Wombat Assembly Manual,

Draft 11/27/02

Foreword

We have been very busy here at the WCC shop and have decided to release the Wombat Manual in draft form since it is taking longer than expected to complete the finished manual.

This current draft has enough information to give you a good idea of what you would be getting into should you decide to build a kit, and to get you through the process of choosing and prepping your donor chassis

The final draft will be similar to our Hummbug manual, with an Assembly Outline Section that gives an overview of the build up, a Donors and Parts section that discusses the donor chassis and other necessary parts, a Photo Section giving a visual record of the entire assembly, a Detailed Assembly Instruction Section, and finally, various Appendices detailing options, contents, etc.

In this draft we have included the Donors and Parts Section (very close to its final state), the current state of the Detailed Assembly Instructions (more diagrams and details to be added later), the Photo Section (which so far includes only the body to chassis bonding) and the Trannys, Tires & Engines Appendix from the Hummbug manual

In the past we have had experienced builders put together our kits with no manual, just the nut & bolt packing lists (which detail which parts each nut & bolt are used to attach.) When you have the pieces of the kit in front of you, it is a very straightforward project. I am pointing this out so you won't get the idea that because we seem to be taking a long time to write a complicated manual that this is a complicated project. It is not. Most of the assembly you could figure out on your own. The manual details are there so you don't have to if you don't want to.

Part of the delay has been in the constant refining of the car. It's hard to write up instructions for a piece that keeps changing. Our designer finally seems to be satisfied with most of our current production design, so I am hoping to have the final draft done soon after the new year.

If you have questions, please feel free to call or email us:

(360) 673-3802; info@worldcarcompany.com

WOMBAT Assembly Manual

Donors and Parts

A donor vehicle is the original car on which the WOMBAT is built.

Choose a Donor Vehicle

The **Wombat** Kit Car is designed to fit on a stock, standard Volkswagen Classic Bug chassis. (Also fits Thing and Kharmann Ghia chassis.) The chassis does not require any modification for the kit to fit other than removal of the floor pan. It is possible to merely swap the bodies, but we highly recommend that you carefully examine the mechanicals and replace or recondition them as necessary. At this point in time most people start with a non-running unit and restore it, which gives them the option to install the engine / transmission combination to match their desired performance and price range

The kit will not fit a Super Beetle unless the front end of the chassis is modified. (Not recommended–this would involve cutting off the Super Beetle front end and welding on a standard front end.) We plan to have a Super Beetle Compatible Kit available by 2004.

We recommend you locate a VW shop or enthusiast in your area to use as a resource for advice on how to set up the chassis to best suit your needs.

The book ***Baja Bugs & Buggies, How to prepare VW-based cars for off-road fun and racing***, by Jeff Hibbard, is an excellent information source to use when making decisions about your donor chassis. It is published by HPBooks, ISBN 0-89586-186-0.

Points to consider when selecting a donor vehicle are:

- Emission Requirements in your area.
  In most locales, cars manufactured before a certain year have less stringent emission requirements than later model cars. Check your local requirements. You may wish to purchase an earlier year car to avoid hassles with the DEQ.
- Licensing Requirements
  It may be easier to start with a licensed running bug with a valid title than a junkyard pan.
- Be sure the donor Bug has a valid title.
  If you discover you've built your kit on a stolen chassis the original owner on the donor bug will be the legal owner of your kit car.
- Your preference of a Swing Axle or CV rear end suspension.
- What you consider will be the primary use of your Wombat
- Professional Mechanic's Inspection.
  You want to avoid (or at least be aware of and correct) bent front and rear suspensions; worn ball joints, bearings, and brakes; transmissions that sound out of gear.
  If you've determined that a part is going to used in the finished Wombat, be sure it is in good working order.

Donor Chassis Checklist

The following abbreviated checklist may help you decide if you want to use a particular chassis for your wombat.

1. Verify the following on the chassis
   A. The transmission yolk mounting bolts are there (this is a difficult bolt to find)
   B. The rear transmission forks are an even height.
   C. The rear control arms do not appear to be bent and look proportionate from one side to the other
2. Check for damage of the framehorn
   A. Are the triangle plates flat or have they been bowed from a collision?
   B. Are the threads in all holes intact?
   C. Verify that the mounting area for the master cylinder has not been crushed due to lack of spacers.

Donor Parts to Save or Locate

It is possible that all of the following parts can be salvaged from your donor car, some will probably need reconditioning. If a part is missing or in poor shape, you may wish to buy new or reconditioned parts.

VW Bug Pan
All Running Gear
Engine
Transmission*
Front Beam Suspension
Lug Nuts
Body To Pan Bolts & Washers
Steering Column
w/ Nuts & Bolts & Wiring Plug
Steering Wheel
Horn
Gauge
Flasher
Dimmer Switch Relay
Emergency Flasher
Voltage Regulators**
Battery & cables
Dashboard Grab Handle and Bolts
(On later models may be found on ceiling.)
Brake Reservoir, Mounting Screws & Aluminum Tubes
Fuel Cap (needs to be low profile)
Early Style Tank
and gas tank sending unit
Clip From Speedometer Cable
Tool Kit.

*Depending on your choice of engine, tire size, and year of donor transmission, you may need to exchange the transmission for one with a different ring and pinion for proper performance. Please consult a competent VW mechanic to assist in this decision. Discuss with him the primary use of your Wombat (Off-Road, Freeway, Around Town, etc.) and he will be able to help you choose the best set up for you. See Appendix H.

**Most engines now come with alternators that have the voltage regulator built in.

Parts to Buy

These parts you will not be able to salvage from your donor.

Carpet/Interior

Headlight Bulbs *–5-3/4" Round 3-Prong High/Low Beam #H5006*

Paint Job

Seats *–Most aftermarket bucket seats will work well.*

Seatbelts

Super Beetle Speedometer Cable (Long)

Gas Cap

Tires

Wheels

Windshield Glass *(Use windshield frame itself as template.)*

Wombat Options

These are items available from World Car Company.

Bikini Top

Baja Header

Carpet Kit

Custom Exhaust System (Designed for use with Baja Header-not included.)

Muffler	1-bend secondary exhaust pipe
Straight tail pipe	Collector w/ flange & gasket
2-bend primary exhaust pipe	Mounting hardware

Hard Top & Windows

Hard Bikini Top

Rear Deck Luggage Rack

Rear Shelf Bench & Back

*Our black rear bench and back fabric and pattern match vinyl PROCAR seats available from Scat: Elite Vinyl 80405S Black and Pro-90 80402S Black. Contact: Scat Enterprises, Inc, 1400 Kingsdale Ave, Redondo Beach CA 90278-3983, Fax(310)214-2285 Phone(310)370-5501, Catalog #982381193

Right Hand Drive Modification

Soft Top & Windows

Soft Bikini Top

Wheels

WCC Experience

Donor Cars: Our preference is 1969 or later IRS chassis.

Tires & Wheels: We have used Mickey Thompson 11.5 x 29.5 x 15 on 15 x 10 rims front and back. This size tire hampers the steering radius in front. Dropping the front tires down to 9.5 x 29.5 x 15 on 15 x 8 rims improves steering but does not allow rotation of tires front to rear.

Mickey Thompson tires look extremely cool and are awesome off road but they are hard to find bias ply tires which will go out of round, are difficult to balance, and noisy.

Currently, our choice in tires are P235 75 R15 Radial Traction Tires, (Les Schwab Brand) all around, mounted on 15 x 8 rims. This allows tire rotation, and gives a ride smoother and quieter than the bias ply Mickey Thompsons. They are also much easier to find.

We use wheels with an offset of 3-1/4" backspacing. You can purchase your wheels from WCC at $65 each or try your local yellow pages under “Wheels”.

Remember that the recommended tire pressure on these large tires assumes a much heavier car than the Wombat. Tailor the tire pressure to the weight of the Wombat and you will get a much better ride.

Shocks: If the standard shocks on your donor bug are in good shape go ahead and use them. Coil over shocks provide a stiffer ride and some lift.

Trannys & Engines: Our prototype used a 1973 chassis with its original 3.88 RP IRS transmission, a 1776 cc, dual carbureted performance engine, and 29" tall Mickey Thompson tires. The higher horse power engine compensated for the 3.88 RP and tall tires providing adequate power and acceleration. When using a stock 1600 cc engine with anything taller than a stock tire we prefer a 4.37 RP transmission.

Our current shop demo is a 1973 chassis, using the original stock single carburetor 1600 cc dual port engine and P235 75 R15 traction tires. The original 3.88 RP ’73 transmission with this engine and tire combination performed terribly. We swapped it for a rebuilt 4.37RP transmission which solved most of the problem. It could still use a little more power in fourth gear. We could do this by either installing a custom close ratio fourth gear or upgrading the engine.

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WOMBAT Assembly Manual

Assembly Instructions

These instructions are in a logical order, but it is not necessarily the only order in which to do things. Some builders prefer to install the wiring harness before bonding to the body whereas we have it as an after-paint procedure. Read through the instructions and choose the order that is most convenient for you.

Tools: You will need a basic mechanics tool set: Metric and US Fractional complete socket and wrench sets, screwdrivers, pliers, measuring tape, rulers, Allen wrenches, etc. Also vise grips, a grinder and a drill. Compressor and air tools will make the job easier, but you can build a Wombat without them. A detailed tool list can be found in Appendix C. .

Personal Protection Equipment: Safety goggles, ear plugs, gloves, dust masks, etc. Use them.

1. Prepare the Chassis:

A. Remove the VW Bug Body from the Pan/Chassis.

Refer to one of the numerous manuals available to guide you in body removal. The factory manual is best ($45). The Haynes manual is also good.

B. Cut Away The Old Floor Pans. There is a natural lip of thicker material where the pan meets the chassis tunnel. You want to leave this flange as you cut away the old pans. We typically use a Sawzall to trim out pans, and an air chisel on spot welds.

