YAMAHA

POWER ASSIST BICYCLES

OWNER'S MANUAL

YDX MORO

YDX-MORO Pro

LIT-15626-00-11

* Product and specifications are subject to change without notice.

X1V-F8199-10

Introduction

Thank you for choosing a Yamaha Power Assist Bicycle.
This model is the result of Yamaha's vast experience in the production of fine sporting, touring, and pacesetting racing machines. It represents the high degree of craftsmanship and reliability that have made Yamaha a leader in these fields.

This manual meets ISO-4210, 16 CFR 1512 and EN 14764, 14766 and 14781 Standards supplemented with text pertaining to electric bicycles

⚠ WARNING

Do not ride with two people, even using a child carrier seat.
This model is not designed to allow the use of a child carrier seat (aftermarket accessory) to carry a second person.

NOTICE

- **This manual contains important safety, performance and service information. Read it before you take the first ride on your new bicycle, and keep it for reference.**
- **Additional safety, performance and service information for specific components such as suspension or pedals on your bicycle, or for accessories such as helmets or lights that you purchase, may also be available. Make sure that your dealer has given you all the manufacturers' literature that was included with your bicycle or accessories. In case of a conflict between the instructions in this manual and information provided by a component manufacturer, always follow the component manufacturer's instructions.**
- **If you have any questions or do not understand something, take responsibility for your safety and consult with your dealer or the bicycle's manufacturer.**

TIP

This manual is not intended as a comprehensive use, service, repair or maintenance manual. Please see your dealer for all service, repairs or maintenance. Your dealer may also be able to refer you to classes, clinics or books on bicycle use, service, repair or maintenance.

YDX-MORO Pro
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OWNER'S MANUAL
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General warning

Like any sport, bicycling involves risk of injury and damage. By choosing to ride a bicycle, you assume the responsibility for that risk, so you need to know — and to practice — the rules of safe and responsible riding and of proper use and maintenance. Proper use and maintenance of your bicycle reduces risk of injury.

This manual contains many “Warnings” and “Notices” concerning the consequences of failure to maintain or inspect your bicycle and of failure to follow safe cycling practices.

⚠	This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
⚠ WARNING	**A WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
NOTICE	**A NOTICE indicates special precautions that must be taken to avoid damage to the bicycle or other property.**
TIP	A TIP provides key information to make procedures easier or clearer.

Many of the Warnings and Notices say “you may lose control and fall”. Because any fall can result in serious injury or even death, we do not always repeat the warning of possible injury or death.

Because it is impossible to anticipate every situation or condition which can occur while riding, this manual makes no representation about the safe use of the bicycle under all conditions. There are risks associated with the use of any bicycle which cannot be predicted or avoided, and which are the sole responsibility of the rider.

Be sure to read the important information about your specific bicycle to be found on pages 38 through 43 in addition to the information in “1. First” on the following pages.

A special note for parents

⚠ WARNING

This manual does not cover Juvenile or BMX bicycles.

As a parent or guardian, you are responsible for the activities and safety of your minor child, and that includes making sure that the bicycle is properly fitted to the child; that it is in good repair and safe operating condition; that you and your child have learned and understand the safe operation of the bicycle; and that you and your child have learned, understand and obey not only the applicable local motor vehicle, bicycle and traffic laws, but also the common sense rules of safe and responsible bicycling. As a parent, you should read this manual, as well as review its warnings and the bicycle's functions and operating procedures with your child, before letting your child ride the bicycle.

⚠ WARNING

Make sure that your child always wears an approved bicycle helmet when riding; but also make sure that your child understands that a bicycle helmet is for bicycling only, and must be removed when not riding. A helmet must not be worn while playing, in play areas, on playground equipment, while climbing trees, or at any time while not riding a bicycle. Failure to follow this warning could result in serious injury or death.

1. First

TIP

We strongly urge you to read this manual in its entirety before your first ride. At the very least, read and make sure that you understand each point in this section, and refer to the cited sections on any issue which you don't completely understand. Please note that not all bicycles have all of the features described in this manual. Ask your dealer to point out the features of your bicycle.

A. Bike fit

1. Is your bike the right size? To check, see Section 3.A. If your bicycle is too large or too small for you, you may lose control and fall. If your new bike is not the right size, ask your dealer to exchange it before you ride it.
2. Is the saddle at the right height? To check, see Section 3.B. If you adjust your saddle height, follow the Minimum Insertion instructions in Section 3.B.
3. Are saddle and seat post securely clamped? A correctly tightened saddle will allow no saddle movement in any direction. See Section 3.B.
4. Are the stem and handlebars at the right height for you? If not, see Section 3.C.
5. Can you comfortably operate the brakes? If not, you may be able to adjust their angle and reach. See Section 3.D and 3.E.
6. Do you fully understand how to operate your new bicycle? If not, before your first ride, have your dealer explain any functions or features which you do not understand.

