FORMULA
TANDEM DISC BRAKE MANUAL

THE OLDER ADJUSTABLE CALIPER
shown above is covered within this manual

A manual for the current self-adjusting caliper
can be downloaded from santanatandem.com

“Do I Really Need to Read This?”
Take the Pop Quiz on Page 3 to find out!

SANTANA
THIRD EDITION
November, 2004

Santana Customer Service: (909) 596-7570
MASTER CYLINDERS
COVERED IN THIS MANUAL
CABLE OPERATED REMOTE MASTER CYLINDERS

WITH STANDARD VENT SCREW

WITH TEST / RESET BUTTON

MASTER CYLINDER
NOT
COVERED IN THIS MANUAL
CABLE OPERATED REMOTE MASTER CYLINDERS

Special thanks to the many Santana owners who reviewed our manuscript and helped us to make this manual more useful.

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The Formula disc brake requires a different kind of thinking from other hydraulic and mechanical brakes, and it requires following instructions in order without skipping steps. For those who prefer not following written instructions, here’s a tongue-in-cheek quiz designed to snare even the most experienced bicycle mechanics.

And after you have failed the “Pop Quiz” on the next two pages, we invite you to sit back, relax, and spend some time getting to know the Formula brake.

**POP QUIZ**

Taking this 3-minute quiz will convince most people that they really do need to read this manual!

1. 95% of all problems with the Formula cable-hydraulic disc brake are caused by:
   A. Fluid leaking out of the system.
   B. Air leaking into the system.
   C. Worn pads.
   D. Cable tension.

2. What fluid must be used in this system?
   A. Certified bicycle disc brake fluid.
   B. DOT 5.0 disc brake fluid.
   C. Mineral oil.
   D. Any DOT, brake fluid that isn’t blue.

3. What type of store is least likely to stock suitable disc brake fluid?
   A. Wal Mart.
   B. A corner gas station.
   C. A country store.
   D. A good bike shop.

4. To check the cable adjustment of this brake, you’ll need:
   A. Good eye-hand coordination.
   B. allen wrenches and a screwdriver.
   C. Small pliers and a third hand.
   D. A large coin and a pen.

5. The first step in pad adjustment is to:
   A. Tighten the cable.
   B. Remove the rear wheel.
   C. Disconnect the hydraulic line.
   D. Loosen the cable.
6. Pad adjustment requires:
   A. Feeler gauges and allen wrenches.
   B. A flashlight and allen wrenches.
   C. Removal of the timing chain.
   D. A 2mm allen wrench.

7. The best way to avoid making a mistake when adjusting the pads is to:
   A. Use a ball-end allen wrench.
   B. Spin the wheel to check alignment.
   C. Pray.
   D. Keep one hand in your pocket.

8. Do what of the following to seat the pads:
   A. Tighten them.
   B. Loosen them.
   C. Score them with a file.
   D. Ride your bike.

9. After a long descent, the brake rubs. What should you do?
   A. Loosen the pads.
   B. Bleed off excess fluid.
   C. Squirt water on the disc.
   D. Loosen the cable.

10. Your bike has been sitting in a hot, parking lot, and the brake has locked up. You should:
    A. Loosen the pads.
    B. Bleed off excess fluid.
    C. Apply sunscreen.
    D. Loosen the cable.

11. New pads:
    A. Improve stopping power.
    B. Improve lever feel.
    C. Will squeal.
    D. Require 200 – 400 miles of break-in.

12. The person best qualified to service this brake:
    A. Has worked on motorcycles.
    B. Has been factory-certified to fix mountain bike disc brakes.
    C. Has tattoos and body piercings.
    D. Is holding this manual.

The final answer is always correct. This should be consulting only to those who havent yet read this manual.
INTRODUCTION

Our Drive. Congratulations! You own the best disc brake system available for tandems. Santana’s mission has always been to provide our customers with the finest bicycle technology. What’s the best way to control the speed of a tandem? For decades the answer has been two, rim brakes for stopping power, plus a mechanical, drum brake for heat dissipation. On paper, however, a hydraulic disc brake has always offered a number of advantages: While a tandem equipped with any type of hub brake can avoid the rim, tire, or tube failures caused by braking heat, a drum or mechanical disc isn’t powerful enough to safely replace a rim brake. Only a hydraulic disc offers enough power to replace a rear, rim brake, simultaneously dispensing with the complication of a third brake lever. The Formula disc brake shaves pounds from a tandem equipped with a drum brake, and is only ounces heavier than a tandem equipped with rim brakes alone. Finally, the advantage of hydraulic actuation is especially evident on the rear of a tandem, where cable stretch will always be an issue.

So now that disc brake systems have become widely available to mountain bikes, why are most tandems still equipped with a rear rim and/or drum brake? Answer: even the best mountain bike brake systems have limitations. They’re typically designed for bike/rider combinations of up to 225 pounds. On a tandem with doubled rider weight and significantly higher, downhill speeds, these brakes don’t have adequate stopping power. When this is ignored, and a single bike disc is installed on a tandem, the first extreme downhill will fry the system, permanently warping the rotor while incinerating brake pads, melting hydraulic lines, or vaporizing brake fluid. As if all of this weren’t enough to dissuade you, every hydraulic, disc brake designed for a single requires a proprietary brake lever, and these levers are invariably designed to fit the flat handlebar of a mountain bike.

In our dissatisfied state, we dreamt up an all-encompassing solution – a hydraulic disc brake made to tandem specifications. This brake would be powerful enough to replace a tandem’s, rear, rim AND drum brake, and could be combined with integrated brake/shift levers favored by the vast majority of today’s cyclists.

After discussions with every manufacturer of bicycle disc brakes, Santana reached an agreement with Formula, an Italian brake manufacturer with decades of experience manufacturing disc brake systems for racing motorcycles. Although Formula is not well known among American cyclists, their brakes have won more UCI World Cup downhill mountain bike races than all other brands combined. Our collaboration yielded a tandem specific disc brake with increased stopping power and additional heat capacity. The most obvious feature, however, is the remote master cylinder. This unique component allows Santana to provide tandems that combine unparalleled performance and control, with the expected convenience of modern, integrated controls.