Insert Image Here

C. Do All Prep Work You Determine is Necessary to Make the Chassis Serviceable.

Some tips from the WCC mechanics:

- **Shift Coupler And Shift Rod Bushing** You should plan to replace the shift coupler and shift rod bushing at this time unless you can guarantee that the current ones are in good shape. These wear out and will need replacing in most donor cars. It is much easier to do now while the body is off than to wait and do it later.
- **Clean Out the Center Tunnel.** *This is usually necessary only on junkyard chassis, but you should probably at least look at the center tunnel of any chassis.* Remove front inspection plate on center tunnel and 2 transmission mount bolts on rear frame horns. Flush any debris out the rear with a water hose directed into the front of the tunnel. This eliminates many mysterious noises that may have been in your future. It is surprising what can find its way into the center tunnel

- **Double Check the Clutch Tube**. The clutch tube is secured in the tunnel with several weld points. Broken welds are a common failure. Inspect and repair as required.
- **Torsion Adjustment**. Due to the wide variation in the number and type of mileage on donor chassis, it may be required to adjust the rear torsion tubes.

D. Be Careful To Save Any Donor Parts You Plan To Use In Your Finished Wombat.

E. Paint Tires: Mount the chassis on old stock VW Bug tires and wheels. Using old small tires gives you more room to work and you don't have to worry about protecting them from paint overspray, etc.

2. Bonding the Body to the Chassis

Tools Needed

grinder w/wire wheel & disc
rags
4 or more strong friends
saw horses
Tapered Line Up Bar
Rubber Gloves
Mask
Ventilation Fan

To Buy

Acetone or equivalent
Tube of silicone sealer (optional)

From the Kit

Front Clamping Fixture
Rear Clamping Fixture
Epoxy Gun
Plexus 2 part Epoxy
Body Nuts & Bolt Assembly Pkg.

From the Donor

Restored Chassis, floor pans removed
Rear Body Mount Bolts (2)
Gear Shift Bolts (2)
Seat Belt Bolts (2)

The body will be bonded to the chassis along the center tunnel flange and the front cross-brace flange using a 2-part epoxy (Plexus), and bolted at standard mount points using front bolts supplied in the kit and rear bolts salvaged from your donor car.

With all chemicals, it is important that you read and follow the safety precautions, and warnings before using them. On the adhesive that you will be using for the bonding process (Plexus), there is an MSDS safety information and precautions that should be followed. (Insert copy)

If you prefer to bond the grille in place, rather then screwing, now would be a good time while you have the plexus out.

A. Prepare the Chassis

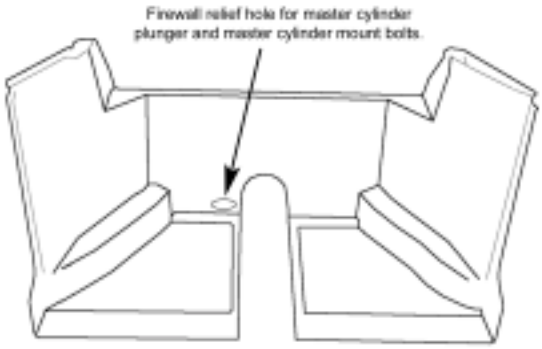
1. Clean Flange: Clean the flange of all grease and debris. Application of the wire wheel followed by an acetone rubdown works well. If you have repainted the chassis you will need to grind the flange to bare metal to maximize bonding strength. A scuffed, rough surface is optimum.

   Figure 1 of the Photo section illustrates the chassis center tunnel flange.

2. Chase threads in rear chassis mount points.

B. Prepare the Body

1. Cut a 4"x2-1/2" oval relief hole for the brake master cylinder plunger and master cylinder mount bolts.



Figures 3 & 5 of the photo section show examples of the cylinder master relief hole.

Figure 3 also details the body tunnel and front cross bar edges.

2. Use acetone to wipe down the tunnel and front cross bar edges where the body will bond to the chassis flange. The bonding surface needs to be clean.

C. Test Fit the Body

1) Set the body down onto the chassis to check its fit. (This is where all those strong friends come in.) The center tunnel edge of the floor unit of the Wombat body should be able to contact the chassis center tunnel flange (this may require some downward pressure). Make sure all 6 body mount bolts line up. Some grinding of the fiberglass may be needed for fit.
2) Bolt the lower sections of the clamping fixtures to the center tunnel using existing shifting lever holes and seat belt holes and shifting lever and seat belt bolts saved from donor. *See figures 1,3 and 5 of the photo section.*
3) Do a “dry run” of the final bonding, tightening the clamping fixtures and the bolts in place. If the tunnel edge of the body is not contacting the chassis flange at the forward most point under the dash/trunk area, use a piece of 2x4 to wedge from trunk down to force it into position.
4) Remove upper parts of clamps and the mount bolts. Remove the body from the chassis.

D. Bond the Body

1) Prepare to apply the glue. Read over the instructions that come with the Plexus and the Epoxy gun. Be sure to set up in a well-ventilated area and wear your personal protective gear. Set time of the glue is temperature sensitive; you will have less time at high temps.

   Glue time is limited so be sure to have at hand before you start:

   - the upper sections of the clamping fixtures,
   - your salvaged rear bolts (2 10mm x 35mm long x 1.5 pitch hex bolts with flat and lock washers),

- the front bolts from the kit (4 3/8"-16 x2-1/2" Hex Cap Bolts with flat washers and nylock nuts),
- shim washers (10 3/8" washer included in kit)
- Friends to lift the body

2) Apply a 1/4" bead of glue along the tunnel flange and the front cross brace flange. *See figure 4 of the photo section.*

3) Lower the body back onto the chassis, lining up all four corner mounting points and install bolts finger tight, this will square up the body to the chassis.

4) Place the upper sections of the clamping fixtures onto the lower sections that are already installed on the chassis.

5) Tighten clamps.

6) Finish installing and tightening body mount bolts. Shimming may be required

7) Scrape off any excess adhesive from the tunnel and fill in the remaining gaps if desired.

8) Once the adhesive is fully cured, remove the clamping fixtures. We recommend letting the glue dry over night just to be assured of a secure bond.

9) If desired, apply silicone sealer to the area where the tunnel and firewall intersect and around the pedal assembly mounting area.

E. Return Materials

1) Return the clamping fixtures and epoxy gun to WCC in order to get a refund of your deposit.

Return to:

World Car Company
2300 N Hendrickson Drive
Kalama, WA 98625

Items:
- Clamping Fixtures
  - Upper Front Section
  - Lower Front Section
  - Upper Rear Section
  - Lower Rear Section
  - 5/8" Hex Nut & Washer
  - 1/2" Hex Nut & Washer
- Epoxy Gun
  - (Used Nozzles/Tips are disposable and need not be returned)

3. Prepare for Paint

Before the car is ready to paint, necessary holes should be drilled, the windshield frame, tire rack, brake reservoir, and luggage rack test mounted, and the front grille and outer B-Pillar filler panels installed. Any mistakes you make while drilling holes at this point can be easily remedied by the painter.

Most of the nuts provided with the kit are nylon lock nuts. When you need to use nuts during a pre-mount you may wish to substitute non-locking nuts to make it easier to disassemble to paint.

Tools Needed
drill
grinder
measuring tape
screwdrivers

To Buy
rivets, screws, or bonding agent
non-locking nuts (optional)

From the Donor
Brake Reservoir
Windshield Frame
Windshield Frame Drawing
Windshield Frame Bolts
Windshield Frame Brackets
Tire Rack & Tire Rack Brackets
Tire Rack Bolts
Luggage Rack
Luggage Rack Bolts
Front Grille
Left Outer B Pillar Filler Panel
Right Outer B Pillar Filler Panel

From the Kit
Top Support Frame Bolts

A.) Top Support Frame.

Your Top Support Frame comes welded and set into position in the body subframe sleeves on your body. Pilot holes need to be drilled out to the appropriate dimensions. Confirm that the pilot holes in the sleeves and top frame line up before drilling. (Test with a thin piece of wire.)

1.) A-Pillars (front pillars) Drill out pilot holes to 3/8". As well as securing the top support frame to the body subframe, these are also the door hinge and spreader bar attachment holes. They may need to be enlarged for door alignment.

2.) B-Pillars (center pillars) Drill out pilot holes to 3/8". These holes are used to secure the top support frame to the body subframe. Insert B-Pillar bolts from the kit. You may also want to use these holes for seat belt mounting.

3.) C-Pillars (rear pillars) Drill out pilot holes to 3/8". These will secure the top frame to the subframe. Insert C-Pillar bolts from the kit.

B.) Windshield Frame.

You will need to drill holes at the top of the windshield frame for the wiper motors and the windshield frame to top support frame mount points. Position holes according to diagram. Test fit, then remove the windshield prior to paint.

C.) Tire Rack.

Pilot holes have been drilled in the rear of the car for the tire rack. Drill out to 3/8". Test mount and remove the tire rack prior to paint.

D.) Luggage Rack. (Option)

Pilot holes have been drilled in the rear deck of the car for the luggage rack. Drill out to 3/8". Test mount and remove the luggage rack prior to paint. If you do not plan to

install a luggage rack you can either fill in the pilot holes before paint, or drill them out and use plugs if you will be installing a luggage rack at a later date.

E.) Front Grille.

Screw grille into place if you did not opt to bond it in when bonding the chassis. May also be painted off the car and then mounted if you prefer.

F.) Outer B-Pillar Filler Panels.

Set B-Pillar filler panels in openings. Trim and adjust to fit. You will need to cut out notches for the B-Pillar on the top and bottom edges, and cut out the striker bolt relief from the front edge. Screw panels into position. May also be painted off the car and then mounted if you prefer.

Add small diagram.

G.) Pre-Mount Brake Reservoir.

The brake reservoir mounts in the front trunk area, towards the firewall on the drivers side. Two holes must be drilled through the body for the fluid lines to run down to the master cylinder. Two holes for mounting must be drilled, also. The reservoir will be mounted using the original nuts & bolts salvaged from the donor car. Hold the reservoir in place to set these holes- it is easiest if the holes allow the fluid lines to run down along the firewall. During final installation you will want to bond the hoses to the firewall.

4. Paint the Car

After each piece has been test-mounted, it is removed. (Be careful not to lose any nuts & bolts.) The car, hood, door panels and windshield frame should now be taken to the paint shop, or painted yourself. We recommend that you use paint tires to avoid getting paint on your finish tires.

Note: If you plan to cover your top frame bars with bar padding so the color won't matter, don't tape off your cage as the paint adds protection.

