 ratio gears, with bad ring gear for $100. Contact Vance Chin at 510-357-2124.

Wanted
RR foldout chair. Mehdi 510-595-3934

Dr. Drip

Secret 101 Cult Discovered California!

So I'm walking down the street and not knowing why, my eye is drawn to this sign on a car…

Hmmm…101 Club! I should write this phone # down and see what this is about! Well as luck would have it, just as I reach my rover (1958 SII 88") I see the Jetta drive off so I follow it.
It soon pulls to a stop and the driver runs into the building. (note dish antenna…link to orbiting mothership?)

I rush after the driver but the door has already closed and it is locked. I knock but there is no answer. Odd, since it is about 3 in the afternoon and according to the sign, they should be open for business.

I knock again but to no avail. I call the phone number on the Jetta but I just get a recorded message, "We have found a volunteer for the sacrifice at the next AGM. Please remember to bring mink oil and shaving cream." <click>

I give up, hang up and as I slowly walk back to my rover, I see this car.

Submitted by Agent 403, John "windup but no photo touch ups" Hong, somewhere in the SW corner of the usa. (jhong@best.com)

Member Profile

Ben Smith

Ben Smith has been involved with Land Rovers for .. well for as long as Ben Smith has had Dora
an SIII 88 that is something of a family heirloom. Ben has a reputation for long distance driving stemming from several trips across the continent from California to Ottawa, Canada, among other destinations. It is acknowledged by many, including Ben himself that (to paraphrase) “Ben would drive Dora half way up the Amazon for a Jolt cola and a stale cookie”.
He has accrued quite a few tales of adventure and component failure in the course of his journeys. In fact, Ben is probably more at ease removing and replacing a Series vehicle transmission than most people are removing and replacing spark plugs. R&R means remove and replace to Ben not rest and relaxation. For example, Ben is known among west coast Land Rover community for at one time carrying a spare engine block in the back of Dora at a time when he was having difficulty with a head gasket. In the course of a trip a group was making many remote miles into the Mendocino National forest during the early spring with snow still covering the ground they were not at all surprised to hear the chugging of an engine behind them followed by the eventual appearance of Ben and Dora. Ben had driven through the maze of forest roads to eventually find the group, pushing Dora on 3 cylinders with the engine block in the rear. It is deliberately fitting that Dora’s name comes from a Heinlen science fiction novel, referring to the name of a space ship that would deliberately break down if it was not paid sufficient attention, a behavior that most Series vehicles’ (and an increasing number of more modern Land Rover vehicles’) owners can well appreciate.
Ben has been one of the pivotal figures in the internet world of Land Rover ownership, contributing substantial work and information to Land Rover resources on the internet. Ben was responsible for setting up the west coast e-mail list popularly known as the “mendo-recce” list that served as a key vehicle for the community of rover owners on the west coast to keep in touch with one another. Ben maintains this list and will be more than glad to add you to it if you’re not already on it (e-mail him at Bens@psa.penscom.com).
After years of using Dora as a daily driver Ben recently took the plunge from Series ownership into the realm of Discovery ownership with his “new” ’94 5spd Discovery (“The Black Watch”) which has recently begun to grace the muddier roads in the state. As part of this transition it is rumored that Ben has also begun to replace his Coleman’s mustard with Grey Poupon, but we must emphasis that at this point this is merely rumor.
Ben is currently running for the Northern California Rover Club Vice President position.

Mechanics & Parts & Service

The following list contains parts suppliers and mechanics who support and work on Land Rover and Range Rover vehicles. **This is not an endorsements list**. Before using particular vendors or mechanics we suggest you talk to fellow Land Rover and Range Rover owners regarding their experience and recommendations. Please contact us with any businesses or updates you would like to see added to this list.