Why Only One Disc Brake? Some folks have wondered about having a disc brake on the front as well as the rear. A traditional, bicycle, rim brake is, in fact, a disc brake, one that is incomparably light and elegantly simple in operation. A tandem needs just ONE non-rim brake to dissipate heat that would otherwise cause rim or tire failure. As a heatsink, a disc brake will function equally well at either end of the bike.
But Shouldn’t this Brake be in Front? There are many reasons this brake has been mounted at the rear of your tandem as opposed to the front. Primary is the fact that on the front of a tandem, where the rearward center of gravity prevents an over-application of the front brake (and the consequential trip over the handlebars), braking power will always be more important than modulation. As a front brake, an unarticulated V-brake (one without a parallel-push mechanism) still reigns supreme. On a rear wheel, where a skid creates longer stopping distances and loss of control, the superior modulation of a disc allows aggressive application at the very edge of lock-up. In summary, if you replace a tandem’s front V-brake with a disc, decreased power will lead to longer emergency stopping distances. But when you replace a tandem’s rear V-brake with a disc, increased modulation allows shorter emergency stopping distances. As if the above weren’t reason enough, cable stretch makes any tandem’s rear brake far less efficient than its front brake. Since hydraulic actuation, unlike cable actuation, is unaffected by length, on a tandem, the best combination is a cable front brake and hydraulic rear brake. For these reasons it makes better sense to mount a tandem’s disc brake at the rear wheel. Additionally, due to Santana’s 160mm rear spacing, we have plenty of room for our brake’s larger disc and more powerful calipers. The spacing constraints of a road tandem’s standard, front fork means that using a front disc requires either a special, wider, nonstandard hub and fork or a severely dished, front wheel that is prone to collapse during a tandem’s low-speed turns. While we’re comfortable redesigning any component we believe deficient for tandem use, fact is, we believe our front wheels and forks are the best designed products.

Surviving the Mother of All Descents. As long as the descent is straight enough, few teams will overheat a rim, drum or disc brake. The explanation is simple: As long as you and your partner don’t mind riding fast, wind resistance will hold your speed in check, even on a long or steep hill.

Overheating typically occurs on a steep descent where the road is so curvy, rough, or crowded that a speed of less than 45 mph is required. Some roads are so twisted or rough as to require a speed of less than 15 mph. In these cases a tandem can burn out a brake or blow a tire within half a mile. No brake, not even the Formula, will endure a mile of 18% descent, if your speed is constrained to 15 mph. The best brakes, however, such as the Formula disc and Arai drum, for holding a tandem’s speed in check, will progressively fade, instead of failing without warning.

Given this situation, the following is the best strategy for steep, slow descents: On a treacherous downhill, use the Formula Disc Brake to control your overall speed. Use your rim brake only sparingly, such as braking for a particular switchback or to help you maneuver around a chuckhole.
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CHAPTER 1
A DIFFERENT KIND OF BRAKE, THINKING, AND SERVICING

Some of the features that distinguish the Santana/Formula hydraulic disc brake from disc brakes found on other bicycles are the following:

**To Tighten this Brake, Loosen the Cable.** A hydraulic, disc brake with a cable-actuated, remote, master cylinder is unlike all other bicycle brakes. With this unique brake, the characteristics, lever feel, and adjustment procedures are different than other brakes. For instance, your experience with rim brakes might cause you to think that the cable of a perfectly adjusted, Formula disc brake is too loose.

When someone discovers the situation, 99% of enthusiasts and mechanics will find the adjuster and tighten the cable to achieve a firmer lever feel. While the lever will FEEL better, an overtightened cable will not improve stopping power, and will cause problems that might not emerge for weeks. OVER-TIGHTENING THE CABLE BY EVEN THE SMALLEST AMOUNT WILL INEVITABLY CREATE PROBLEMS WITH THE HYDRAULIC SYSTEM.

Because living with a new, disc brake involves relearning old tricks, DO NOT ATTEMPT ANY READJUSTMENT UNTIL YOU’VE READ THIS MANUAL AND FAMILIARIZED YOURSELF WITH THE OPERATION OF THIS BRAKE.

Since the operation of this brake is not intuitive, we believe your safety and ultimate satisfaction will depend on your willingness to read this manual and learn how to adjust the pads and cable tension. If you were not proficient at making gear and brake adjustments on your previous bikes, we encourage you to reevaluate your choice of brakes with your dealer.

If the time comes that you have this brake serviced by a dealer, please make sure they have a copy of this manual. If they don’t, loan them yours.

As the Formula brake heats up, the brake lever will feel firmer as expanding fluid “pumps up” the system and seems to pry the lever from your fingers. To reset the feel, it is necessary to only momentarily release the lever to allow the expanded fluid to reach the master cylinder reservoir. Flicking the lever open once every quarter mile is all it takes to maintain a good lever feel. Later, as the pads and rotor get very hot, fading will occur, causing you to have to squeeze the lever progressively tighter to maintain consistent braking. Finally, when the disc brake has faded to the point that you can no longer use it alone to maintain your desired speed, the only safe thing to do is to use the front rim brake to bring the bike to a complete stop. Within five minutes, less on a cool day, the disc and pads will have cooled enough to allow you to safely continue.

“It FEELS All Wrong!” Our most often encountered criticism from new owners is that the brake feels “mushy.” On a normal, rim brake, this would be an understandable concern. A spongy-feeling, rim brake is usually caused by energy-robbing flex of the brake arms, brake pads, cable, and cable housing. Fortunately, that’s not the case with a hydraulic, disc brake. As we’ve said before, this brake requires a different way of thinking. While we could “fix” the lever feel by trading brake modulation for decreased lever throw, the result would be on-off braking with too-little leverage to allow the power of your hand to
control a heavily loaded tandem. Instead, this entire brake system was designed to take advantage of every bit of stroke available with today’s drop bar brake levers. This not only improves stopping power, your hands have more strength when they’re clenched as opposed to fully outstretched. That is, we’ve geared the lever so its most effective range of modulation occurs where you have the greatest hand strength and are, therefore, least likely to encounter hand fatigue.

The important thing to remember is that as long as the lever feel is a bit soft or spongy, your new brake is probably operating correctly. If the lever, instead, feels firm, like a traditional rim brake, something’s definitely wrong.

**Not Enough Stopping Power.** The Formula disc brake, like the disc brake on cars or motorcycles, requires a break-in period. While a car’s power-assist masks the initial inefficiency of a new brake, on bicycles and motorcycles the braking improves dramatically once the pads have been seated and readjusted. Within 200 – 400 miles (and after you have seated and readjusted the pads), we think you’ll agree this brake provides great control, fantastic modulation, and incredibly short, stopping distances.

**Opposing Caliper Pistons.** Formula was the first to employ this design in a bicycle brake, instead of less expensive, single-sided systems. This design avoids the rattle and rub inherent to systems with floating discs or calipers.

**Positive Pad Retraction.** Many bicycle disc brake systems are “blessed” with the same pad retraction system used on cars and motorcycles. If you ever get the wheel of a car or motorcycle off the ground, spin it, and you’ll see what we mean. Positive pad retraction means a properly seated and adjusted, Formula disc brake is absolutely quiet and friction free.

**203mm (8 inch) and 255mm (10 inch) Rotor.** Santana’s tandem-specific version of Formula’s best brake uses the largest diameter rotor available to bicycles today. The large disc increases the brake’s mechanical advantage, stopping your bicycle quickly, while maximizing heat dissipation and minimizing pad and rotor wear.

**Insulated and One-Piece Rotor.** Really powerful, racing motorcycles use an insulated (riveted) rotor that survives temperatures that would permanently warp a one-piece rotor design. Santana’s new one-piece rotor performs as effectively with less weight.

**Remote Master Cylinder.** By mounting the master cylinder and fluid reservoir on the down tube, our design fights cable stretch and allows you to use any traditional, cable-operated, brake lever on the market. Whether you prefer STI or Ergo (or even old Suntour), you can combine this brake with your favorite lever.

**Automatic Heat Compensation.** Every time the lever is released, even for a split second, the system automatically adjusts itself to compensate for changes in heat and atmospheric pressure. The Formula brake, unlike many others, won’t rub or “pump-up” during a long descent.

**Sealed Reservoir.** Because bicycles are commonly stored, serviced, or transported on their sides or even upside down, bicycle disc brakes need a tightly sealed, fluid reservoir that can resize itself without leaking. The Santana/Formula, remote, master cylinder includes a variable-capacity, sealed, fluid, reservoir more advanced than any you’ll find on a car or motorcycle.
CHAPTER 2
ADJUSTMENT PROCESS – BEGINNING

Before adjusting your brake, take time to read this chapter thoroughly. This brake is quite unlike other cable or hydraulic, disc brakes used on bicycles, and it requires that you follow the adjustment directions step by step. SKIPPING A STEP OR REVERSING THE ORDER OF TWO STEPS IS LIKELY TO RESULT IN POOR BRAKING.

Perhaps the most difficult feature of this brake to understand is how the plunger assembly is depressed. While in most brakes the cable pulls the brake, in the Santana/Formula brake, the cable is solidly anchored within the master cylinder and does not pull anything. Instead, the brake lever pushes the brake cable housing to depress the piston inside the master cylinder. This approach (pushing a piece of housing instead of pulling a cable), while counterintuitive, is supremely efficient. Once you can visualize the relationship, adjustment becomes quite simple.

As the pads seat and wear, they will need to be adjusted closer to the rotor. While a bicycle rim brake may sit a few millimeters away from the rim, the clearance between the pad and the rotor of a disc brake will be a few hundredths of a millimeter. In making such a precise adjustment, an essential first step is to be sure that there is no hydraulic pressure pushing against the back of the pad. The easiest way to be certain of this is to loosen the cable all the way.

There are two barrel adjusters for the cable. One, for fine adjustment, is aninlineadjuster 3 – 4 inches above the frame-mounted, master cylinder. The other, for coarse adjustment, is on top of the master cylinder.

1. Loosen theinlineadjuster by turning it counter-clockwise (looking from above from the captain’s perspective), until the chrome, cable housing ferrule recedes into the barrel adjuster.

2. Expose the other adjuster by pulling back the domed, black, rubber boot to expose the red-anodized, domed adjuster with the adjacent, red, knurled, lock ring.

3. Unlock the lock ring from the domed adjuster with a fraction of a turn.

4. While holding the underlying, silver plunger with the thumb and forefinger of your right hand, to prevent it from rotating, use your left hand to rotate the lock ring to the base of the plunger’s threads.

5. Rotate the domed adjuster against the lock ring, until no threads show on the plunger.

6. Pull back the other, black, rubber boot at the top of the master cylinder housing to the lock ring.

7. Without tools, pull the plunger mechanism away from the pump body, creating a 2mm gap. Looking into the gap, you should see the back of the piston. If you see something, and you’re not sure it’s the back of the piston, use the plunger to push against it. The piece that the plunger
engages and depresses is the piston; the main working part of the entire pump system.

If nothing is visible, and the plunger moves into the pump body 3 or more millimeters, before touching anything, a vacuum has formed on the face of the piston, which prevents proper operation. Because a system “in vacuum” cannot be adjusted, normal operation of the brake is not possible, until the problem is solved (Chapter 8).
CHAPTER 3
ADJUSTMENT PROCESS – CHECKING AND ADJUSTING CABLE TENSION

It takes only 60 seconds with the aid of a quarter and a pen or pencil to verify proper cable tension. While the brake pads and the hydraulic system will not need frequent adjustment, we do recommend checking the cable adjustment before every major ride, or any time the brake does not seem to be performing properly. It is NOT that this brake is finicky or comes out of adjustment, but it has been our experience that well-meaning enthusiasts fascinated by this cool-looking brake will invariably squeeze the lever and decide that the cable is a bit too loose. Half of these people will help you out by tightening the cable’s barrel adjuster. They’ll walk away satisfied that they’ve done you a big favor. This seems to happen whenever you park your bike and then turn your back for as little as thirty seconds. It is most likely to happen when your bike is in or near a bike shop. While the cable that operates this brake cannot possibly tighten itself, many enthusiasts have become dismayed at how often the cable needs to be loosened. What follows is the 60 second method for optimizing cable tension and averting 95% of the problems that can occur with a cable-hydraulic, disc brake.

1. Remove the slotted vent screw at the top of the master cylinder with a screwdriver, quarter, or key.

2. Press on the master cylinder float with the blunt end of a pen or pencil.

   If the float doesn’t move, the cable is too tight.

   If the float does move, the brake pads will move toward the rotor. Verify the braking effect by rolling the bike back and forth.

3. Repeatedly let up on the pen, tighten the cable half a turn, and push down on the pen, until the cable becomes too tight, and the brake can’t be applied by pushing with the pen.

4. Loosen the cable just enough (usually half a turn) to restore float movement.

   The cable is now perfectly adjusted.

5. As a final check, depress the float one last time to make sure the passageway between the fluid reservoir and the remainder of the hydraulic system is not blocked.

   Blockage of this passageway is the first step leading to system failure.