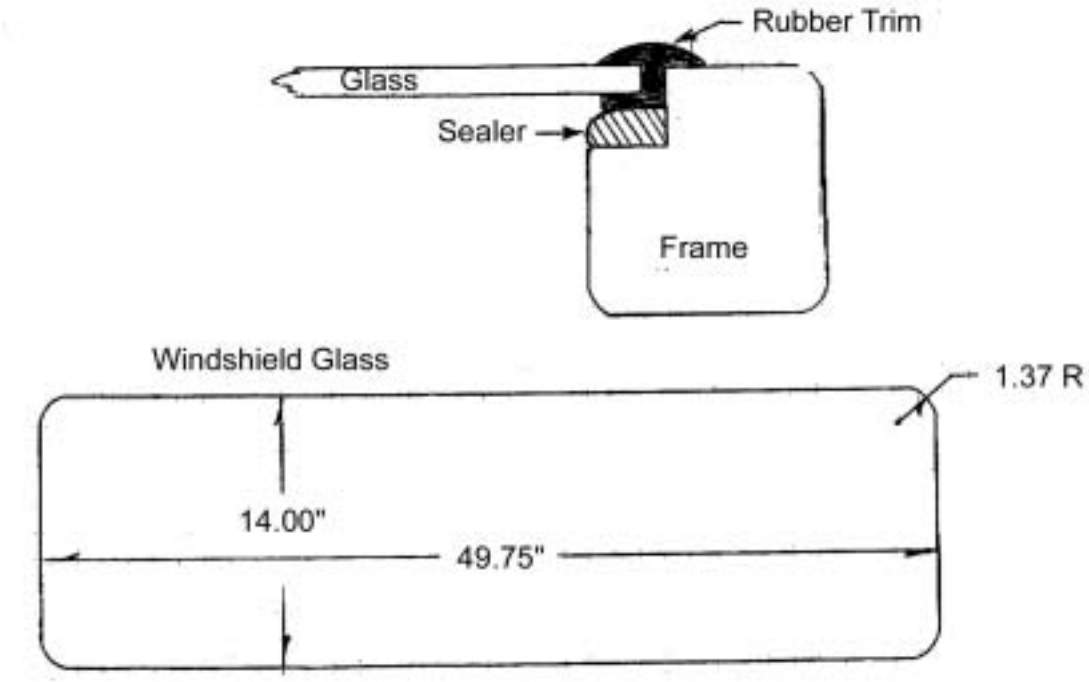
5. Paint, Chrome, or Powdercoat Steel Pieces.

While the body is being painted, it is a good time to paint, chrome, or powdercoat the steel pieces: Bumpers and mounting brackets, brushguard, tire rack, and hood support rod. Krylon Satin Black Interior/Exterior Spray Paint works well.

Powder coat is recommended as the most durable finish. If you decide to use paint, it is definitely worth the trouble to use a coat of primer. Be sure to rub the steel down with solvent to remove any grease before painting.

6. Install Windshield Glass

After the windshield frame has been painted, take it to a glass shop and have the windshield glass installed now. The windshield frame itself acts as a template. Use flat plate safety glass. The process is a standard bond in system.



7. Apply Bedliner Coating to Floor.

Option Coating the floor with a bedliner product is an alternative to carpet. There are a variety of bedliner options available at various prices in both do-it-yourself and professional installation. Be sure to mask off the heater vent tubes before bedlining.

8. Install the Wiring Harness

Tools Needed

Drill
5/8" hole saw
1-3/4" hole saw
4 or more strong friends
blower or vacuum
extension cord

From the Kit

Wiring Harness Nut & Bolt Assembly Package
Wiring Schematic

From the Donor

Dimmer Switch Relay
Flasher & Emergency Flasher
Fuel Tank Sender

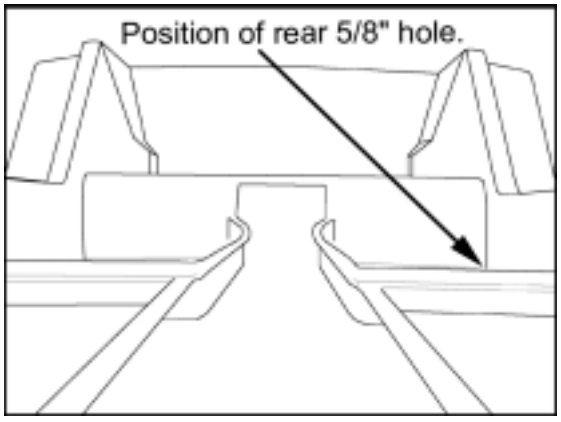
Some builders think the optimum time to install the harness is before bonding the body. They find it easier to get to the body before the chassis is bonded. Others prefer to wait until after bonding to body to the chassis. Your car, you choose.

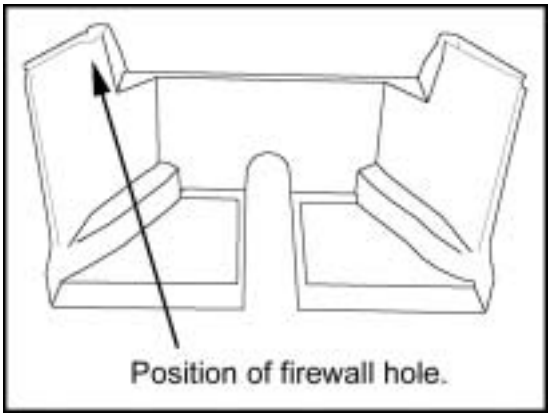
Although our Wiring harness has been greatly simplified, you may still wish to get experienced help for this. Use the schematic diagram included in your accessory box (also in Appendix C) to install the included harness. Test the wiring before final bolt in of the gas tank for easy access.

The harness is in sections that plug together. The front section is detailed on page 1 of the schematic. The rear section is detailed on pages 2 & 3. Page 4 is a detail of the turn signal converter box.

You will need to drill a hole in the firewall on the driver's side for the front trunkline to the front lights, fuel tank and brake master cylinder. The main wiring trunk runs from the firewall hole, along the driver side lower sill inside the car along the frame rail near the floor, then through a hole drilled at the base of the rear seat (**Alternatively**, some builders have chosen to run the main wiring trunk through a pvc pipe bonded beneath the body. If you choose to carpet the interior, the harness running alng the floor of the car is neatly hidden. If you choose bedliner, having the wires under the body works better. The choice is yours.) The rear harness runs along the frame rails, to each taillight assembly, engine connections, and to the transmission for backup lights

The first step in the installation is to drill the bulkhead holes. Drill a 1-3/4" hole in the firewall and a 5/8" hole at the base of the rear seat. (Not necessary if you opt to run the harness through pvc pipe on the underside of the car.) See diagrams below for positioning.





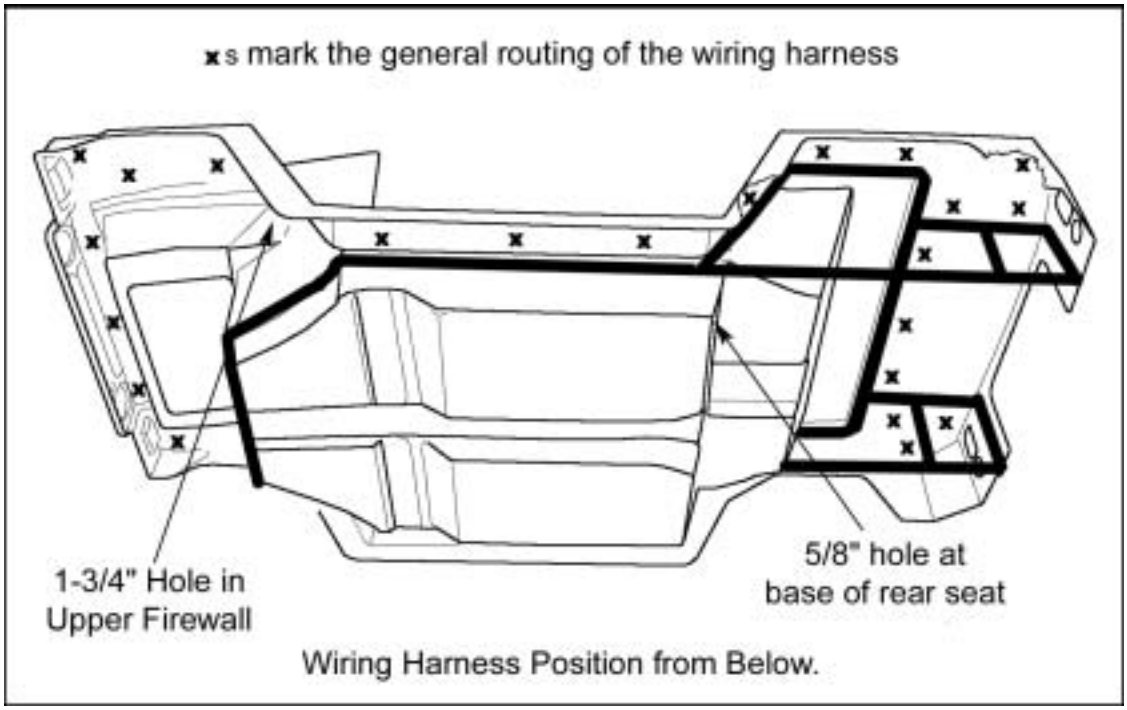
You will want to prop the body up on sawhorses if you choose to install the wiring harness before bonding to the chassis. We recommend that you have at least 4 people, to move the body onto the supports.

Clean the underside of the body. Blowing or vacuuming work well, as does hosing it off with water.

The drawing below shows the general routing of the harness on the underside of the body. The harness is affixed via zip ties, self-adhesive cable clamps, and screw in cable clamps. An assortment is provided with your kit. We found the adhesive in the self-adhesive clamps to fail in the extreme heat of desert summers, but they may be sufficient for milder climates.

Along the sub frame you may wish to simply zip tie the harness in place, or use the provided self-drilling screws to affix cable clamps to the sub-frame. In the front trunk area, away from the sub-frame, you may use either the self-adhesive clamps to bond to

the fiberglass, or drill holes through to the trunk and fasten cable clamps with the stainless machine screws and nuts. As an alternative, you may wish to bond various lengths of pvc pipe under the body to hold the harness.



Before you begin, you may want to relax and take your time to familiarize yourself with the harness. Lay the harness out on the floor. With the diagram and a cup of coffee or pop, figure out where each of the wires go. This will help tremendously.