P	Parts
S	Service
D	Dealer
NV	Newer Vehicle
OV	Older Vehicle
AA	After-market Accessory
ABA	After-market Body Armor

Atlantic British ***[P, OV]***
Box110. Rover Ridge Drive
Mechanicville, N Y 12118
tel. 800-533-2210

Badger Interior Coachworks
[soft tops and interiors for Series and Defender]
Christopher Laws
259 Great Western Road
South Dennis, MA 02660
tel. 501-364-2680, fax 508-760-2281

Britalia ***[S, P]***
2210 San Pablo Avenue
Berkeley, CA
tel. 510-548-0240

British BullDog Spares LTD.
[P, NV]
394 Kilburn St.
Fall River, MA, 02724
tel. 888-874-3888, fax 508-674-5025
bulldog@meganet.net

British Motor Car Distributors ***[D, S, P]***
901 Van Ness Ave.
San Francisco, CA
tel. 415-776-7700

British Northwest Land Rover Co.
[S, P, OV]
1043 Kaiser Rd. S.W.
Olympia, WA
tel. 206-866 2254

British Pacific ***[P]***
3317 Burbank Ave.
Burbank, CA
tel. 800-554-4133

Cole European ***[D, S, P]***
2103 N. Main St.
Walnut Creek, CA
tel. 510-935-2653

DAP Enterprises, Inc.
86 Clinton St.
Springfield, VT, 05156
tel. 802-885-6660

Euro Parts, Ltd ***[P]***
1910 Prospect Ave.
East Meadow, NY 11554
tel. 800-274-4830

Great Basin Rovers ***[P, AA]***
342 West 1700 South
Salt Lake City, UT
tel. 801-486-5049

Hubacher Cadillac and Land Rover ***[P,S,NV]***
#1 Cadillac Drive
Sacramento, CA, 95825
tel. 415-460-4600

RAB Motors/ Land Rover Marin
[D, S, P]
540 Fancisco Boulevard West
San Rafael, CA
tel. 415-460-4600

Roverland ***[S, P]***
San Francisco, CA
tel. 415-648-0885
service and parts for newer vehicles

Roverland Parts ***[P, NV]***
2038 Village Point Way
Salt Lake City, UT 840093
tel. 801-942 7533

Rovers North ***[P]***
1319 VT Rt. 128
Westford, VT
tel. 802-879-0032

Safari Gard ***[ABA, NV]***
41095 Fig St.
Murrieta, CA 92562
tel. 909-698-6114

Land Rover San Jose ***[D, S, P]***
4040 Stevens Creek Boulevard
San Jose, CA
tel. 408-246-7600

Scotty's ***[S, OV]***
(Chevy conversions)
tel. 510-686-2255

Shamrock Services ***[S, NV, OV]***
Robert Davison
15195 Arnold Drive
Glen Ellen, CA 95442
tel. 707 935-3605

West Coast British ***[S]***
190 Airway Blvd.
Livermore, CA 94550
tel. 510-606-8301

Northern California Rover Club

Membership Application Form

The Northern California Rover Club is a club dedicated to providing communication between owners of Land Rover and Range Rover vehicles. We aim to provide a venue for the enjoyment of the vehicles including off road activities and their maintenance by focussing on providing a means of connecting fellow owners. The Club will be holding meetings on alternating months and aiming at producing a newsletter covering issues of interest and providing a forum for communication.

If you are interested in becoming a member of the Northern California Rover Club send this form and a check for $20 made out to Northern California Rover Club to the following address:

Northern California Rover Club
P.O. Box 14961
Berkeley, CA 94712-5961

The $20 covers membership dues for one year with all the rights of membership outlined in the club bylaws; members will receive an initial membership card and club decal, all newsletters mailed in that period, and an annual directory of club members.

Please provide the following information and **INDICATE IF ANY OF IT <u>SHOULD NOT</u> BE INCLUDED IN THE CLUB DIRECTORY** which will be distributed only to other members. The NCRC will assume that all information provided is to be distributed unless indicated otherwise. Please note that members must be over 18 years of age and have a valid driver's licence.

Name:

Street Address:

City, State and ZIP:

Tel. number (day):

Tel. number (eve):

Types of Land Rover/Range Rover owned:

Rover related interests: