



READ THIS MANUAL CAREFULLY!
It contains important safety information.
Keep it for future reference.

TANDEMS

Owner's Manual Supplement

116831.PDF

Revision 2

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Please note that the specifications and information in this manual is subject to change for product improvement without notice. For the latest product information, go to: <http://www.cannondale.com/bikes/tech/>.

GENERAL SAFETY INFORMATION

About This Supplement

Cannondale Owner's Manual Supplements provide important model specific safety, maintenance, and technical information. They are not replacements for your Owner's Manual.

This supplement may be one of several for your bike. Be sure to obtain and read all of them.

If you need a manual or supplement, or have a question about your bike, please contact your Cannondale Dealer immediately, or call us at one of the telephone numbers listed on the back cover of this manual.

You can download Adobe Acrobat PDF versions of any Cannondale Owner's Manuals or Supplements from our website. Go to: <http://www.cannondale.com/bikes/tech>

- This manual is not a comprehensive safety or service manual for your bike.
- This manual does not include assembly instructions for your bike.
- All Cannondale bikes must be completely assembled and inspected for proper operation by a Cannondale Dealer before delivery to the owner.


** IMPORTANT **

This manual may include procedures beyond the scope of general mechanical aptitude. Special tools, skills, and knowledge may be required.

If you have any doubt about your ability to properly inspect, adjust, or service your bicycle, do not attempt to perform the work described; please take the fork to a Cannondale Dealer.

Special Manual Messages

In this manual, information which affects your safety is emphasized in the following ways:

The Safety Alert Symbol  means : "ATTENTION...BECOME ALERT, YOUR SAFETY IS INVOLVED."



WARNING

A WARNING indicates a potentially hazardous situation which, if not avoided, can result in serious injury or death.

WARN000

CAUTION

A CAUTION Indicates a potentially hazardous situation which, if not avoided, can result in serious damage to the product. The matters described under CAUTION may, if not avoided, lead to personal injury, or results depending on the situation and degree of damage. Important matters are described in CAUTION (as well as WARNING), so be sure to observe them.

CAUT000

NOTE:

A NOTE provides helpful information or tips intended to make the information presented clearer.

Intended Use

Road Tandems:

Are designed to be ridden on paved roads, hard dirt or gravel roads only. They are not designed for mountain biking or off road use. Cannondale road tandems are designed for touring with racks and panniers.

Mountain Tandems:

Are designed as mountain bikes and may be ridden off road in easy to moderate terrain.

The challenges of mountain biking are obvious, but outlined in PART II, Section C of the *Cannondale Bicycle Owner's Manual*. The added challenges of tandem riding, many of which are outlined in this owners manual supplement mean that you should limit off road tandem riding to easy - moderate terrain.



WARNING

Using your bicycle improperly is hazardous.

WARN001

Building Up A Frameset

Consult with your Cannondale Dealer and the component manufacturers and frankly discuss your riding style, ability, weight, and interest in and patience for maintenance.

Generally speaking, lighter weight components have shorter lives. In selecting lightweight components you are making a trade-off, favoring the higher performance that comes with less weight over longevity. If you choose more lightweight components you must inspect them more frequently. If you are a heavier rider or have a rough, abusive or "go for it" riding style, buy heavy duty components.

Make sure the components chosen are compatible with your bike and intended for your weight and riding style.

Read and follow the component manufacturers warnings and instructions.

TANDEM RIDING

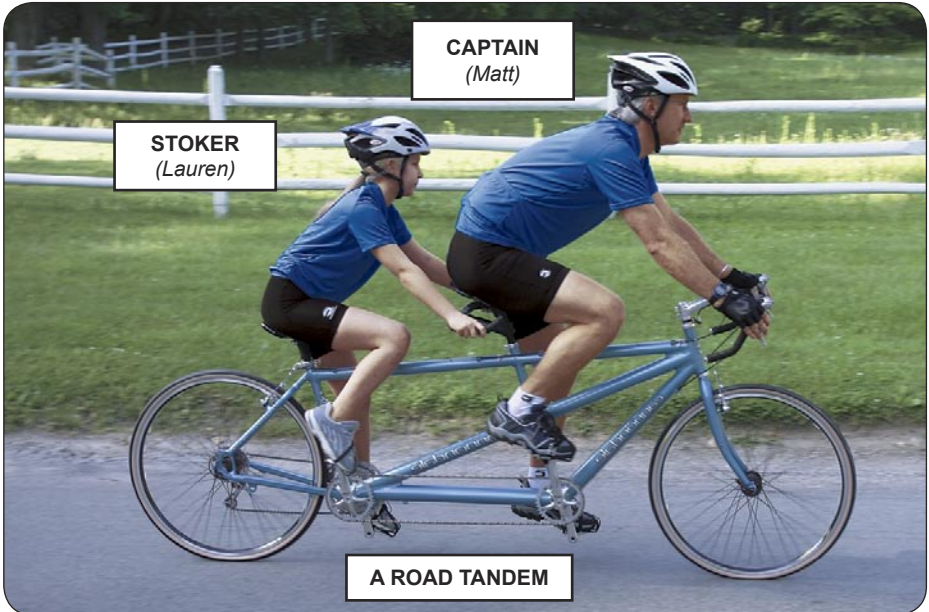


Figure 1 - Captain and Stoker on a Road Tandem

Tandems are fun, and with two engines for the same frontal area, they're considerably faster than single bikes. Tandem teams learn to ride together well, to communicate without words, and to anticipate each other's desires. Tandeming is a great way to enjoy cycling with another person.

Tandems are serious business too. One rider (THE CAPTAIN) is entirely responsible for the well-being of the other rider (THE STOKER). The bike is bigger, heavier, and less forgiving of sloppy riding habits. A tandem captain can't be as spontaneous as a rider on a single, nor can the captain make the same kinds of last-minute recoveries from errors in judgment. Look farther ahead, plan farther ahead.

Also, be aware that tandems attract attention. People will stare, wave, shout. Passing cars, temporarily distracted, will often swerve in or out. The presence of a tandem can make people act differently on the road. A bell or air horn can be very handy in traffic.

**WARNING****TANDEMS ARE BIGGER, HEAVIER, AND LESS MANEUVERABLE THAN SINGLE RIDER BIKES.**

- Ride very cautiously as your team climbs the tandem learning curve.
- More time is needed to react and avoid ride hazards.
- Always think further ahead. Allow more time. Learn to anticipate hazards.

Tandem riding, like any bicycle riding carries a risk of serious injury, paralysis or death.