The fuse panel mounts to the driver side, upper firewall with the screws, washers, and nuts.

Depending on which year steering column you have, you will either wire though it, or bypass it. You can wire in custom gauges, or reuse your donor Bug gauge.

Headlight Switch, Emergency Panel Light, & Switch are will be mounted in the dash to the left of the steering column.

Note that the schematic calls for the harness wires to be fed through the rubber grommet in the base of the front turn signal so that the connections between the light wires and harness wires are protected by the lens.

If you encounter problems when testing your vehicle, it is a good idea to keep in mind that most electrical problems are ground related.

9. Apply Undercoating or Paint to the Underside of Body and Hood.

Option. Spray paint or 3M rubberized undercoating to the underside of the fiberglass body and subframe. You may choose to undercoat the hood also. The black color gives the car a clean finished look. Undercoating helps add another layer of soundproofing to the entire structure.

It is your choice as to the best time to undercoat the body. Some people prefer to do it before mounting the body, some after mounting but before painting, others after painting but before wiring.

If you choose to undercoat early in the assembly of the car you may wish to apply a touch-up coat later in some areas.

10. Brake Reservoir

Tools Needed
- Drill
- Drive Bit

From the Donor
- Reservoir with mounting screws
- Aluminum fluid tubes

From the Kit
- Extended Brake Hose
- Brake Reservoir nuts & Bolts

Holes should have been drilled during the pre mount before paint.

Attach a length of brake hoses to each end of the metal tubes from the donor to give the correct length to reach from the reservoir to the master cylinder. Run hoses through holes down towards master cylinder along the firewall. Don't add too much length. You want the fluid to flow smoothly without any bends or folds to catch air bubbles.

Attach reservoir in place using screws from your kit. Tubes should be attached to the firewall in some fashion, such as zip ties or cable clamps. (Silicone is not recommended for fastening).

11. Door Install.

No instructions yet

12. Install Inner B-Pillar Filler panels.

No instructions yet. Mention speakers.

13. Install Kick Panels.

No details yet

14. Mount Windshield Frame.

Tools Needed
- Drill
- #10 Phillips Bit
- Utility Knife

From the Kit
- Windshield Frame
- Pkg Gasket material
- Windshield Nut & Bolt Package

The windshield is secured at the base by metal brackets bolted to the cowl behind the dashboard. The top of the windshield is secured by brackets pre-welded to the top support frame. The gasket runs under the base of the windshield frame.

15. Install Defrost Tubes

No details yet

16. Install Dash.

The dash is vacuum formed ABS molded plastic. Hold in position, check fit, trim as necessary. Mount using supplied screws as per diagram.

Drill and mount headlight switch, emergency flasher and switch.

17. Install Gauge and Speedometer Cable?

The speedometer cable requires a small clip that is not included in most new cable packages. Salvage one from your donor car or remember to get one when you buy your new super beetle speedometer cable

We install the speedometer from the back, drill two holes in the dash on each side of the gauge hole to match the factory speedometer mount tabs.

18. Mount the Steering Column

Tools Needed

Ratchet & Socket to fit donor bolts
Drill
¼" and 5/16" Bits,
2" Holesaw
Straight Dowel or stiff ruler
Caulking Gun

To Buy

1 Can Black Satin
Interior/Exterior Spray Paint
Silicone (left from previous step)

From the Donor

Donor Nuts & Bolts
Steering Column

Your column should be inspected and reconditioned if needed. It is also advisable to paint it before installation

A. Drill Steering Column Hole in Firewall

Sight visually the line from the steering box to the bracket on the dash bar onto which the steering column will mount. It is helpful to use a stiff ruler or narrow dowel to help locate the point in the firewall the steering column should go through.

Start with a small hole you can sight through, so that if you are off line you can make adjustment with your next hole. Work your way up in size until the hole is just large enough to allow the column through.

B. Mount the Column

Loosely mount the column to the underdash bracket (reuse donor bolts & nuts) and to the steering box. Inspect to insure everything is correct, then tighten.

C. Seal the Column Hole

Seal the column hole with the column firewall cover included in your kit using provided self tapping screws.

19. Mount the Lights.

Tools Needed
Screwdrivers
Wrenches

To Buy
2 5-3/4" Round 3-Prong #H5006
High/Low Beam Headlight Bulbs

From the Kit
Lights (In cardboard Light Box in kit)
Lights Nuts & Bolts Assembly Pkg.
Headlight Support Frames
Headlight Rings

Front Turn Signals: Mounting holes are pre-drilled. A gasket is included that fits between the body and the base. Amber lens attaches with 2 screws. Feed wiring harness wires through the rubber grommet in the base so that the connections between the light wires and harness wires are protected by the lens.

Front Marker Lights: Amber lights are sealed units that snap into mounting brackets. Brackets screw into pre-drilled holes.

Rear Marker Lights: Red lights are sealed units that snap into mounting brackets. Brackets screw into pre-drilled holes.

Back Up Lights: Cut outs are done for you. Fit rubber mounting grommets into cut outs then work in the round amber sealed lights. Lubrication eases this task.

Stop/Turn/Tail Light: Cut outs are done for you. Fit rubber mounting grommets into cut outs then work in the rectangular red sealed lights. Lubrication eases this task.

Headlights: Refer to diagram**.**

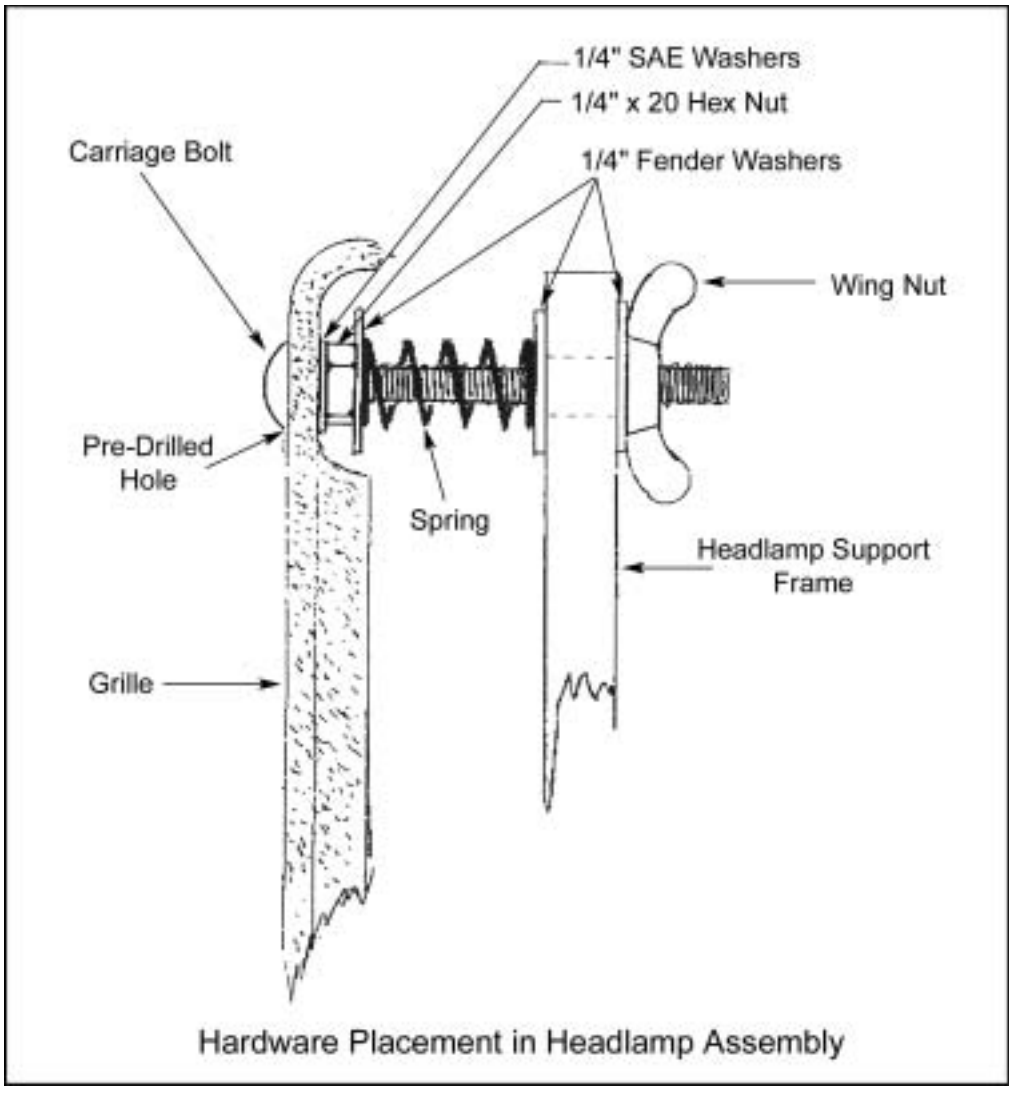
1.) Pre-assemble the headlamp Support Frame, Headlamp, and Retaining Ring. Line up the 3 notches on the Headlamp and Support Frame. Slip retaining ring over headlamp and line up the three small screw holes. Use the 8-32 x 3/8" screws provided to secure the three pieces together.

2.) Place carriage bolts through the 4 holes in the body by each headlamp opening. Use one 1/4" SAE washer and one 1/4"-20 hex nut to secure carriage bolts to body creating 8 fixed studs.

3.) On each stud place a fender washer, spring, and fender washer in that order. Refer to diagram.

4.) Place Headlamp Assembly over studs making sure that the top of the headlamp is actually on top.

5.) Put one fender washer and nylon wing nut on each stud and secure the assembly in place. Tighten wing nuts to adjust the headlamp to desired depth and angle.



Hardware Placement in Headlamp Assembly

License Bracket With Light: This should be mounted on the passenger side of the rear bumper, after the bumper and tire rack are mounted. Holes are not pre-drilled. Mounting screws are provided in the nut & bolt package. The bracket comes with a small bag of fasteners to fasten the license plate to the bracket.

20. Install Battery Box & Battery

Tools Needed
Drill & Bits

To Buy (or salvage from donor)
Battery
Battery Cables

From the Kit
Battery Box
Nut & Bolt Assembly Pkg

The battery box mounts to the pre welded mounting plate on the right rear frame rail using provided nuts and bolts..