Now you understand the unique characteristic of this system. BIKE MECHANICS AND ENTHUSIASTS ACCUSTOMED TO ADJUSTING A BRAKE ACCORDING TO LEVER FEEL WILL AUTOMATICALLY OVERTIGHTEN THE CABLE OF THIS HYDRAULIC BRAKE EVERY TIME.
CHAPTER 4
ADJUSTMENT PROCESS – ADJUSTING PADS

The performance of a new disc brake is NOT impressive. Within two months, however, you’ll be amazed by the power and modulation of this disc brake.

Car and motorcycle mechanics talk about “seating” or “breaking-in” pads on disc brakes. By this, they mean wearing the new pad until the face of the pad is parallel (more correctly, “coplanar”) with the face of the rotor. Until new pads are seated, only a corner or edge of the noncompliant pad will be able to make contact with the disc. A new or unseated pad has two problems: reduced braking power and more caliper flex.

If you use the Formula disc brake as your primary brake, the pads should seat in no more than 200 – 400 miles, and require two readjustments. As you wear-in the pads and readjust the brake (by tightening the pads and NOT the cable), the power and feel of your new brake will improve dramatically.

Typically, the brake’s first pad adjustment should be performed after about 100 miles. Some bikes may need the service a little sooner, if the captain brakes frequently. Do not proceed, until you have adjusted the cable (Chapters 2 – 3).

The $150 Mistake, and How to Avoid It. It is possible, with a small wrench, to strip or split the adjusting screw. Avoid forcing the wrench when adjusting the brake pads. Most broken adjustment screws occur on the inboard pad (the one closest to the spokes) of the caliper and are the result of spinning the wheel or moving the bike without, first, removing the wrench. We advocate keeping one hand in your pocket while adjusting the inboard pad of your tandem’s disc brake. This way, you won’t try to spin the wheel with one hand while holding the wrench with the other.

The Procedure. To adjust the inboard pad, you will have to insert the allen wrench between the spokes of the rear wheel to reach the adjuster. Both pads adjust independently. Please note that you cannot loosen a pad which has hydraulic pressure forcing it toward the rotor. While you can loosen the adjustment screw (counter-clockwise), the pad will NOT move away from the rotor, and if you continue to turn the screw, you will only succeed in letting fluid out of and air into the system. The sign that you have done this will be a wet wrench and fluid weeping from the grommet. Bad, very bad. Because it is all-too-easy to inadvertently do this while loosening a pad, NEVER attempt to adjust a pad, until the cable is totally loose (Chapter 2).
Necessary Tool
2mm allen wrench – straight with screwdriver handle.

A ball-end, allen wrench may be easier to use, but its decreased working surface can split the adjusting screw.

1. The best way to attain proper pad adjustment is to turn the screw clockwise, until you feel resistance. The resistance you feel is the pad pressing against the rotor. At this point, turn the wrench counter-clockwise, until the pad no longer rubs when the wheel turns. With a new, unseated pad, you may have to back off the adjustment by half a turn. Later, when the pad is seated (or coplanar), one-eighth (1/8) of a turn is all that will be necessary. Do not pull the brake lever.

Every Hadley hub has four contact seals that can create significant drag when new. It is easy to mistake this drag for brake drag and consequently over-loosen the pads, compromising performance or the integrity of the system.

Congratulations! You have properly adjusted the brake pads. Once you get good at it, the above process can be accomplished in 90 seconds.

2. Reset the cable tension (Chapters 2 – 3).

Notice that you performed an entire brake adjustment without squeezing the brake lever once. Don’t be surprised if once you’ve seated the pads and taken the above steps in the proper order, you can pull the brake lever to the handlebar. The combination of cable stretch, housing compression, and brake lever flex make this possible. However, if by using one finger, only, you can easily squeeze the lever to the handlebar, the only remain cause for excess lever travel must be air inside the system, requiring bleeding of the system (Chapters 6 – 7).
CHAPTER 5
CHECKING PAD WEAR AND REPLACING PADS

As of this writing, it appears most enthusiasts will obtain 4,000 – 5,000 miles of use from a set of brake pads. As the pads wear, they move away from the caliper, increasing the volume of brake fluid needed at the caliper. This causes the fluid level to drop in the master cylinder, causing the piston to lower, which can close the system, locking it. Pad wear can be checked by insuring that there is more pad thickness than the thickness of a quarter.

When pad wear becomes critical, fluid will leak from the caliper adjusting screws. To avoid having to bleed the system, check pad wear whenever the brake is adjusted.

Third party pads can be thicker than Formula specification, requiring splitting the caliper to install them.

Checking Pad Wear on Adjustable Caliper

Necessary Tool (adjustable caliper)
2mm allen wrench.

1. With a new pad installed, the adjustment screw can be backed off only a bit more than one-half (1/2) turn, before you feel increased resistance, as the pad bottoms out against a rubber O-ring. It is important not to turn the wrench beyond this “soft stop,” as pinching the O-ring will instantly let fluid out of and air into the system. A wet wrench is the sign you’ve lost the system’s integrity.

2. Count the turns required to tighten the brake pad against the rotor. If two-and-three-quarter (2 3/4) turns or more are required, the pad is worn out and should be replaced. Unlike a car, where a worn out pad will score the rotor, a worn out Formula pad will result in fluid loss that occurs after the adjustment screw is threaded too far in.

While replacing the pads sooner might seem prudent, because new pads can require 200 – 400 miles of use before becoming fully seated, it is best to stick with the old pads, until there are at least two-and-a-quarter (2 1/4) revolutions of adjustment screw travel.

Replacing Pads

Necessary Tools
2mm allen wrench.
Flat-blade screwdriver or putty knife.
New set of brake pads.

1. Loosen the cable completely (Chapter 2).

2. Remove the rear wheel.

3. Loosen the two, 2mm, allen adjusters, one on each side, to the soft stop. Warning: loosening past the soft stop will let fluid out of and air into the system.

4. Put a flat-blade screwdriver or putty knife under the edge of a pad, and pry upward. Formula brake pads snap in and out exactly like the snap on the front of a pair of jeans.

5. Snap the new pad in place by pressing against it with the flat face of a screwdriver.

6. Insert the wheel.
7. (Adjustable caliper) Tighten each pad using the adjustment screw until it hits the rotor, and then loosen it one-half (1/2) turn.

If the pad still rubs, it is only touching on one edge or corner, and with a few miles of use with aggressive braking, the protruding edge will wear away.