WARN002

The Captain's Responsibility

The captain's primary job is to make the stoker happy. With an unhappy stoker, the captain won't have a riding partner! So you must reassure your partner with careful, methodical riding habits. Anticipate maneuvers, beginning them far in advance. Be alert to shifting needs. A too-fast or too-slow cadence is doubly annoying to the stoker because she/he can't fix it. Watch the road or trail ahead, and make your steering and braking corrections smoothly.

Ride slightly farther from the curb, or from parked cars, than you would on a single bike. Your stoker doesn't want to feel hemmed in. If you ride too far to the right, you may find your stoker leaning to the left, trying to veer away from the curb.

When you conduct a maneuver, such as merging across traffic to make a left turn or steering around a pothole, make your decision early. Signal your intentions clearly, proceed on a straight path, and complete the maneuver. A decisive captain will ride smoother, and that will make the stoker happier.

Most new tandemists find captaining exhausting, and they get sore shoulder muscles from being tense. This too will pass. As you become accustomed to the requirements of captaining a tandem, you'll develop a light touch.

Don't hot dog. If your stoker is nervous, ride slowly. In time, the stoker may become more confident and ask for more speed. But if she/he wants to go slow, go slow! The more conservative voice must prevail. That's only fair. Remember, you're the chauffeur, not the stunt pilot.

The Stoker : The Best Seat in The House

The back seat on a tandem is the fun seat. You have this person in front of you who's giving all his/her attention to making you feel comfortable. The view is terrific out to the sides, just like on a train ride. The view to the front may be a bit bland, but the captain's jersey pockets are a great place to put your binoculars, camera, radio, fruit bars, and other hedonistic goodies.

Your obligations are few: Pedal—at an agreed-upon effort level. Pedal smoothly, so your pedaling doesn't make your upper body move around. Don't shift your upper body weight abruptly. (Your weight shift can inadvertently steer the bike, and force the captain to fight you.) Hold your head high and enjoy the scenery. Tell your captain what she/he is missing while she/he keeps eyes glued to the road for potholes.

Many tandem teams delegate hand turning signals to the stoker. This not only encourages communication between the stoker and the captain, it also allows the captain to concentrate on the steering and braking involved in making the maneuver.

Every successful stoker learns to delegate authority. The captain steers. The captain decides when to pedal and when to coast. When coasting, the captain decides where to position the pedals. Never fight the captain on these matters. She/he is busy giving you a great ride so you can enjoy yourself.

Tandem Bike Fit

In addition to sizing and comfort issues for each individual, the bicycle must be made to accommodate the interaction between the two riders. This document is meant to offer hints and suggestions but only scratches the surface of tandem setup. The best configuration for any pair of cyclists on a tandem will be the result of experimentation. You should investigate the pros and cons of any setup decisions by first consulting with people or publications which are knowledgeable about tandem bicycles. See page 9.

The captain should fit the tandem as she/he would fit on a single bike. But on a tandem, it's doubly important to have 2-3 inches of crotch clearance for the starting and stopping maneuvers described earlier.

The stoker uses the same seat-to-pedals distance as on a single bike. But the handlebars will be closer (which is okay, since the stoker doesn't need to steer).

Getting Underway

Allow time for a complete pre-ride inspection. See the back cover of this manual for Tandem specific Pre-Ride Checks and the back cover of your Cannondale Bicycle Owner's Manual for overall bicycle pre-ride checks.

Starting Off

Starting and stopping a tandem is smooth and easy, but only if you do everything in the exact prescribed order. Start by shifting the bike into a comfortably low gear.

The captain mounts first. Before, and only before anyone gets on the bike, it can be leaned over to lower the clearance to straddle the bike. Swing your leg forward over the handlebars, not back over the rear of the bike. (There might be a person standing there!) Straddle the top tube, plant your feet on the ground, and spread your legs to clear the pedals. Firmly hold the bike upright and squeeze both brakes.

Never let the bike lean to the side, particularly after the stoker gets on. This is the biggest difference between your tandem and your single. (Your single is so light that you don't think twice about leaning it. The tandem is not only heavy, it's top heavy. Once you let it lean a little, the stoker's weight makes it want to lean more. And the stoker just hates the way that feels.)

The stoker gets on now. Because the captain is holding the bike rock solid, the stoker can mount it like a horse. Put one foot on a pedal and swing your other leg rearward over the saddle. Now the stoker puts both feet in the toe clips or clipless pedals. When you're ready, backpedal so the captain's preferred starting pedal is in the up position. Say "ready."

Now the captain can start. Pick up one foot, put it on a pedal, and stand on it while steering straight ahead. (Don't put your rear end on the seat before starting to pedal, because that could make the bike lean over and wobble, and possibly fall.) After you've started the first pedal stroke, get in the saddle, put your other foot on the backside of the pedal, and continue pedaling and steering. Don't worry about the toe clip or clipless pedals. Let the toe clip scrape the ground. Pedal until you are going comfortably fast (10 mph or so), and then put your other foot in the toe clip or clipless pedals.

Stopping

If you stop briefly, say, for a traffic light, the captain stops the bike while the stoker stays strapped in. The captain takes one foot off the pedal, dismounts from the seat, and puts the foot on the ground while holding the bike absolutely upright. Starting up again is just like your initial start-up. The captain should let the stoker know what's happening —talk to one another —no surprises.

To stop and dismount, reverse the mounting procedure. The captain gets off the seat, spreads legs to clear the pedals and brace the bike upright while the stoker climbs off. Then the captain can dismount.

Slow Speed Riding

Tandems are stable and easy to maneuver at slow speeds. But they need a confident captain who doesn't overcorrect or induce wobbling. A smooth style is the key to good slow-speed riding. After you've gotten to know your tandem well, you'll find you can make a U-turn on a narrow two-lane road.

Communication

Some tandem teams talk a lot about riding. They inform each other of every bump, every shift, every time they slow down, every drink from a water bottle. Others almost never talk. They prefer to communicate silently. Whichever style you pick is up to you. Just pick the one that works for you.

One important coordination activity may require talking, at least at first: shifting. The reason: on a single bike, riders intuitively let up on the pedals when they're shifting. On a tandem, the stoker doesn't necessarily do that. This is hard on derailleurs (especially front derailleurs) and may make shifts more difficult. Make sure you both let up on the pedals during critical shifts. Whether you do that by talking or by the stoker feeling when captain is about to shift is up to you.



WARNING

GOOD COMMUNICATION BETWEEN THE CAPTAIN AND STOKER INCREASES THE SAFETY AND ENJOYMENT OF THE RIDE. MISCOMMUNICATION OR POOR COORDINATION INCREASES THE CHANCE OF BEING INVOLVED IN AN ACCIDENT.

NEW TANDEM RIDERS:

Before riding on a more challenging course, choose an open area free of hazards to practice and develop good Tandem communication skills.