21. Mount Horn

The horn can be attached directly to any of the available mounting points on the VW front beam suspension. The horn can be salvaged from your donor or purchased new.

22. Steering wheel

After the column is wired, if the steering wheel has been removed, or a custom one is going on the car, it should be installed at this time..

23. Gas Tank-

Tools Needed
- Drill
- Screwdriver
- Utility Knife

From the Kit
- Gas Tank Nut & Bolt Package
- Pkg Gasket material

To Buy or salvage from Donor
- Early Style Gas Tank
- Gas Cap

The Wombat requires an early style gas tank.

Before the tank is installed, replace or clean the in-tank fuel screen. A nice touch is to paint the exterior of the tank with satin black.

Outline the bottom edge of the tank, under the flanges, where it will contact the body with the gasket material.

Attach a length of neoprene gas hose to bottom of tank and secure with a hose clamp. Attach length of fuel tube to vent fitting.

Place the modified tank in the opening. There are nuts fixed in place in the gas tank mount holes. Reusing the retaining clips from your donor and the supplied bolts, secure the tank in place. Hook up the sending unit.

24. Hood & Hood Support Rod

Tools Needed
- Drill
- #10 Phillips Bit
- Utility Knife

To Buy
- 3M Spray Undercoating

From the Kit
- Hood Support Rod
- Hood
- Pkg Gasket material
- 2 Hood Hinges
- 4 Hinge Butt Gaskets
- 2 Hinge Strap Gaskets
- 2 Rubber Hood Latches
- Hood Nut & Bolt Package

Needs Update

If desired, undercoat or paint the bottom of the hood before installation.

Apply the self-adhesive rubber strip as a gasket along the edge of the hood indentation. Begin in the center rear and continue all around. Cut small v notches to turn corners cleanly. Press firmly into place.

Install the hood support rod on the drivers side of the trunk area using the 2 ¼" nuts and 2 washers supplied. Fit the plastic end cap on the hood support rod.

The holes for the hinges have been pre-drilled in both the body and hood. Mount the hinge (short side) to the body first, using the long oval head phillips machine screws (1-1/2"). Then mount the hood to the hinges using the short (¾") #10 oval head screws.

The rubber hold down latches mount in the pre-drilled holes with #10 x ¾"pan head machine screws.

25. Install Wiper Motors in Windshield Frame

Holes were drilled in the windshield frame during pre-mount. The shafts of the wiper motors can be shortened if desired for a cleaner look:

- Place a rubber washer on the shaft then position wiper motor in place with the shaft through the hole in the window frame. Place second rubber washer, metal trim piece, and nut on the shaft. Tighten the nut down..
- Count 4 threads out from the nut and mark this as the cutting location. Remove wiper motor from windshield frame.
- Run the nut only back onto the shaft. Now cut off only the outer threaded housing of the shaft at the mark. This can be cut with either a saw or a small tubing cutter. Be careful not to cut the smooth inner shaft.
- Now cut off an equal amount of the inner shaft so that it again protrudes 3/4" from the threaded outer housing..
- Clean up the threaded shaft by backing off the nut.

Mount the wiper motors to the windshield frame with the shafts through the hole pre-drilled before paint using the washers, trim piece and nut provided in the wiper kit.

Mount the wiper arms onto the shaft.

Secure the wiper motors to the Windshield Frame with #10 phillips pan head self-tapping screws. Drill pilot holes with 1/8" bit.

Run wires along the top support frame, securing with zip ties, to connect to the wiper motors.

26. Front Bumper & Brushguard

Tools Needed	From the Kit
Drill	Front Bumper
Bits	Front Bumper Bracket
Wrench & Socket Set	Brushguard
One helper	Front Bumper & Brushguard Nut & Bolt Package
Repair Manual	

Front Bumper: Mount the Front Bumper Bracket to the Angle Beam on side at a time using provided bolts, DO NOT REMOVE BOTH SIDES OR THE AXLE BEAM WILL DETACH ITSELF

Center bumper on bracket. Mark locations on bumper to match predrilled holes on bracket. Center Brushguard on bumper. Mark locations on bumper to match predrilled holes on brushguard tabs. Drill holes in bumper. Attach bumper to bracket using bolts supplied with your kit. Attach brushguard to bumper using bolts supplied with the kit.

27. Exhaust System

We recommend our optional custom exhaust system (muffler, exhaust pipes and hangers) designed to be used with a Baja header. See Appendix F.

We used an exhaust header: Thunderbird #4224 from Autosport: 1-800-344-2847

We suggest that you may want to sand lightly and paint black the muffler and exhaust pipes using a paint designed for barbecues. This looks good and prevents corrosion.

When installing the muffler adjust/rotate it in position to give maximum clearance from the body subframe on one side and the engine valve cover on the other. Leave enough clearance to service the valves.

28. Rear Bumper

Tools Needed	From the Kit
Drill	Rear Bumper
Wrench & Socket Set	Rear Bumper Brackets (2)
Marker	Rear Bumper Nut & Bolt Package

Insert brackets into tubes on body subframe. Center bumper on brackets. Mark and drill bumper to match bracket holes. Bolt Bumper into place using provided bolts.

Adjust Bumper to Body distance so that it lines up with the tire carrier, then drill frame and bracket. Secure using supplied bolts.

29. Mount Tire Rack

Tools Needed
Wrench & Socket Set

From the Kit
Tire Rack
Hinge Bracket
Pin Bracket
Safety Snap Pin
Tire Rack Nut & Bolt Package

Pilot holes were drilled out during the test-fit before paint.

Mount the tire rack hinge and pin brackets in the predrilled holes using the provided bolts. Mount the tire rack to the hinge bracket using the 1/2" x 2-3/4" Hex Cap Screws, nuts, and washers provided. Close the tire rack and secure with the safety snap pin.

30. Install Seat Mounts

Place your seats in the car, and determine where the mounting hardware will mount. Different seat companies use different systems, so follow their directions for proper installation. Any drilling that is to be done should be done before carpet is installed– *drilling through carpet is a very bad idea*.

31. Carpet/Floor Covering

You will have to decide on what type of interior you want. Possibilities include spray on bedliner, custom rubber mats, custom carpet, carpet kit from World Car Company. Our carpet kit consists of pieces that are glued in place onto the floor. Detailed instructions will come with your carpet kit.

32. Install Kick Panels

Put in position and attach with supplied self-tapping screws.

33. Install Rear Bench & Back (option)

Seat is attached to the body via carriage bolts. Template and detailed instructions come with seat.

34. Mount Seat Belts

There are gussets welded into the corners of the top support frame as attachment points for shoulder straps.

35. Running Boards

Trim and attach self-adhesive anti-slip tape to running boards.

36. Grille Decals

Your kit contains two 2" x 2' strips of self-adhesive black vinyl textured tape. Trim to fit in your grille. Remove backing and apply to your clean, painted grille. Be careful, the adhesive is strong and will stay stuck in the first place it touches.

37. Wombat Decals

Clean areas you wish to install decals.

Suggested Locations:

- Centered on nose section,
- Each front quarter panel in front of door openings
  Position at a height below the mirror mounts (rather than level with) so that the emblems are visible to a viewer at the rearward side of your Hummbug.
- Rear panel, on either side of engine.

38. Side Mirrors

The mirrors mount to the top of the door frame hoops using supplied bolts.

39. Mount & Hook Up License Bracket with Light

Mount the license bracket with light on the passenger side of the rear bumper. Use the pan head machine screws & nuts included in the kit. Holes are not pre-drilled. The bracket comes with a small bag of fasteners to fasten the license plate to the bracket.

40. Hard Top & Windows (option)

No details yet.

41. Soft Top & Windows (option)

No details yet.

42. Hard Bikini Top

No details yet.

43. Soft Bikini Top

No details yet.

44. Mount Finish Tires & Wheels

45. Test Drive

WOMBAT Assembly Manual

Photo Section

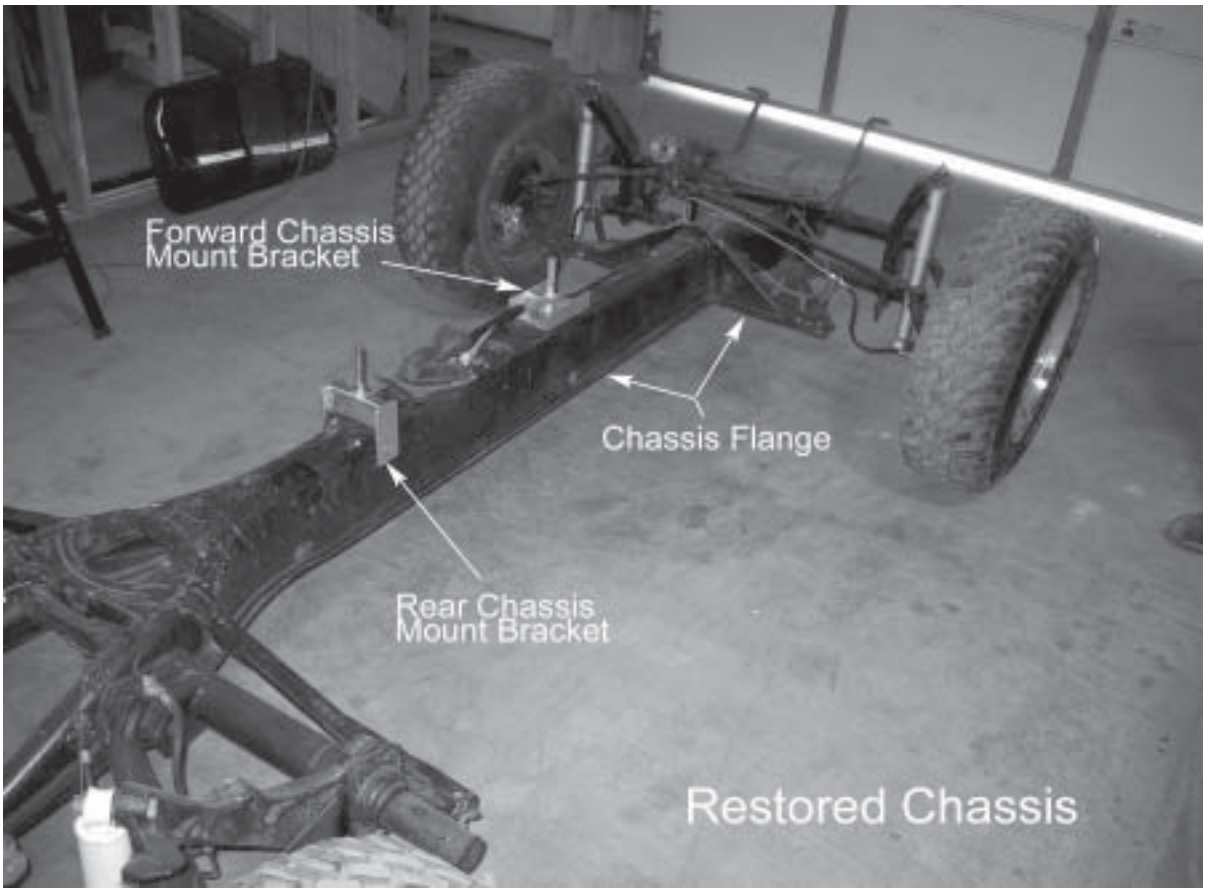


Figure 1. Refurbished chassis with floor pans removed. Bonding fixtures are in place. Rear clamping fixture fixes to the seatbelt mount holes. Front clamping fixture fixes to the shifter mounting holes. Picture is inaccurate as we reccomend using stock size used tire/wheel during the complete build up process. The smaller tires allow easier access to the chassis.