Carry a 2mm allen wrench with you on your next few rides, so you can take up the slack as the pads become seated. Important: always loosen the cable (Chapter 2), before adjusting the pads.
CHAPTER 6
BLEEDING PROCESS – BEGINNING

Air in the hydraulic system can cause brake failure, since gas, unlike liquid, can be compressed.

Unless you open a seal that allows fluid to escape and air to enter, the only time you’ll need to bleed the system is after you’ve changed the fluid. Because brake fluid degrades over time (which lowers its resistance to boiling), most mechanics will advise you to replace the fluid every two to three years.

Even if you don’t need to replace the fluid, the process of bleeding the brake requires you to add brake fluid. Fortunately, the Formula, hydraulic system uses ordinary DOT brake fluid – the stuff found in 99.9% of all cars, trucks, and motorcycles. For an exasperatingly long explanation of various DOT fluids and their boiling temperatures, you may refer to Chapter 10.

**How Tight is Tight?** A problem we’ve periodically seen, is a rubber part of the hydraulic system breaking through overtightening. While car and motorcycle mechanics long ago learned to “go easy” when tightening hydraulic fittings, most of us have not learned the distinction between metal-on-metal and metal-on-rubber tightness. Learning this distinction is especially important when adjusting the pads on the adjustable caliper (in either direction), tightening the bleed valve on the caliper, or reinstalling the 3mm, bleed screw on the master cylinder. For these fittings, we recommend “light-bulb-snug” as opposed to “lug-nut-tight.” If fluid doesn’t seep out when squeezing the brake lever, it’s tight enough to do its job.

**What Fluid?** If you need to bleed your bike’s brake before tomorrow’s ride, it’s okay to use DOT 4 brake fluid, which can be found anywhere motor oil is sold. Otherwise, if replacing all the fluid, we recommend searching out DOT 5.1 (Motul is a brand stocked by better motorcycle shops). If you have trouble finding DOT 5.1, contact Santana, and we can ship some to you. DO NOT USE “bicycle” brake fluid, mineral oil, or DOT 5 (blue) brake fluid. (Chapter 10 explains the salient differences in brake fluids.)

**Find a Good Spot.** Bleeding your brake is best performed in your driveway or a workshop. Because brake fluid is incompatible with good flooring, and splattered droplets will soften paint if not cleaned off within a few minutes, this is not a kitchen table operation.

1. Loosen the cable (Chapter 2).
2. Determine pad wear (Chapter 5).
3. Adjust the brake pads on adjustable caliper.

Combining pad replacement with fluid replacement can save labor. To attain optimal performance, the pads should be properly adjusted BEFORE bleeding the system (Chapter 4).
CHAPTER 7
BLEEDING PROCESS – BLEEDING

NOTICE! Brake fluid containers feature a warning label. Read it. Be especially careful when compressing the syringe. If the clear plastic bleed hose blows off the bottom of the syringe, getting fluid in your eyes is very painful to say the very least.

Because the master cylinder and the caliper are both self-sealing (there are spring-loaded check-valves within the red anodized connectors), these pieces won’t leak when the hydraulic line is disconnected. The hydraulic line, itself, however, can weep a bit when one end is disconnected, and will drain completely if both ends are disconnected. Therefore, the bleed process is typically a bit neater if you always leave one end of the line connected.

Warning: if after you disconnect the line at the caliper (per the above instruction) someone squeezes the brake lever, your disconnected brake system becomes a toxic squirt gun. When working in an area where someone might squeeze the brake lever, the recommended process is to disconnect both ends and catch the fluid seepage in a rag or handfull of napkins.

Necessary Tools
DOT brake fluid.
Formula Bleed Kit which contains:
- Syringe.
- Small clear plastic hose.
- Large clear plastic hose.
- Two brass fittings.
- 6mm white nylon spacer.
- Allen wrenches – 2, 3, 4, & 5mm.
- 8mm box or open-end wrench.
- Flat-blade screwdriver.
- Shop glasses or safety goggles.

Bleeding Caliper

1. Disconnect the hydraulic line where it enters the caliper. The red part should stay with the caliper, and the silver part should remain with the hydraulic line.

2. Attach the slotted, brass fitting with the knurled nut onto the Formula syringe.

3. Draw in 10ml of brake fluid from the brake fluid container. DOT 5.1 is recommended (Chapter 10).

4. Thread the brass fitting of the syringe onto the red fitting of the caliper body.

5. Remove the caliper from the mounting bracket by removing the horizontal, 5mm, allen bolts. Watch for any washers that will need to be replaced in the same position. (Do not remove the vertical, 4mm bolts, since this will require readjusting the caliper angle.)

The caliper is free of the bike and dangling from the half-filled syringe.

6. With the red fitting of the caliper pointed upward and the syringe held vertically above it, use a downward stroke to pump in new fluid and compress the pads, until they touch each other. Use an upward stroke to extract fluid with bubbles. Continue pumping down and up with the syringe to pump in fluid without bubbles and extract fluid with bubbles. Tapping the caliper with the handle of a screwdriver will loosen bubbles that would otherwise stick in the corner of an
internal cavity. With enough pumping, tapping, and other gyrations, you should finally get to a point where no more bubbles appear on the upstroke.

Congratulations! You have successfully bled the caliper. With experience, you can do this in 60 seconds.

7. Reinstall the caliper onto the frame.

8. Remove the syringe from the caliper, and reattach the lower end of the hydraulic line.

**Bleeding Master Cylinder**

1. Remove the master cylinder from the down tube by removing the 4mm, allen bolt.

2. Remove the master cylinder’s bleed screw by carefully using a 3mm, allen wrench.

Warning: the pointed end of the bleed screw tightens against a small, rubber O-ring, which occasionally sticks to it. Watch for it. Don’t lose it. If, when you remove the bleed screw, you don’t see the O-ring, that’s good news – it remained seated at the bottom of the bleed port.

3. Remove the slotted, brass assembly from the syringe’s clear, plastic, bleed hose, and replace it with the threaded one.

4. Fill the syringe with 20ml of DOT brake fluid.

5. Thread it into the bleed screw opening in the master cylinder.

6. Remove the slotted, vent screw at the top of the reservoir of the master cylinder. Insert the 6mm, white, nylon spacer (or a 1/4" ball bearing) into the reservoir, and tighten the vent screw.

7. Using the same pumping, tapping, and gyrating method you successfully learned earlier, remove all vestiges of air from the master cylinder.