WARN003

Riding at Night

Most of tandem safety comes from good technique, which we've described above. A few specific warnings merit mention, though.

Riding a tandem at night is legal if you have a headlight and taillight— but we don't recommend it. Nighttime riding is more mentally demanding than day time riding. Tandem riding is more mentally demanding than single riding. A tandem at night adds up to too much demand, and too small a margin for error. A tandem is a pleasure vehicle, so use it during day—the most pleasant time to ride.

See your *Cannondale Bicycle Owner's Manual*

For more important safety information on riding at night.

Tandem Braking

Tandems can stop shorter than single bikes on pavement.

The reason: a single bike's braking performance is limited by the physics of pitching the rider over the front wheel. The tandem has the stoker's weight to hold the rear wheel down, so pitchover doesn't apply.

The tandem's braking force on pavement is limited by the friction between the tire and the road. How great is that? It depends on the road and the tire, and there's no way to measure it. Since you don't want a front-wheel skid, don't be too bold. On good pavement, you can stop slightly more abruptly than you would on a single bike. Remember to gauge this by the feeling of deceleration, not by the brake hand lever effort. On poor pavement, unpaved surfaces, sand, oil, or any other debris, brake gingerly. Slow down—drastically—before you reach such surfaces.

Tandems, like singles, get most of their braking force from the front wheel. The rear wheel is more prone to skidding. The left hand lever normally controls the front brake. Apply front braking more than the rear brake for maximum stopping power. Brake before turns, not in them. If you must brake in a turn, do it with the rear brake.

Tandems are much faster than singles on downhills: GO SLOW and control your speed.



WARNING

WHEN DESCENDING A LONG DOWNHILL, APPLY YOUR FRONT AND REAR BRAKES TOGETHER IN AN “ON AGAIN, OFF AGAIN” METHOD ALLOWING BRIEF PERIODS IN BETWEEN FOR THE BRAKE SYSTEM TO COOL. WHY? READ ON.....

When used for long periods of continuous braking in mountainous terrain, rim brakes will heat the rims. Heat build up in the rim can overheat the air in the inner tube, possibly resulting in a tire blowout.

During long downhill descents in mountainous terrain, there is a risk that hydraulic brake systems will fade or lessen braking force as heat grows in the pads, fluids, and calipers from friction. Under extreme conditions, your brakes could fade or “fade-out” completely. You can be severely injured, paralyzed as a result.

NOTE : All Cannondale Tandem bike frames can be fitted with a rear drum brake (such as Arai). Rear drum brakes can be used as drag brakes to control speed such as on long downhill descents. Drum brakes are capable of dissipating heat without affecting other systems. A drum brake can be set up in addition to rim brakes. Please consult with your Cannondale Dealer or shop to help you select and install a rear drum brake system. See page 14 for more information.

WARN004

Further Reading & Information:

This supplement can't cover everything you might want to know about tandeming. For additional information on riding technique, we suggest you contact:

- Tandem Club of America, c/o Jack & Susan Goertz, 2220 Vanessa Dr., Birmingham, AL 35242, 205-991-7766, e-mail: tca_of_a@mindspring.com. Their magazine, Doubletalk, and attendance at TCA events will make you an expert. Besides, TCA events, such as the various regional tandem rallies, are lots of fun.
- Local tandeming/bicycling clubs in your area have many helpful people. Ask your Authorized Cannondale retailer to put you in touch with them.
- The Tandem Scoop, the only book about tandeming we know of, contains extensive instructions on smooth technique, racing, touring, and dirt riding, riding with children, blind and disabled stokers, and other subjects. (By John Schubert, published by Burley Designs, Eugene, Oregon, 1996. Paperback, \$9. ISBN 0-9637190-0-9)
- The Tandem Book, The Complete Guide to Buying, Riding and Enjoying Tandem Bicycles. (By Angel Rodriguez and Carla Black, \$14.95, available from Adventure Cycling, 800-721-8719 8am.-5pm. M-F Mtn. Time, or www.adv-cycling.org)

TECHNICAL INFORMATION

Stoker Handlebar System

The Stoker's handlebar is attached to the bike on the Captains seat post. It is important to ensure that the attachment is always secure and that the Stoker's handlebar stem extension is properly installed and tightened.

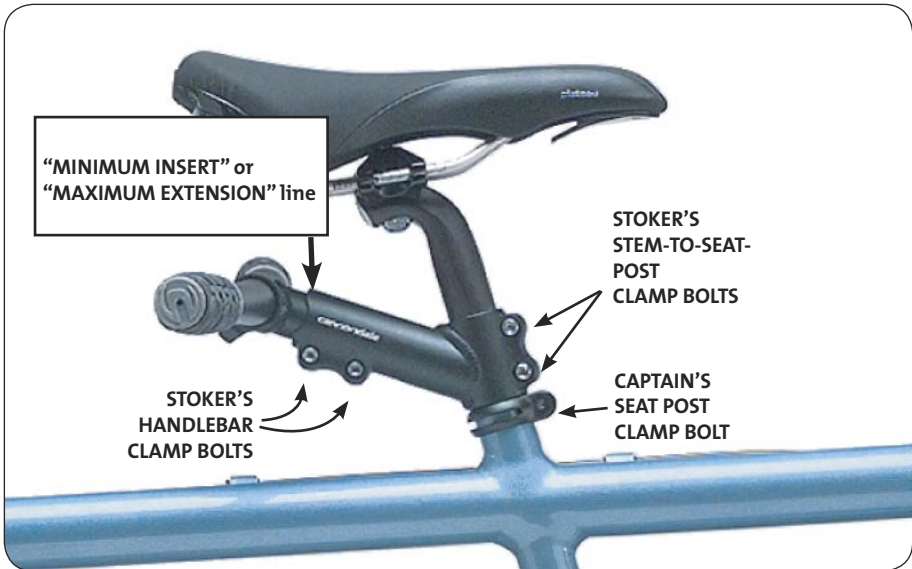


Figure 2 - Stoker Handlebar System

Before every ride:

1. Inspect the Captains seat post make sure it is in good condition and installed properly.
2. Inspect the Stoker's handlebar system. Make sure it is in good condition and attached securely to the Captain's seat post. If it is the type that can be extended, be sure it is not extended beyond the "MINIMUM INSERT" or MAXIMUM EXTENSION" line. Also, make sure the Stoker's handlebars will not rotate or move. Tighten all bolts to recommended torque when necessary.

SEE YOUR CANNONDALE BICYCLE OWNER'S MANUAL FOR INFORMATION ON PROPER SEAT POST INSTALLATION AND COMPONENT INSPECTIONS.