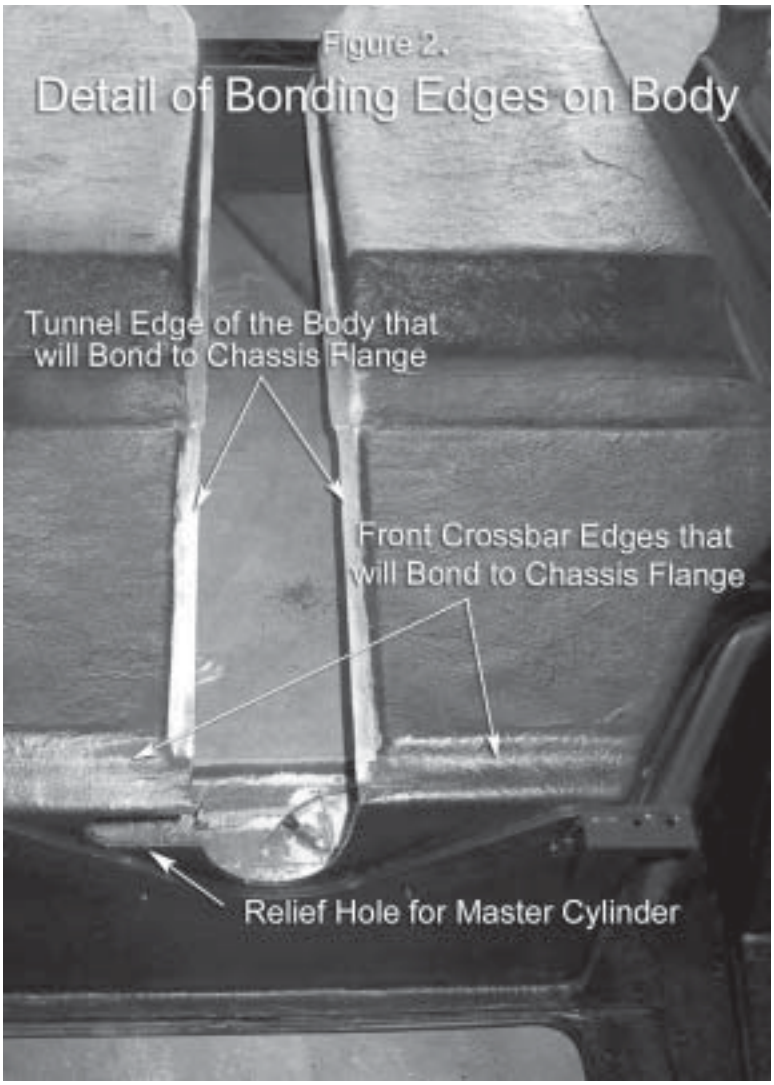


Figure 2.

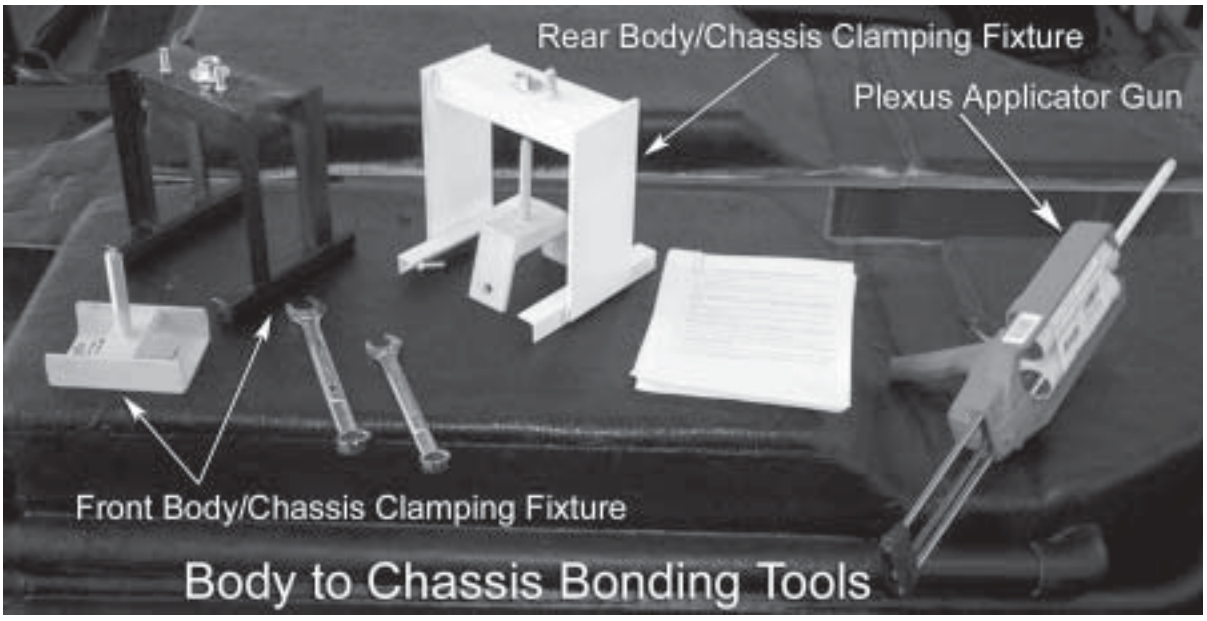
The body is inverted to show the detail of the body tunnel edge that will be bonded to the chassis flange. This may need to be sanded for the best fit.

Also visible is the relief hole for the Master Cylinder Plunger and mount bolts.

Figure 3.

Body to Chassis Bonding Tools.

Close ups of the body to chassis clamping fixtures and the Plexus Applicator Gun.