IF BRAKE FLUID WON’T GO INTO THE MASTER CYLINDER, the cable might have been overtightened for an extended period of time, causing the cylinder to be stuck in too-low a position, closing the passageway between the two portions of the master cylinder. The piston can be pushed back into its fully-seated position by attaching the syringe to the red hose port, and applying mild pressure.

In this case, upstrokes and downstrokes will push the float up and down in the reservoir, creating movement of the fluid past the bleed port that separates the pump’s two chambers (the reservoir and the wet side of the piston).

Do not remove the syringe.

While it takes longer to successfully bleed the master cylinder than the caliper, a pro can do it in 120 seconds.

**Bleeding Line**

1. Attach the large, clear, plastic, bleed hose to the bleed valve on the caliper. Place the other end of the hose in a container to catch excess fluid.

2. Depress the plunger of the syringe lightly while reattaching the hydraulic line to the master cylinder.

3. Continue to maintain light pressure on the syringe while opening the bleed valve one-quarter (1/4) turn.
4. Slowly pump 10ml of brake fluid into the system. Because a tandem-length, hydraulic line holds only 7 – 8ml of brake fluid, all of the air inside the hydraulic line will be expelled through the caliper.

While it might seem stupid to pump air through a caliper you bled a few minutes ago, it is easier for the air to exit by way of the bleed valve, than is for it to fight its way into one of the fluid-filled cavities in the caliper. If you want to worry about air from the hydraulic line reaching these areas, raise the front end of the bike, so the bleed valve and red fitting are at the top of the caliper.

5. SNUG the bleed valve.

**Finishing Bleeding**

1. Holding the master cylinder so the bleed port is pointing upward, remove the syringe from the master cylinder.

2. Overfill the port, where you just removed the syringe, with three or four drops of brake fluid.

3. Thread the pointed bleed screw back into the master cylinder. Do not overtighten. Wipe off the excess fluid.

4. Reattach the master cylinder to the frame.

5. Remove the white, nylon spacer (or 1/4" bearing) from the reservoir, replace the vent screw, and wipe away all excess fluid.
CHAPTER 8
REPLACING CABLE

In the course of performing periodic maintenance on your bike, the brake cable should be inspected for signs of wear. Frayed or rusty cables should be replaced.

For the brake to work optimally, the new cable must be cut precisely to 35mm beyond the end of the lower piece of housing.

**Necessary Tools**
- Cable cutter.
- Metric ruler.
- 2mm allen wrench.

**Removing Cable**

1. Remove the rear wheel.
2. Release cable tension by following steps 1 – 3 in Chapter 2.
3. Depress the plunger.
4. Screw the red, domed adjuster off the silver plunger, and remove the adjuster from the cable.

After sliding the plunger up the cable housing, you’ll be able to loosen the two, 2mm, allen bolts on the cable anchor.

5. Remove the lower section of cable housing and the inline adjuster.
6. Feed the cable out of the upper housing and out the front of the brake lever.

**Installing Cable**

1. Feed the new cable through the brake lever, through the upper, longer section of housing, the inline barrel adjuster, and the lower, shorter section of housing.

Make sure that the housing is properly seated in the brake lever and inline adjuster.

2. Rotate the inline adjuster to the middle of its limits, so there will be fine adjustability in both directions, in case the cable is cut slightly under or over.

3. Measure and cut 35mm of cable from the end of the housing.
4. Slide onto the cable, the domed, rubber boot, the lock ring, the plunger, and the other, rubber boot.
5. Insert the end of the cable into the cable anchor, and tighten the two, 2mm allen bolts.
6. Slide the plunger back down the cable, and reinstall the domed adjuster.
7. Properly adjust the cable, following the instructions in chapters 2 and 3.
8. Replace the rear wheel.
CHAPTER 9
FIXING A BRAKE IN VACUUM

As we noted earlier, a too-tight cable prevents complete retraction of the piston, which blocks the passageway connecting the master cylinder’s two reservoirs: the working reservoir on the wet side of the piston, and the reservoir. There are two, opposite problems that can occur when the cable is too tight.

Expanding brake fluid is prevented from getting to the reservoir, causing the brake to rub or even lock up. The brake lever will feel tight.

Expanded brake fluid in the reservoir is prevented from getting back to the working side of the cylinder, as the fluid cools and contracts, causing a vacuum. The brake lever will feel limp.

An in vacuum problem is most likely to occur just after you’ve descended a hill. While the fluid is still hot, you might either overtighten the cable or, more likely, park the bike in such a way as to depress the brake lever (against a fence or another bike). Another possibility is when a rider uses some sort of strap to lash down the brake lever, thinking the disc will make an excellent parking brake. In the above cases, as the brake fluid cools and contracts (a couple minutes is all it takes), the piston in the master cylinder is sucked, downward, into vacuum.

The least common way for a brake to go into vacuum is if the cable is overtightened on a warm afternoon, and then you try to use the bike the following morning, when the temperature is still cool.

Prevention

1. Never overtighten the cable.

2. Never lash down the brake lever. The disc brake is not a parking brake.

3. Do not attach the disc brake cable to a shift lever. The disc brake is not a drag brake.

4. Do not use as a parking brake, especially when heated.

Cure

Because an in vacuum system can’t restore itself, until the piston is retracted, and the piston can’t be retracted while the vacuum exists, the system must be opened to release the vacuum. Because you don’t want air to enter the system, you’ll need to:

1. Loosen the cable, until the end of the plunger can be seen just above the master cylinder.

2. Fill the larger, clear, plastic, bleed hose with 2 – 3” of DOT brake fluid.

3. Attach the bleed hose on top of the caliper’s bleed valve (the steel nipple with the rubber cap).
4. Open, and then immediately close the valve with one-quarter (1/4) counter-clockwise and clockwise turns with an 8mm, open-end wrench.

The system will inhale about an inch of brake fluid, which allows the spring at the face of the piston to push the piston back into its normal, retracted position.

Now the brake will work fine, but there is too much fluid in the reservoir, which means the next time the brake heats up, there won’t be enough room in the reservoir to accommodate the expanding brake fluid, and will cause the hot brake to drag.

5. Remove the vent screw at the top of the reservoir of the master cylinder. Insert the bleed kit’s 6mm, white, nylon spacer (or a 1/4" ball bearing) into the reservoir, and tighten the vent screw.

6. Open and close the bleed valve on the master cylinder with a 3mm, allen wrench.

The excess fluid will dribble out.