**WARNING**

FAILURE TO CHECK THE CAPTAIN'S SEATPOST AND STOKER'S HANDLEBAR SYSTEM ATTACHMENT TO IT CAN RESULT IN THE HANDLEBARS DETACHING OR TWISTING UNEXPECTEDLY WHILE RIDING. BOTH RIDERS CAN BE SERIOUSLY INJURED, PARALYZED, OR KILLED. IN A RESULTING ACCIDENT.

If the stoker handlebar stem is extended past the "MINIMUM INSERT " or "MAXIMUM EXTENSION" line the handlebar can break off or detach while riding. If the Captain's seat post or the Stoker's stem clamp bolts are not tightened securely, the handlebars can twist or move suddenly while riding.

WARN005

About Tandem Forks

The front fork of your Cannondale Tandem is specially designed to be much much stronger than a regular bike fork. One of the reasons it is much stronger is that braking a tandem subjects the frame and fork to tremendous stresses. Ordinary forks can buckle or fold under tandem braking conditions. Any fork used on your tandem should be design specifically for tandem use.

Brake Systems

Your Cannondale Tandem will have either rim or disc type brake systems for the front and rear wheels. If your tandem has disc brakes, the frame and fork will have brake mounts conforming to the international brake standard.

**WARNING**

DO NOT MODIFY YOUR BIKE OR ITS FORK TO INSTALL A BRAKE SYSTEM.

Do not attempt to weld, clamp, or otherwise attach a disc brake mount to a frame or fork. Do not change forks. Do not use caliper mounting adapters or brackets. The incredible braking forces which can be produced by a disc brake, especially on the front wheel of a tandem, can bend or break a fork or frame which has not been designed and tested to withstand such a load. Therefore, the use of non-standard brake caliper mounts places the rider(s) at risk of personal injury or death.

WARN006

About Braking Systems (Rim, Hydraulic Disc, and Rear Drum)

Rim brakes used in normal conditions work fine. When used for long periods of continuous braking in mountainous terrain, rim brakes will heat the rims. Heat build up in the rim can overheat the air in the inner tube, possibly resulting in a tire blowout.

Hydraulic brakes used in normal conditions work fine. When used for long periods of continuous braking in mountainous terrain, hydraulic brakes will heat the hydraulic brake fluid. Heat build up in hydraulic brake fluid can cause brake fade possibly resulting in partial or complete loss of braking.

All Cannondale tandem frames are equipped with a frame mount for a supplementary rear Arai brand (or similar) drum brake arm.

A drum or drag brake system is typically used as a speed control brake. Addition of a supplemental drum brake is a wise investment for tandems used in long descents or mountainous terrain.

The left underside of the chainstay includes a cable guide and arm mount to be used with a cable actuated (Arai) drum brake.



WARNING

DO NOT USE A DISC BRAKE SYSTEM WHICH USES A “CLOSED” HYDRAULIC SYSTEM ON ANY TANDEM BICYCLE.

The brake heat which can be developed by a heavily loaded tandem under heavy braking can reduce stopping power and cause the hydraulic fluid to expand. Brake fluid expansion in a closed system will force the brake pads to close, causing drag on the disc rotor and possible locking of the brakes in extreme conditions, with attendant risk of injury or death to the rider(s). Consult your authorized Cannondale retailer for advice about adding mechanical (non-hydraulic) or “open” system hydraulic disc brakes to your tandem.

WARN007

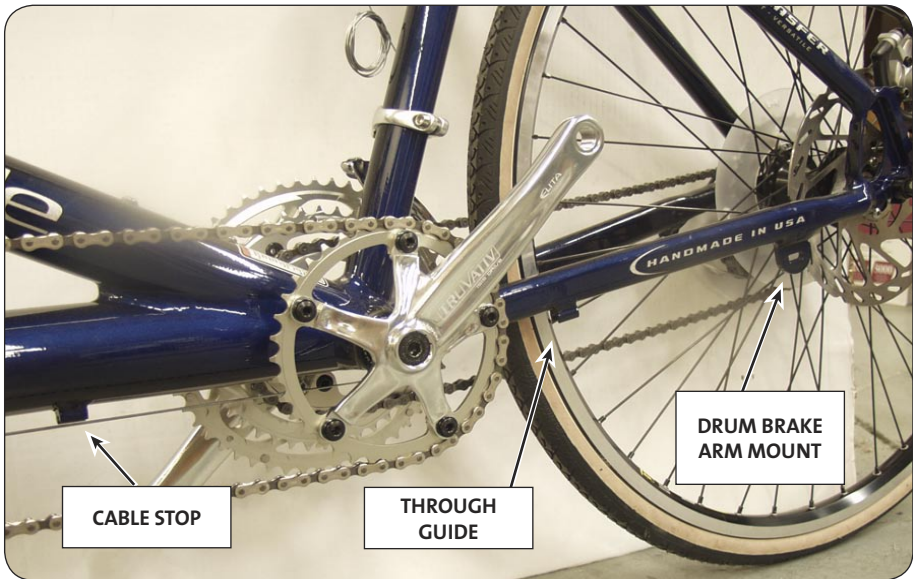


Figure 3 - Frame Features for Option Drum Brake

Installation Points

1. Install the drum brake on the rear wheel according to the brake manufacturer's instructions.
2. Position the rear wheel in the rear dropouts in the normal manner. Before tightening the axle, swing the brake arm around until the hole in the drum brake arm lines up with the slot of the drum brake anchor. This anchor is located on the underside of the tandem frame's left chainstay. Put the bolt supplied with the drum brake through both the hole in the drum brake arm and the frame's drum brake anchor. If used on a 1999 frame, the supplied bolt may be too short. If so, it should be replaced with a longer M5 x 20mm, Grade 8 bolt. Tighten the bolt as per the brake manufacturer's instructions (using Loctite or a nyloc-type nut), and then secure the rear wheel in the dropouts.
3. Install whatever type of lever you wish to use to control the drum brake, according to the lever manufacturer's instructions. Some tandem riders use a friction-type shift lever to control the drum brake allowing the captain or stoker to use the drum brake as a drag brake on descents. This allows the riders to set a desired level of secondary braking friction but does not require constant user input.

4. Install the cable through a length of brake housing from the drum brake lever to the housing stop located under the downtube near the headtube, with bare cable continuing to the center slot of the plastic cable guide located under the front bottom bracket.
5. For all tandems, the cable must be attached to the brake's cable anchor bolt according to the brake manufacturer's instructions.
6. Adjust the drum brake according to the brake manufacturer's instructions. Use the drum brake cable barrel adjuster to remove slack from the cable as necessary.