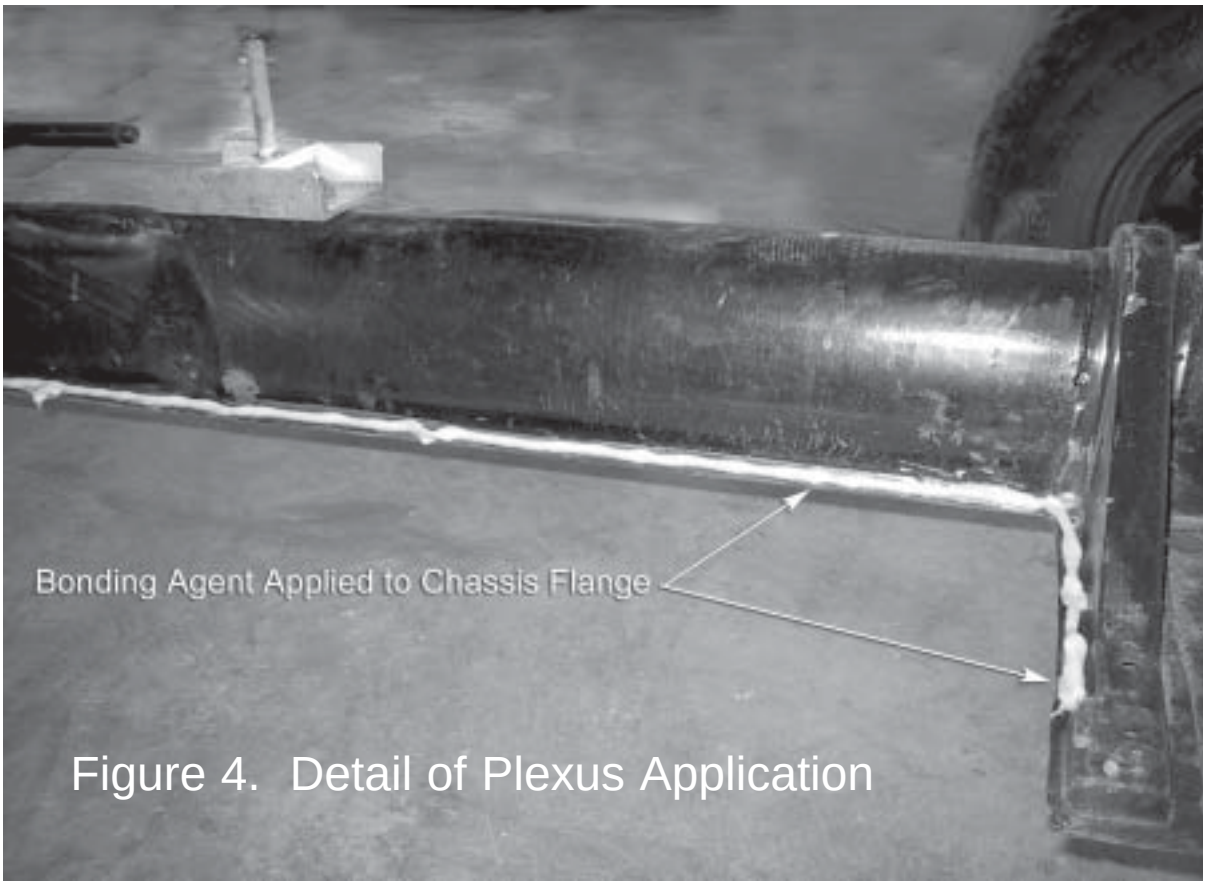
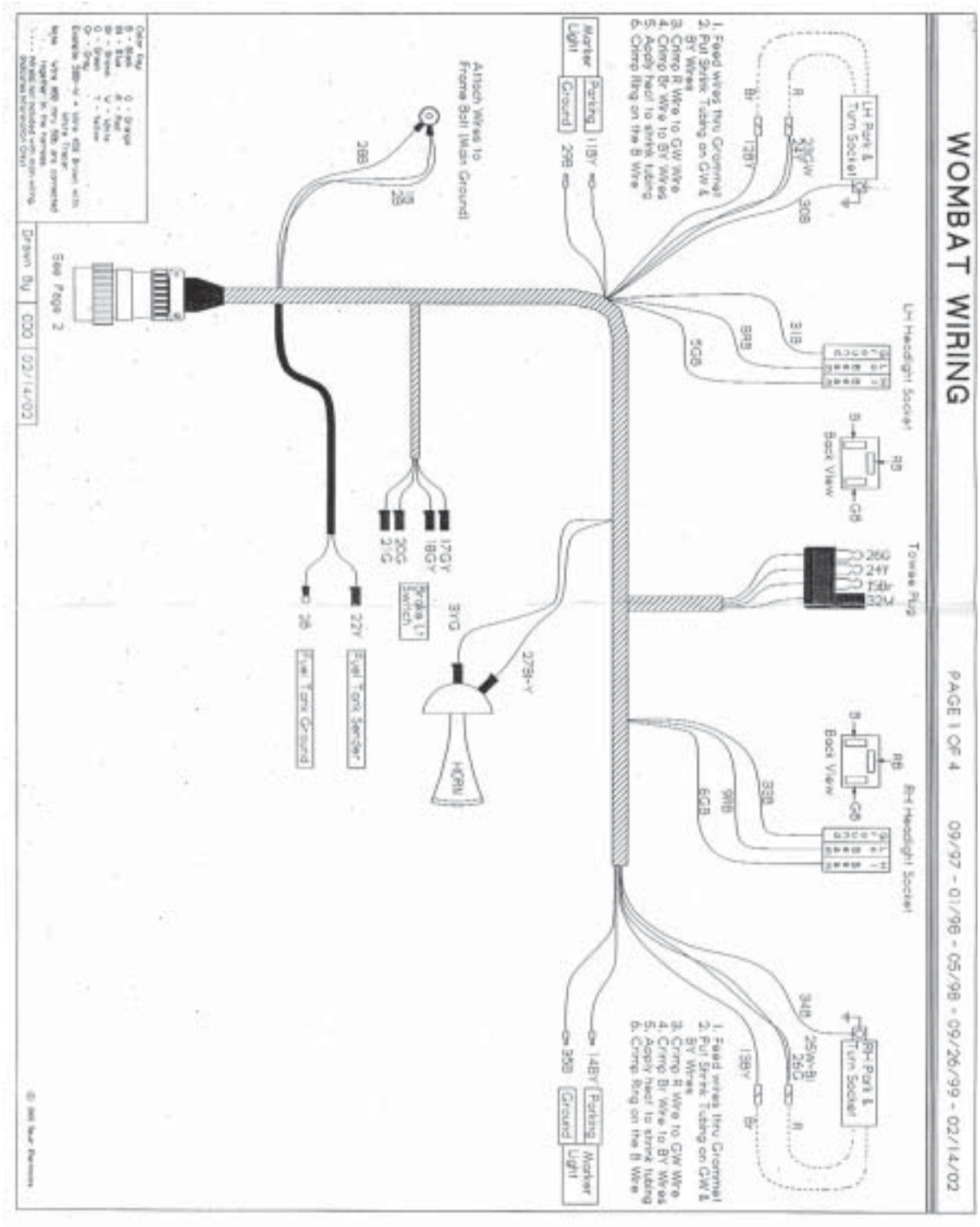