7. Remove the white, nylon spacer (or 1/4" bearing) from the reservoir, replace the vent screw, and wipe away all excess fluid.

Temporary Cure

With the help of a motorist and a straw, this temporary cure should get you through the day.

1. Loosen the cable, until the end of the plunger can be seen just above the master cylinder.

2. Dip a straw about 2 – 3" into the brake fluid reservoir of a motor vehicle.

3. Seal the top of the straw with a finger, and remove the straw with the trapped, brake fluid.

4. Place the bottom of the straw onto the caliper, bleed valve, and release the top of the straw.

5. Continue with step 4 in Cure.
Chapter 10
All About Brake Fluid

History and Distinctions. Brake systems for cars, trucks, motorcycles, and airplanes use “DOT” brake fluid. Even in the smallest, third-world outpost, DOT is the term used by car and truck mechanics. DOT is shorthand for U.S. Department of Transportation, which long ago determined a specification for the performance of brake fluid. The original DOT specification was replaced by DOT 2, which was replaced by DOT 3, when disc brakes became common. DOT 4, which is even better, is for today’s high performance cars with antilock brakes. DOT 5 was developed for certain, racing motorcycles that needed a fluid that could withstand temperatures hot enough to make discs glow red. DOT 5.1 was obviously developed later, but is an improved DOT 4.

The problem is that while DOT’s 2, 3, 4, and 5.1, which are glycol-based, are compatible with each other, none are compatible with DOT 5, which is silicone-based. If DOT 5 (known to most as “the blue stuff”) or any other, silicone-based, or synthetic, brake fluid is added to a system that contains DOT 3, 4, or 5.1 (which are the color of motor oil), the mixture will dissolve the rubber O-rings common to all hydraulic systems. Within a couple hours, the brake system will leak like a sieve. The remedy requires an expensive, complete, system overhaul with all, new, rubber parts. DO NOT USE DOT 5, SILICONE-BASED, OR SYNTHETIC BRAKE FLUID. MAKE SURE ANY FLUID USED IS LABELED “DOT 3,” “DOT 4,” “DOT 5.1,” or “COMPATIBLE WITH DOT 4.”

DOT 5.1 is the super fluid that’s installed in the Formula brake at the factory. Unfortunately, it’s super hard to find, but we feel the extra effort and money are well worth it. The best place to look for it is at your Santana dealer or high performance auto and motorcycle shops. When you ask for it, people will typically try to sell you non-compatible, DOT 5. If you’re simply topping off or bleeding fluid, we recommend DOT 4, which is compatible with DOT 5.1. If you’re refilling the entire system, and can’t find DOT 5.1, call us, and we’ll sell you a bottle.

Wet vs. Dry Boiling Temperatures. DOT brake fluid is “hydrophilic.” This means the fluid will absorb water from the air. Rumor has it that you can fill a shot glass with DOT fluid, and after an hour or so, the glass will overflow. The brake fluid absorbing moisture from the surrounding air causes its volume to increase. This is why every container of DOT fluid requests that it be kept closed when not in use. As the fluid absorbs water, its vaporization temperature (or boiling point) is reduced. DOT 4 becomes no better than DOT 3, and eventually degrades in performance to the level of DOT 2. Amazingly, a small amount of moisture will be absorbed through rubber seals and nylon, hydraulic lines (virtually any material except metal or glass). This is why car manufacturers recommend brake fluid replacement every two to three years.

Because fluid that exists in a hydraulic system will have a lower boiling point than when new, the Department of Transportation specifies two, minimum, boiling points for each brake fluid, known as “dry” and “wet.” The distinction “dry” is given to fluid uncontaminated by water, while “wet” is for a fluid with approximately four percent water content, the average amount the DOT found when randomly testing truck brakes.
“Racing” brake fluid will boast a high, dry, boiling point. Less expensive fluid might have a higher wet boiling point. Which is better? For racers who replace their brake fluid following every event, dry, boiling point is more important. Unless you wish to replace your brake fluid after every ride, ignore the dry rating, and choose a fluid based on its wet rating. The minimum wet boiling point that qualifies a fluid for DOT 4 status is 311 degrees Fahrenheit.

**What’s so Good about 5.1?** DOT 5.1 has a wet boiling point of 365 degrees. Better yet, DOT 5.1 is half as viscous as DOT 4. This means a system filled with DOT 5.1 provides quicker lever response, better modulation, and faster pad retraction. When servicing, the lower viscosity facilitates bleeding and pad adjustment. DOT 5.1 also experiences less volume change as a result of temperature shift, allowing more consistent braking through a wider temperature range.

**Bicycle Brake Fluid.** Some bicycle disc brake systems (including Shimano and Magura) use a proprietary fluid that is actually inexpensive, mineral oil. While mineral oil is less caustic than DOT fluid, it suffers from higher compressibility, greater expansion and contraction, and a lower boiling point. When performance matters, there’s ample reason to use DOT, brake fluid (except DOT 5, silicone-based, and synthetic). If mineral oil is mistakenly added to any system designed for real brake fluid, the rubber parts in the system swell shut. The fix requires an expensive, complete, system overhaul with all, new, rubber parts. Because many bike shops stock proprietary fluids, and do not understand the compatibility issues, it’s best to inform them and/or supply them with proper, DOT, brake fluid.
Chapter 11
Caliper and Rotor Issues

This is the one chapter you should never need to read, but don’t stop now; this is the last chapter.

In two years, we haven’t found a lot of problems with Santana/Formula calipers or rotors. As long as you pay attention to the placement of any washers when you remove and reinstall the caliper in order to bleed it, the original factory alignment should stay intact. If you lose this adjustment, the mounting bracket has slots on the chainstay side that allow you to change the angle of the caliper relative to the rotor, and ovalized holes on the caliper side that allow you to move the caliper closer to or further from the axle.

If the caliper body rubs the rotor, loosen the 5mm, horizontal, mounting bolts, and move the caliper forward, until it misses by the thickness of a fingernail.

If the caliper gets cocked sideways, simply loosen the 4mm, vertical, mounting bolts, apply the brake (which will align the caliper) and, without releasing the lever, tighten the bolts. You’ll need a friend to help you or a strap around the lever.

If the rotor is not running true, retorque the 4 – 6, rotor, attachment bolts. If this doesn’t solve the problem, gently massage the rotor by hand. Riveted rotors will often get hung up on the rivets during expansion and contraction, and will “click” back into position when massaged. If, through an accident, the rotor becomes bent, heavy-duty hand massage may save you from having to buy a replacement. In our experience, a nearly straight rotor becomes straighter with use.