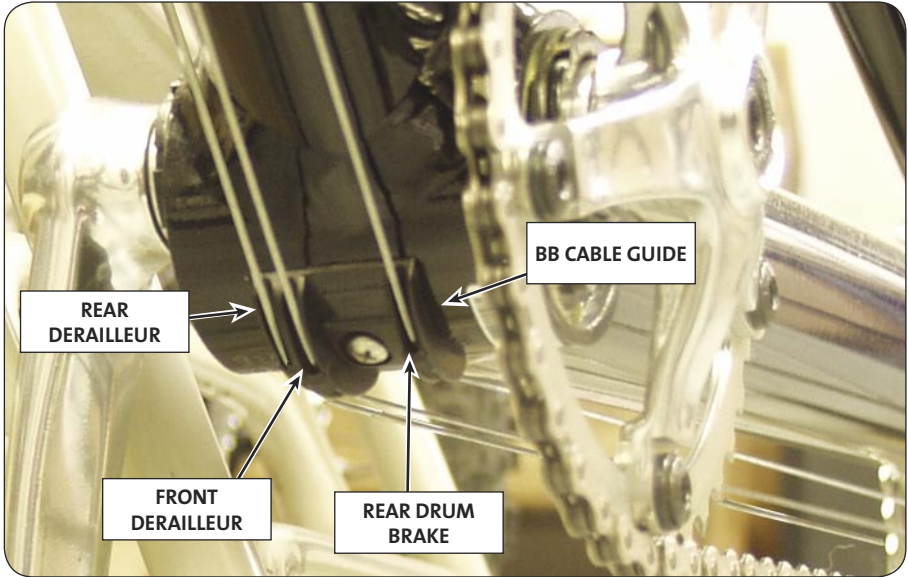


Figure 4 - Front Bottom Bracket Cable Guide

Derailleur BB Cable Routing

The primary difference in routing derailleur cables on a Cannondale tandem is the use of two rollers located on the bottom of the stoker bottom bracket shell to help direct the cables.

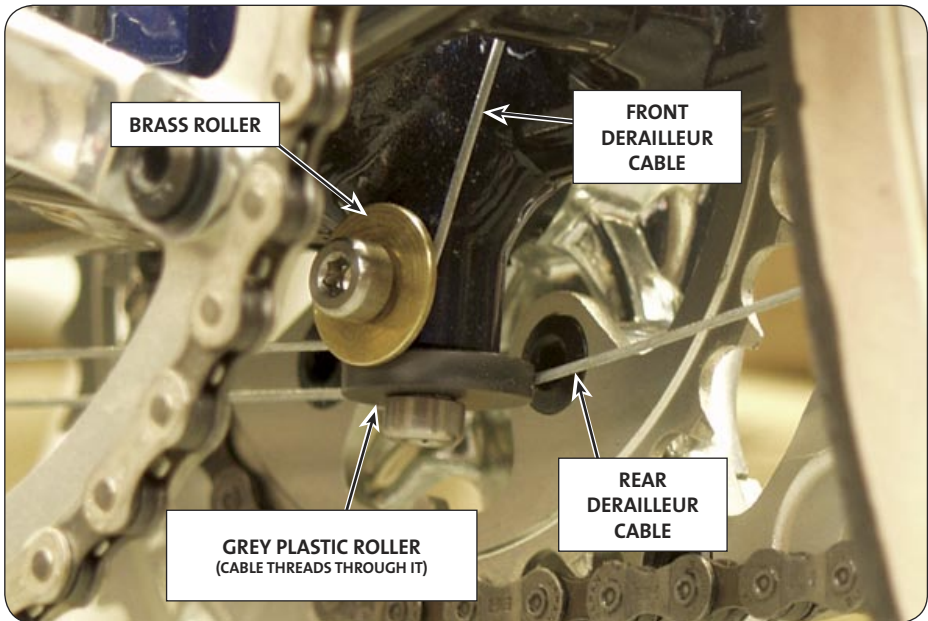


Figure 5 Left Side View of Stoker Bottom Bracket

- A. Install and route the cables from the shifters according to the shifter manufacturer's instructions.
- B. Thread the front derailleur cable through the vertical brass roller so that the cable is directed up towards the front derailleur.
- C. FOR MOUNTAIN TANDEM: Position the horizontal gray plastic disc so that the cable hole through it is to the outside of the center bolt. Route the rear derailleur cable through the cable hole in the disc so that the cable is directed towards the rear derailleur on the right dropout.
- D. FOR ROAD TANDEM: Route the rear derailleur cable to the inside of the horizontal brass roller so that the cable is directed towards the rear derailleur on the right dropout.
- E. Install the cables to the derailleurs and adjust according to the manufacturer's instructions.

Adjusting The Timing Chain

Periodically, the tension of the timing chain must be checked.

The tension should be maintained at 1/2" of total vertical deflection. Wear and stretch will cause the tension to change over time. A chain that is too loose can come off and a chain that is too tight can bind, break or accelerate wear on other parts. Both conditions can lead to an accident.

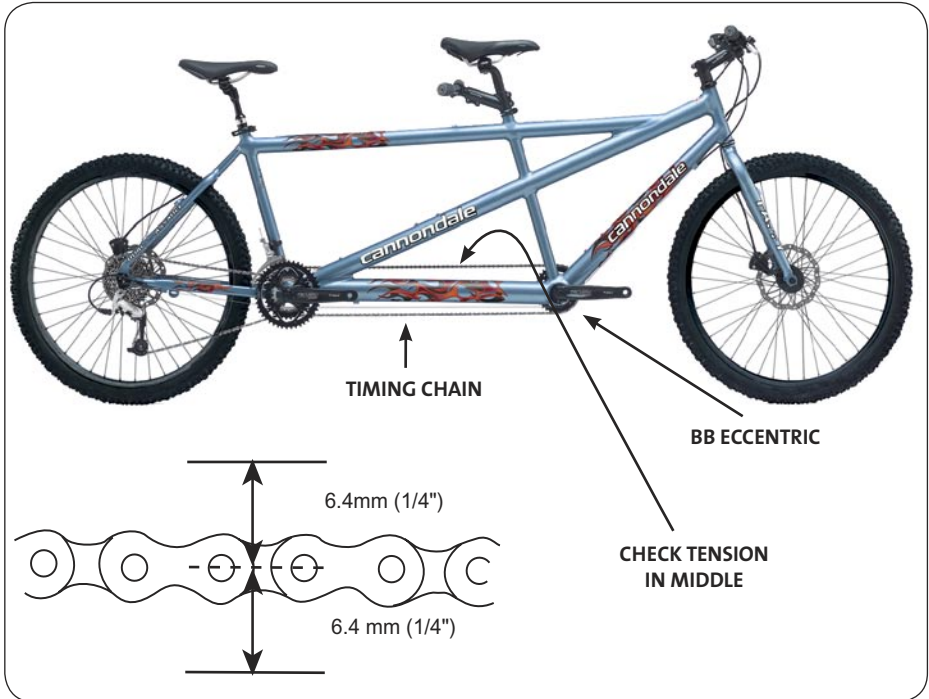


Figure 6

The chain must be in good condition and lubricated before the tension is measured or adjusted.