Figure 4. Detail of Plexus Application

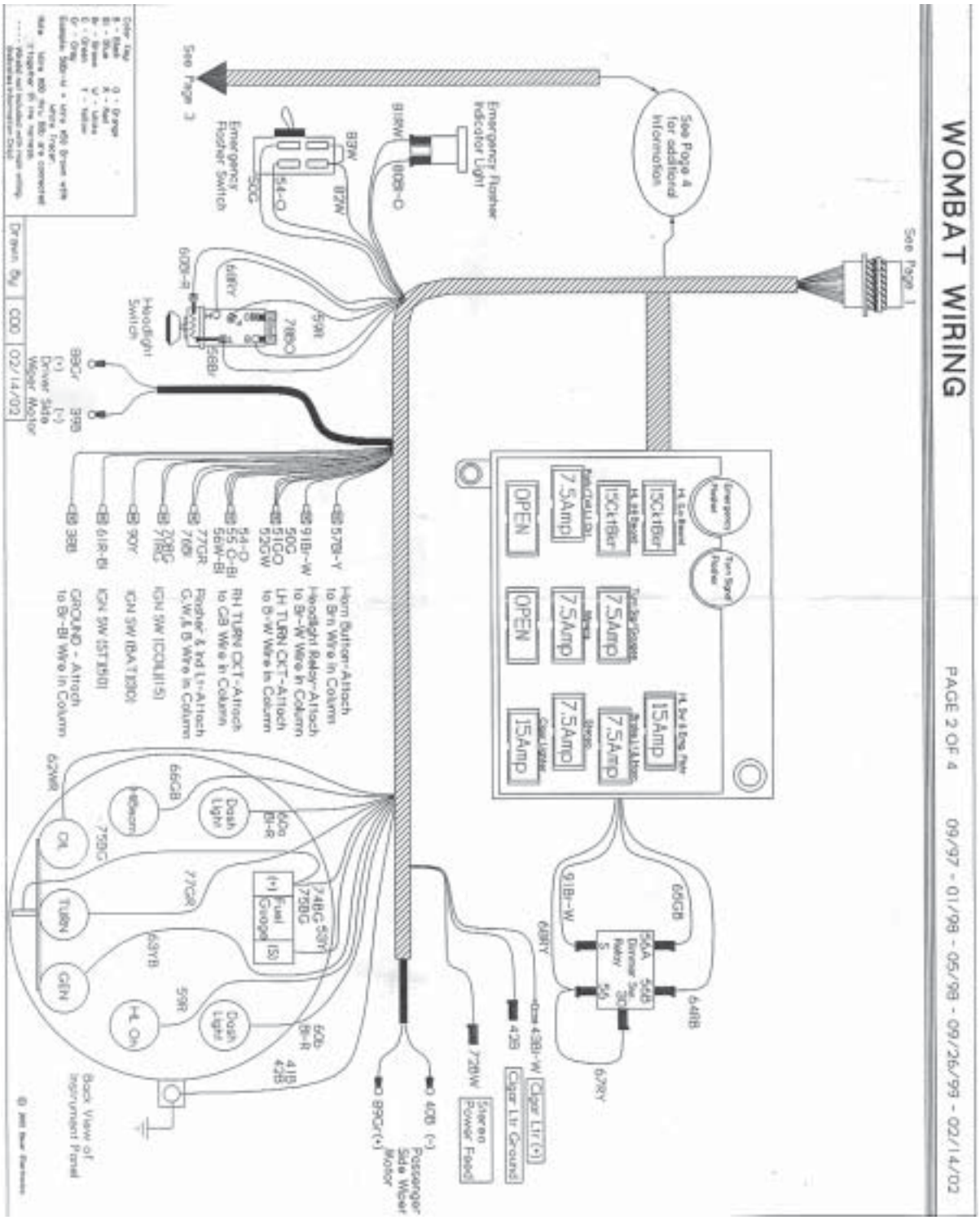
Figure 5

WOMBAT Assembly Manual

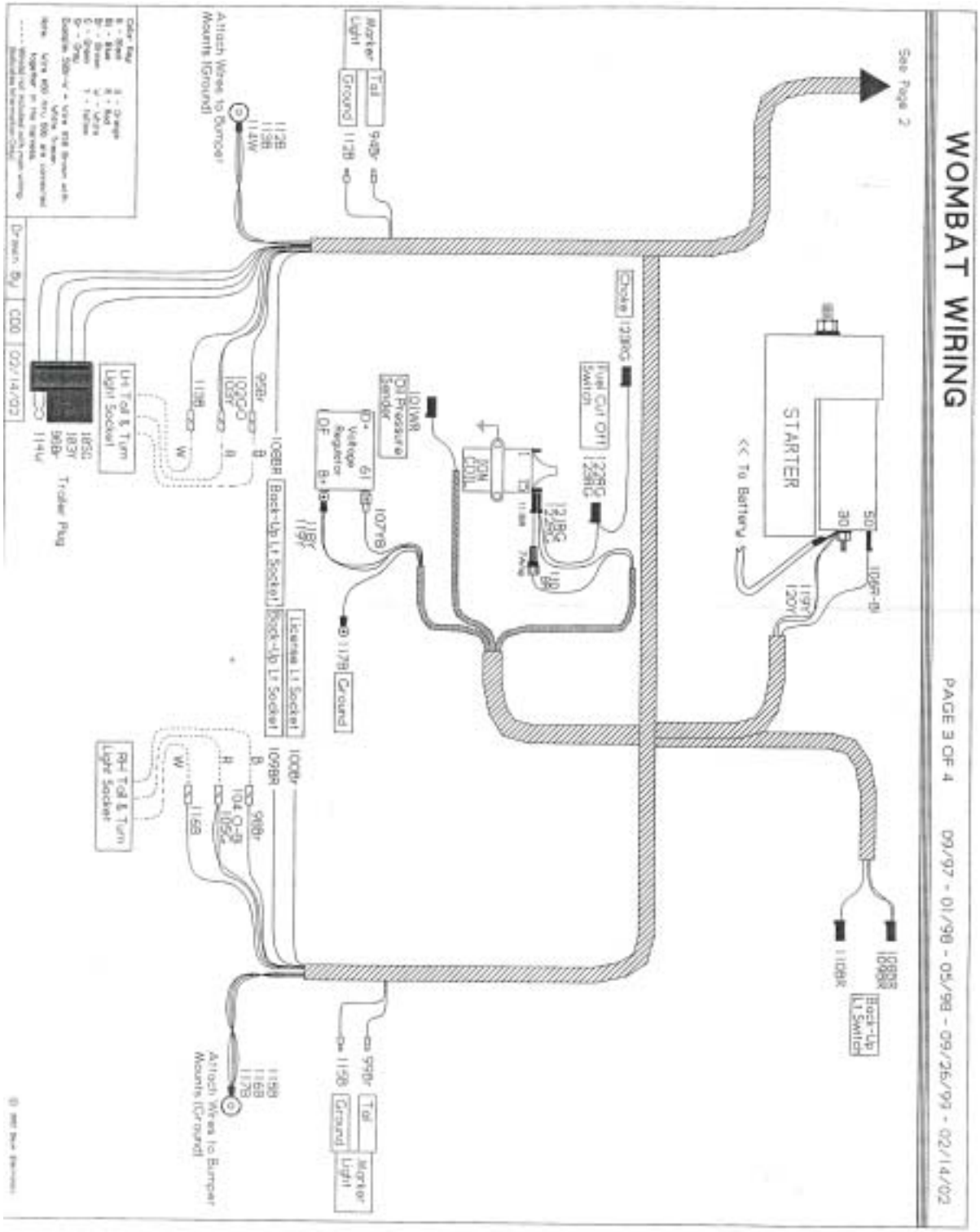
Appendix C: Wiring Harness Schematic



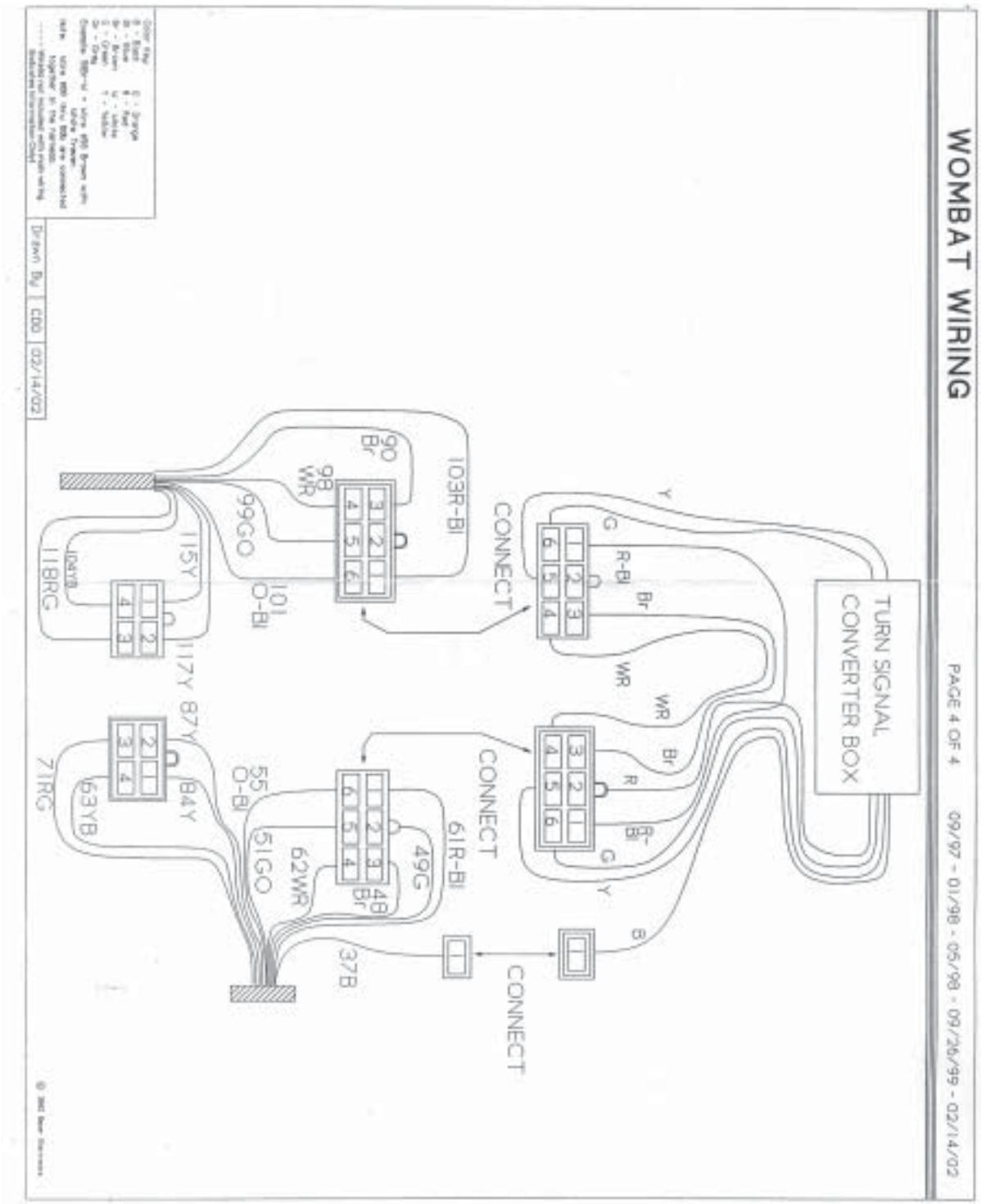
Appendix C: Wiring Harness Schematic Page 2



Appendix C: Wiring Harness Schematic Page 3



Appendix C: Wiring Harness Schematic Page 4



Hummbug™ Assembly Manual

Appendix H: Trannys, Tires, & Engines

Depending on your choice of engine, tire size, and year of donor transmission, you may need to exchange the transmission for one with a different ring and pinion for proper performance. Please consult a competent VW mechanic to assist in this decision.

Taller than stock tires change the effective gear ratio of the transmission. To maintain equivalent performance the gear ratio in the transmission must be lowered and/or the engine power output increased as tire height is increased.

Pre-1968 swing axle transmissions have a 4.37 ring & pinion. IRS transmissions 1968-'72 have a 4.12 RP, 1973 and later have a 3.88 RP. Re-built transmissions are readily available with your choice of ring and pinion for around $300.00.

Our prototype used a 1973 chassis with its original 3.88 RP IRS transmission, a 1776 cc, dual carbureted performance engine, and 29" tall Mickey Thompson tires. The higher horse power engine compensated for the 3.88 RP and tall tires providing adequate power and acceleration. When using a stock 1600 cc engine with anything taller than a stock tire we prefer a 4.37 RP transmission.

Our current shop demo is a 1973 chassis, using the original stock single carburetor 1600 cc dual port engine and P235 75 R15 traction tires. The original 3.88 RP '73 transmission with this engine and tire combination performed terribly. We swapped it for a rebuilt 4.37RP transmission which solved most of the problem. It could still use a little more power in fourth gear. We could do this by either installing a custom close ratio fourth gear or upgrading the engine.

The correct matching of engine, transmission and tires is a science. Please consult a professional.

Performance Formulae

Formulae courtesy of
Oregon Performance Products
PO Box 1715
Hillsboro, OR 97123
(503) 628-3409
http//www.spiretech.com/~opshroud

Factors That Must Be Known

1. Engine RPM (Revolutions per Minute)
2. Tire Radius in Inches (Tire Diameter divided by 2)
3. Ring and Pinion Ratio
4. Transmission Gear Ratio
5. Final Ratio = (Ring & Pinion Ratio x Transmission Gear Ratio)
6. Constant = 168
7. M.P.H. (Miles per Hour)

Formula to Determine MPH:

MPH = (RPM x Tire Radius) / (Final Ratio x 168)

Example: (4400 RPM x 16 inches) / {(4.59 x .88) x 168} = 70,400 / 675.36 = 104.2 MPH

Formula to Determine Cruising RPM

RPM = (MPH X Final Ratio x 168) / Tire Radius

Example: (65 MPH x (4/57 x .88) x 168) / 16 inches=43,898 / 16 = 2,743.6 RPM

Formula to Determine RPM Change when Shifting Up or Down:

(Present RPM / Present Transmission Gear Ratio) x Next Gear Ratio = New RPM

Example A, Shifting from 2nd (2.06) to 3rd (1.26) @ 4,400 RPM

(4400 / 2.06) x 1.26 = 2,135 x 1.26 = 2,691 RPM, a 1,709 RPM Drop.

Example B, Shifting from 4th (.88) to 3rd(1.26) @ 2,500 RPM
(2500 / .88) x 1.26 = 2,840 x 1.26 = 3,579 RPM, a 1,079 RPM Rise.

Some HUMMBUG™ Customers have found this company to be quite helpful with their transmission decisions:

Transform Company
2105 Cowles Street
Long Beach, CA 90813

800-508-7267 Phone
562-435-2966 Fax

Mail $3.00 for a catalog. See their ad in Hot VWs.

Quote from TRANSFORM COMPANY catalog:

Ever wonder why your Baja Bug, Thing, Manx, or Street Rail never has the power it should? Gets poor mileage? Suffers early engine failure? The answer is simple. When you installed those tall (27" to 33") tires, the effective gear ratios in the transaxle were changed dramatically. The stock ratios, so carefully chosen by the factory to optimize the VW engine, are now working against you. Big Time. The combination of bad ratios and greater wheel/tire moment of inertia commonly results in a 25% loss of power when the same bad ratios that kill performance also hurt mileage and engine life.

Fortunately, excellent performance is available with a well-planned change of ratios. At TRANSFORM we specialize in Baja ratios and take pride in providing effective, affordable solutions. We will take the time to analyze your exact needs, as these vary greatly with type of vehicle, terrain, tire diameter, etc. (please measure from ground to top of tire before you call.) Prices start as just $299. Look at it this way: the transaxle will pay for itself with added mileage and engine life. The great performance is free! All have great freeway drivability. NOW ON SALE!

	Price	***Ring***	***3rd***	***4th***	***Comment***
Baja #1	$299	4.37	1.26	.93	Great for shorter (26"-28") tires and/or small budgets.
Baja #2	$379	4.37 or 4.12	1.32	1.00 or 1.04	Low cost choice if freeway rpm is the problem.
Baja #3	$469	4.37 or 4.12	1.48	1.04	If stock 1st & 2nd ratios are OK , you win big in 3rd & 4th.
Baja #4	$489	4.86	1.32	.89	When more rpm is needed in 1st & 2nd as well as 3rd & 4th.