Broken rivets, thankfully rare, can be replaced by Santana.
APPENDIX 1
ADJUSTMENT PROBLEMS – TROUBLESHOOTING

Brake lever feels spongy.

● This brake has been designed to allow full lever stroke, i.e., you should be able to mash the lever all the way to the handlebar.

● A new disc brake becomes firmer in feel with extended use. This is because the pads seat within the first 200 – 400 miles. Optimal brake feel cannot be obtained until the pads are readjusted after proper seating (Chapter 4).

● The brake needs to be adjusted. In the meantime, DO NOT TIGHTEN THE CABLE (Chapters 2 – 4).

Brake progressively loses power and lever gets softer.

● The master cylinder O-ring is damaged, and brake fluid is being pushed by it.

Brake rubs or locks up.

● The cable is too tight. This prevents the heated brake fluid from expanding into the reservoir. The heated brake fluid will expand despite the lack of an appropriate reservoir, and will force the pads against the rotor, even though you haven’t squeezed the lever.

I loosened the cable, and the brake rubs or locks up with use.

● If the pads continue to rub, even when the cable is completely slack, either the pads are too tight, the rotor is warped (Chapter 11), the caliper is out of alignment (Chapter 11), or a bicycle mechanic mistakenly put bicycle disc brake fluid (mineral oil) in the automotive-quality system (Appendix 2).

Brake doesn’t develop enough stopping power.

● Lever feel does NOT equal stopping power. Many mechanics, however, will tighten the cable to improve feel while neglecting pad adjustment. This will result in good lever feel and abysmal braking. Follow the instructions in Chapters 2 – 4 to solve this too-common problem.

● A brake with new pads will have diminished stopping power, until the pads have been adequately seated through as much as 200 – 400 miles of use. Full power is obtained when the pad is readjusted after proper seating (Chapter 4).

● The disc or pads may be contaminated. Always be careful when using spray lubricants. If you suspect your brake is contaminated, you’ll need to clean the disc with alcohol, and also remove the pads, and use emery cloth to remove the contaminated, pad surface.

I have carefully readjusted the brake and cleaned it as noted above, and the brake still performs poorly.

● Find a comfortable chair and reread Chapters 2 – 4. 95% of the time we receive a phone call from an understandably frustrated customer or dealer, we learn that he has skimmed the material and attempted to adjust the brake, before fully understanding how simple (although different) this system really is. Without this understanding, it is far too easy to skip a necessary step. While there is half a dozen ways to adjust a rim brake or derailleur, and two or three ways to adjust any other disc brake, there is just
one way to properly adjust the Formula brake. While the brake system is neither fussy, nor difficult to adjust, the necessary steps must be performed in the proper order.

- There is air in the system. Because air is compressible (and hydraulic fluid is not), even a tiny amount of air in the system will prevent the hydraulic fluid from fully actuating the caliper. If you have already rechecked the adjustment of the system and the condition of the pads, you will need to “bleed” the system in order to remove the air (Chapters 6 – 7).

**When to cry for help**

- Should you feel that the brake is not responding to your best efforts, you may want to put your tools down, take this manual into the next room and reread this section and noted chapters. If you have no epiphanies as a result of this experience, don’t hesitate to pick up a phone to call us. We’ve always been able to walk our customers through the adjustment process to get their bike ready for the next day’s ride. Technical support is available from Santana 8 – 4:30 weekdays at (909) 596-7570.
When I attempt to bleed the Master Cylinder, I keep finding bubbles.

- The Remote Master Cylinder is comprised of two, major parts. A close look will confirm that the cylindrical section is threaded into the rest of the unit, which is in turn, bolted to the frame. If bubbles appear every time you pull up on the syringe, you can tighten the two pieces back together by using an 8mm, open-end wrench to tighten the red hose fitting onto the base of the pump, which will also tighten the cylindrical section within the pump body.

I can’t push fluid through the Master Cylinder to bleed the hose.

- If the cable was overtightened for an extended period of time, the piston might now be stuck in too-low a position; closing the passageway between the two portions of the master cylinder. You can push the piston back into its fully-seated position by attaching the syringe to the red hose port, and applying mild pressure.

I re-seated the piston per the above instructions and still can’t push fluid through the Master Cylinder. …or…

When I attempt to bleed the Master Cylinder, I find little black pieces in the fluid.

- More than one ham-fisted mechanic, while overtightening the Master Cylinder’s bleed valve, has split the small O-ring into pieces which can then clog the orifice separating the master cylinder’s two chambers. Tiny black specks of rubber appearing in the syringe means the pump will need to be taken apart and thoroughly cleaned. In the meantime, an emergency bleed can be effected by attaching the syringe to the caliper’s bleed port by way of linking the two hoses. While this “reverse bleed” method will not remove all of the air from the master cylinder’s reservoir, as long as the bike stays upright, the air that remains in this uppermost part of the system will not affect braking.

After being serviced at a bike shop, the brake has a new problem – it seizes.

- The shop may have mistakenly added Shimano or Magura brake fluid to your system. These fluids (mineral oil) permanently swell the rubber parts in the system. Your system will need to be rebuilt.

After being serviced at a bike shop, the brake has a new problem – it leaks.

- Because your Formula brake is made in Italy, and many Italian, racing motorcycles use DOT 5, someone at a motorcycle shop might have convinced your mechanic that DOT 5 was suitable. DOT 5, when mixed with any other DOT fluid, will dissolve rubber. Because proper DOT fluids are the color of motor oil, seeping fluid with a blue or purple tinge indicates DOT 5 was added. Your system will need to be rebuilt.

When to cry for help

- Should you feel that the brake is not responding to your best efforts, you may want to put your tools down, take this manual into the next room and reread this section and noted chapters. If you have no epiphanies as a result of this experience, don’t hesitate to pick up a phone to call us. We’ve always been able to walk our customers through the adjustment process to get their bike ready for the next day’s ride. Technical support is available from Santana 8 – 4:30 weekdays at (909) 596-7570.
BAD
SYSTEM IS "CLOSED"

Even the best mechanics mistakenly over-tighten the cable to achieve "proper feel." When adjusted by "feel" the piston blocks brake fluid from entering or exiting the reservoir. Because a blocked system cannot tolerate changes in temperature, a system that feels good in the shop will not work correctly on the road.

GOOD
SYSTEM IS "OPEN"

When the cable is properly adjusted it feels "TOO LOOSE."