1. **MEASURE THE TENSION** - On the upper length of the chain in the middle of the front and rear sprocket, move the chain up and down. You should be able to lift it up 1/4" and move it down 1/4" easily. This total movement is called vertical deflection and it should be 1/2."

Turn the crank to rotate the wheel so you can check tension at different links of the chain. The amount of deflection the same.

If the chain seems tighter in some places, it may be an indication of chain damage or some other problem. Have the chain replaced or the damage repaired before attempting any adjustment. If the chain is in good condition continue to step 2.

2. **LOOSEN THE BB ECCENTRIC WEDGES** - Insert a 4 mm Allen key into the wedge bolt and turn it clockwise to loosen the wedge.

After the first turn or so, the wedge bolt will feel loose then it may seem to tighten as it pushes the wedge backward.

You should never turn the bolt if the resistance felt in the tool is high; the threads of the wedge can suffer damage. The wedge may be stuck in the bottom bracket shell due to the lack of grease or corrosion. It may be helpful to loosen a "sticky" wedge by taping the head of the wedge bolt after it is loosened a turn or two. To do this, insert the 4 mm key of an allen tool set (or T-handle) and tap only lightly. Never strike the eccentric or bike frame or use hard force. If lightly tapping the head of the wedge bolt doesn't loosen the wedge, the assembly should be checked out by a bike mechanic.

3. **ROTATE THE ECCENTRIC WITHIN BB SHELL** - When the wedge is loose and the eccentric assembly is free to rotate within the bottom bracket shell, insert the ends of a pin spanner tool into the eccentric holes and rotate it until the correct vertical chain deflection is reached.
4. **RETIGHTEN THE WEDGE** - When the chain tension is set, tighten the wedge bolt clockwise to 6.75 N•m (5.0 Ft•Lbs).
5. **RECHECK THE CHAIN TENSION.**



WARNING

INCORRECT CHAIN TENSION ADJUSTMENT CAN CAUSE YOU TO HAVE AN ACCIDENT.

If you do not understand these instructions or are unable to complete them as described, please have the chain tension checked and adjusted by a professional bike mechanic.

WARN008

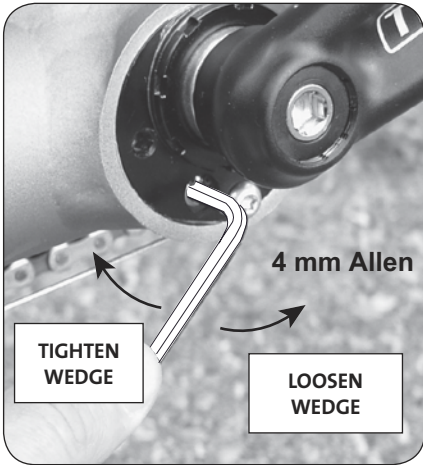


Figure 7

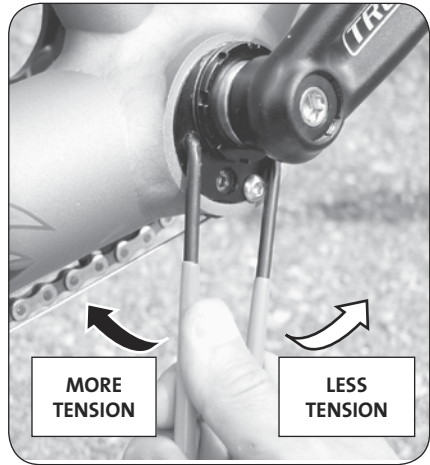


Figure 8

About the Double Wedge Eccentric (Figure 9)

Changing the arrangement of the head and threaded wedge enables the wedge bolt to be located on either the drive side (right) or non-drive side (left) of the bike. It is not necessary to remove the wedge bolt from the head wedge when reversing the arrangement.

Installation Points For the Eccentric:

- A. Wipe clean all parts and threads before installation.
- B. The bottom bracket center bolt is always positioned on the right (drive) side of the bicycle. It locates on the face of the bottom bracket shell to center the assembly. It is not an adjustment; do not remove it.
- C. Grease or apply anti-seize to the wedge faces and outside surfaces of the wedges as well as the eccentric body and inside the bottom bracket shell before inserting the wedge assembly.
- D. Be sure to check the condition of the eccentric pins and wedge slots for damage. The eccentric pins are pressed into the body; do not remove them.

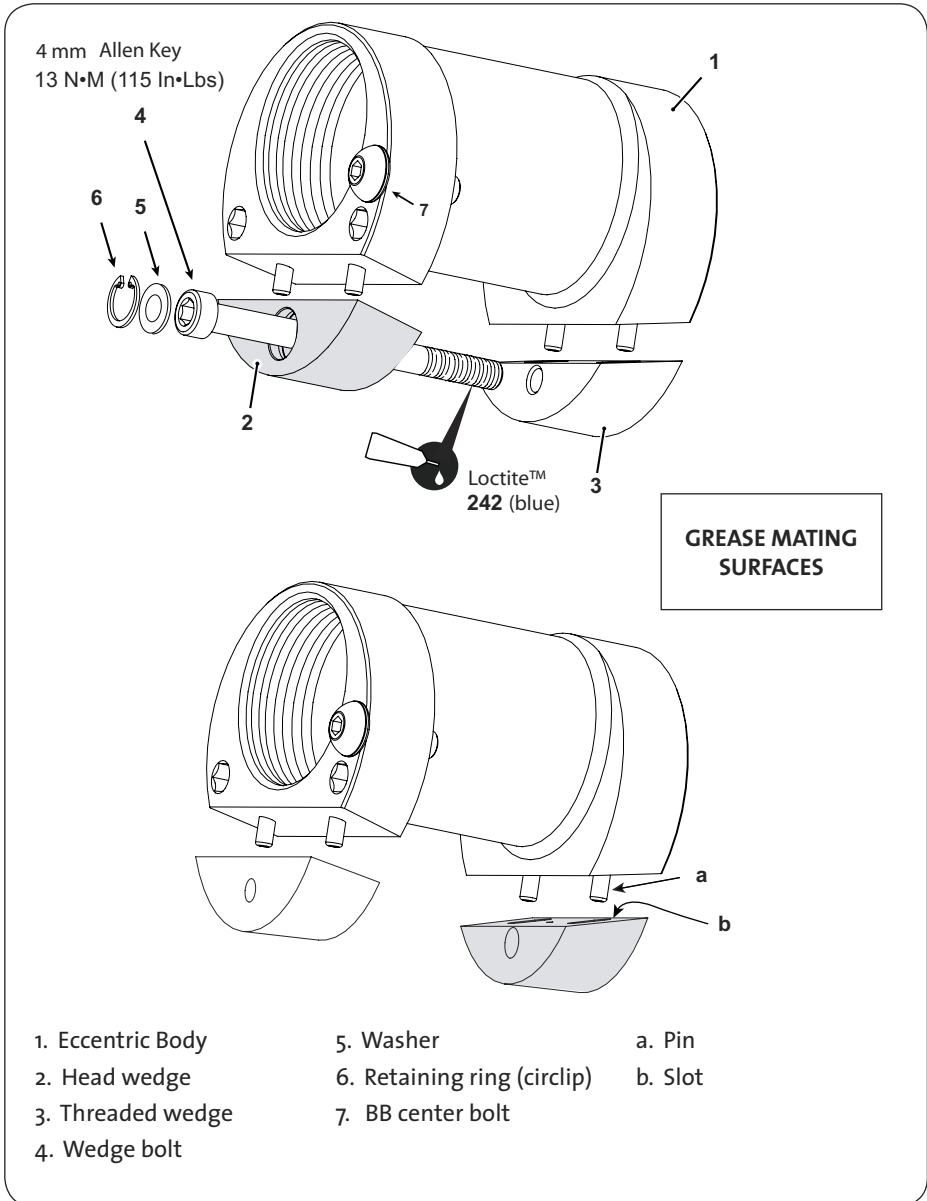


Figure 9

MAINTENANCE

Please consult your *Cannondale Bicycle Owner's Manual* for more information on basic bike maintenance. And, so you may create a complete maintenance program best suited to you and your riding style, please talk to your Cannondale Dealer. Also, remember to follow the maintenance recommendations given by the component manufacturers for the various non-Cannondale parts of your bike. **We urge you to work with a Cannondale retailer who is experienced with tandems.**

SOME TANDEM MAINTENANCE CONCERNS

CHAINS, DERAILLEURS, HEADSETS AND TIRES:

These parts on Tandems experience greater wear and tear than on single bikes. These items should be maintained as on your single bike, but more frequently and more carefully.

TIRE PRESSURE:

Tire pressure is critical. Low tire pressure invites pinch-cut flats, while high pressure improves your performance and makes the tires last longer. Use the maximum pressure named on the tire sidewall.

CONTROL CABLES:

Cables are critical. Because of their length, they're vulnerable to poor performance from cable friction or poor cable routing. Spokes, handlebar stems, and other components must be inspected for tightness every month, or after every long ride. The front derailleur needs visual inspection, since you can't see it when you're riding (as on your single bike).

TIMING CHAIN:

The timing chain—between the two cranksets—is unique to tandems. It stretches in normal use, and must be kept tight. A loose timing chain can flop sideways and snag a crank arm, or it can come off entirely.

Hold the chain in its middle and wiggle it up and down. You should be able to wiggle it about 1/2 inch, and no more. If it moves more than 1/2 inch take it to your Cannondale Retailer for tightening.

The timing chain should be checked for tightness every 200-300 miles. Buy a chain wear indicator to know when to replace both chains. A tandem has a lot of expensive chainwheels and cogs, so the chain wear indicator will quickly pay for itself.



WARNING

ANY PART OF A POORLY MAINTAINED BIKE CAN BREAK OR MALFUNCTION. AND, THAT CAN LEAD TO AN ACCIDENT WHERE YOU CAN BE KILLED, SEVERELY INJURED OR PARALYZED.

Please ask your Cannondale Dealer to help you develop a complete maintenance program, a program which includes a list of the parts on your bike for YOU to check regularly.

Frequent checks are necessary to identify the problems that can lead to an accident.

WARN009

GEOMETRY

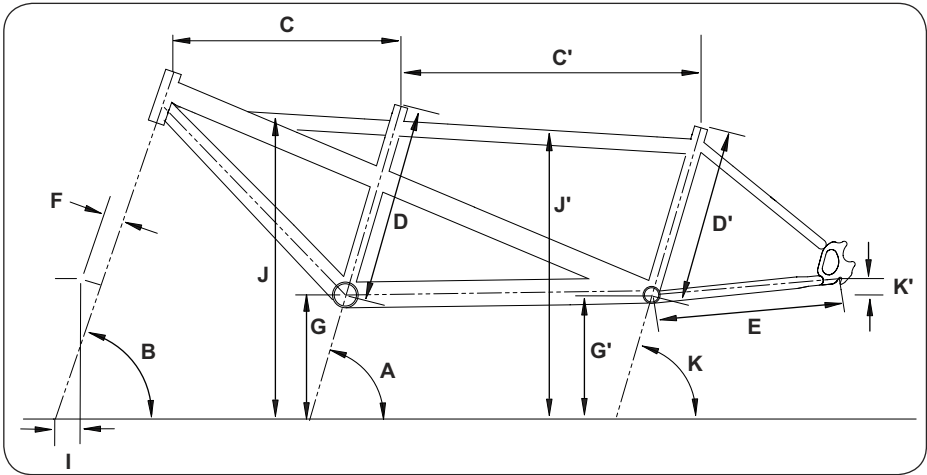


Figure 10

Mountain Tandems		M/S	L/S	X/S	X/M	J/L
Seat Tube Angle (degrees)	A	73	73	73	73	73
Rear Seat Tube Angle (degrees)	A'	73	73	73	73	73
Head Tube Angle (degrees)	B	73	73	73	73	73
Horizontal Top Tube Length (in/cm)	C	21.5/54.6	22.1/56.1	23.8/60.5	23.8/60.5	24.6/62.5
Rear Horizontal Top Tube Length (in/cm)	C'	27.1/68.8	27.1/68.8	27.1/68.8	28.1/71.4	29.1/73.9
Seat Tube Length to Top (in/cm)	D	19/48.3	20/50.8	21/53.3	22/55.9	24/61
Rear Seat Tube Length to Top (in/cm)	D'	17/43.2	17/43.2	17/43.2	19/48.3	21/53.3
Chainstay Length (in/cm)	E	17.4/44.2	17.4/44.2	17.4/44.2	17.4/44.2	17.4/44.2
Fork Rake (in/cm)	F	2.1/5.3	2.1/5.3	2.1/5.3	2.1/5.3	2.1/5.3
Bottom Bracket Height (in/cm)	G	10.8/27.4	10.8/27.4	10.8/27.4	10.8/27.4	10.8/27.4
Rear Bottom Bracket Height (in/cm)	G'	10.5/26.7	10.5/26.7	10.5/26.7	10.5/26.7	10.5/26.7
Wheelbase (in/cm)	H	67/170.2	67.6/171.7	69.2/175.8	70.2/178.3	72.1/183.1
Trail (in/cm)	I	2/5.1	2/5.1	2/5.1	2/5.1	2/5.1
Standover Height (in/cm)	J	28.3/71.9	30.3/77	31.2/79.2	31.6/80.3	33.6/85.3
Rear Standover Height (in/cm)	J'	26.6/67.6	27.1/68.8	27.6/70.1	29/73.7	30.9/78.5
Bottom Bracket Drop (in/cm)	K	2.9/7.4	2.9/7.4	2.9/7.4	2.9/7.4	2.9/7.4
Rear Bottom Bracket Drop (in/cm)	K'	1.3/3.2	1.3/3.2	1.3/3.2	1.3/3.2	1.3/3.2
Front-Center Distance (in/cm)	L	23/58.4	23.6/59.9	25.2/64	26/66	26/66

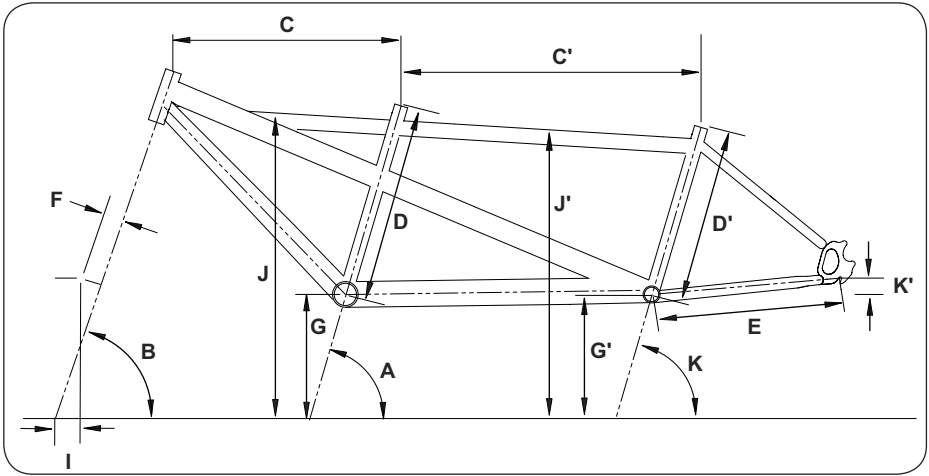


Figure 10

Road Tandems		M/S	L/S	X/S	X/M	I/L
Seat Tube Angle (degrees)	A	73	73	73	73	73
Rear Seat Tube Angle (degrees)	A'	73	73	73	73	73
Head Tube Angle (degrees)	B	73	73	73	73	73
Horizontal Top Tube Length (in/cm)	C	21.5/54.6	22.1/56.1	23.8/60.5	23.8/60.5	24.6/62.5
Rear Horizontal Top Tube Length (in/cm)	C'	27.1/68.8	27.1/68.8	27.1/68.8	28.1/71.4	29.1/73.9
Seat Tube Length to Top (in/cm)	D	19/48.3	20/50.8	21/53.3	22/55.9	24/61
Rear Seat Tube Length to Top (in/cm)	D'	17/43.2	17/43.2	17/43.2	19/48.3	21/53.3
Chainstay Length (in/cm)	E	17.4/44.2	17.4/44.2	17.4/44.2	17.4/44.2	17.4/44.2
Fork Rake (in/cm)	F	2.1/5.3	2.1/5.3	2.1/5.3	2.1/5.3	2.1/5.3
Bottom Bracket Height (in/cm)	G	10.8/27.4	10.8/27.4	10.8/27.4	10.8/27.4	10.8/27.4
Rear Bottom Bracket Height (in/cm)	G'	10.5/26.7	10.5/26.7	10.5/26.7	10.5/26.7	10.5/26.7
Wheelbase (in/cm)	H	67/170.2	67.6/171.7	69.2/175.8	70.2/178.3	72.1/183.1
Trail (in/cm)	I	2/5.1	2/5.1	2/5.1	2/5.1	2/5.1
Standover Height (in/cm)	J	28.3/71.9	30.3/77	31.2/79.2	31.6/80.3	33.6/85.3
Rear Standover Height (in/cm)	J'	26.6/67.6	27.1/68.8	27.6/70.1	29/73.7	30.9/78.5
Bottom Bracket Drop (in/cm)	K	2.9/7.4	2.9/7.4	2.9/7.4	2.9/7.4	2.9/7.4
Rear Bottom Bracket Drop (in/cm)	K'	1.3/3.2	1.3/3.2	1.3/3.2	1.3/3.2	1.3/3.2
Front-Center Distance (in/cm)	L	23/58.4	23.6/59.9	25.2/64	26/66	26/66

REPLACEMENT PARTS (KITS)

The following parts are available through any authorized Cannondale retailer:

CANNONDALE KIT NO.	DESCRIPTION
A463/	Tandem rear brake cable housing stops, fit into top tube through guides, pair
A457/	Tandem BB cable guide and screw, plus BB derailleur cable guide rollers & plastic disc and mounting screws
A399/EBO	Tandem stoker stem, 120-170mm, 27.2mm post clamp, 25.4 bar clamp
A181/	TYPE 2 - Tandem bottom bracket eccentric, complete
80255	Bolt for tandem bottom bracket eccentric, M5x.8x60mm
116376	Cannondale Bicycle Owner's Manual
116831	This tandem owner's manual supplement
A238X/EBO	includes. 1 - Derailleur hanger/2 M3x10mm screws, 1- 2.5mm hex key

For an up to date list of kits available for your bike, please visit our Tech Center at : <http://www.cannondale.com/bikes/tech/>

OWNER NOTES

You can use a table like this to record maintenance history, service, or set up information about your bike.

Date	Work Performed

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TANDEM PRE-RIDE CHECKS

The back cover of your *Cannondale Bicycle Owner's Manual* (your main manual for bicycles) includes a "Pre-Ride Checklist." In addition to that **Pre-Ride Checklist**, you should do the following:

1. **Inspect the Stoker's Handlebar System**, see page 12.
2. **Inspect Wheels, Brakes, Tires**

Check your wheels (rims, hubs, spokes) for damage. Tandems are very hard on wheel systems.

Make sure your brakes work well. Tandems can be very hard on brakes, especially the wear items like pads, discs, and wheel rims. Test the brakes with both riders at slow speeds.

Check your tire pressures and condition. Tandems are very hard on tires. You should inspect to make sure the tire pressure is correct. See the tire sidewall. Make sure the tire and rim are in good condition: lots of tread and no damage.

A PRE- RIDE INSPECTION OF YOUR BIKE IS IMPORTANT TO YOUR SAFETY.