B. Safety first

1. Always wear an approved helmet when riding your bike, and follow the helmet manufacturer's instructions for fit, use and care.
2. Do you have all the other required and recommended safety equipment? See Section 2. It's your responsibility to familiarize yourself with the laws of the areas where you ride, and to comply with all applicable laws.
3. Do you know how to correctly secure your front and rear wheels? Check Section 4.A.1 to make sure. Riding with an improperly secured wheel can cause the wheel to wobble or disengage from the bicycle, and cause serious injury or death.
4. If your bike has toeclips and straps or clipless ("step-in") pedals, make sure you know how they work (see Section 4.F). These pedals require special techniques and skills. Follow the pedal manufacturer's instructions for use, adjustment and care.
5. Do you have "Toe Overlap"? On smaller framed bicycles your toe or toeclip may be able to contact the front wheel when a pedal is all the way forward and the wheel is turned. Read Section 4.F. to check whether you have toeclip overlap.
6. Does your bike have suspension? If so, check Section 4.G. Suspension can change the way a bicycle performs. Follow the suspension manufacturer's instructions for use, adjustment and care.

C. Mechanical safety check

Routinely check the condition of your bicycle before every ride.

- **Nuts, bolts screws & other fasteners:** Because manufacturers use a wide variety of fastener sizes and shapes made in a variety of materials, often differing by model

and component, the correct tightening force or torque cannot be generalized. To make sure that the many fasteners on your bicycle are correctly tightened, refer to “Fastener torque specifications” in Appendix C of this manual or to the torque specifications in the instructions provided by the manufacturer of the component in question. Correctly tightening a fastener requires a calibrated torque wrench. A professional bicycle mechanic with a torque wrench should torque the fasteners on you bicycle. If you choose to work on your own bicycle, you must use a torque wrench and the correct tightening torque specifications from the bicycle or component manufacturer or from your dealer. If you need to make an adjustment at home or in the field, we urge you to exercise care, and to have the fasteners you worked on checked by your dealer as soon as possible. Note that there are some components which require special tools and knowledge. In Sections 3 and 4 we discuss the items which you may be able to adjust yourself. All other adjustments and repairs should be done by a qualified bicycle mechanic.

⚠ WARNING

Correct tightening force on fasteners —nuts, bolts, screws— on your bicycle is important. Too little force, and the fastener may not hold securely. Too much force, and the fastener can strip threads, stretch, deform or break. Either way, incorrect tightening force can result in component failure, which can cause you to lose control and fall.

- Make sure nothing is loose. Lift the front wheel off the ground by two or three inches, then let it bounce on the ground. Anything sound, feel or look loose? Do a visual and tactile inspection of the whole bike. Any loose parts or accessories? If so, secure them. If you’re not sure, ask someone with experience to check.
- **Tires & Wheels:** Make sure tires are correctly inflated (see Section 4.H.1). Check by putting one hand on the saddle, one on the intersection of the handlebars and stem, then bouncing your weight on the bike while looking at tire deflection. Compare what you see with how it looks when you know the tires are correctly inflated; and adjust if necessary.
- Tires in good shape? Spin each wheel slowly and look for cuts in the tread and sidewall. Replace damaged tires before riding the bike.
- Wheels true? Spin each wheel and check for brake clearance and side-to-side wobble. If a wheel wobbles side to side even slightly, or rubs against or hits the brake pads, take the bike to a qualified bike shop to have the wheel trued.

NOTICE

Wheels must be true for rim brakes to work effectively. Wheel trueing is a skill which requires special tools and experience. Do not attempt to true a wheel unless you have the knowledge, experience and tools needed to do the job correctly.

- Wheel rims clean and undamaged? Make sure the rims are clean and undamaged at the tire bead and, if you have rim brakes, along the braking surface. Check to make sure that any rim wear indicator marking is not visible at any point on the wheel rim.

⚠ WARNING

Bicycle wheel rims are subject to wear. Ask your dealer about wheel rim wear. Some wheel rims have a rim wear indicator which becomes visible as the rim’s

braking surface wears. A visible rim wear indicator on the side of the wheel rim is an indication that the wheel rim has reached its maximum usable life. Riding a wheel that is at the end of its usable life can result in wheel failure, which can cause you to lose control and fall.

- **Brakes:** Check the brakes for proper operation (see Section 4.D). Squeeze the brake levers. Are the brake quick-releases closed? All control cables seated and securely engaged? If you have rim brakes, do the brake pads contact the wheel rim squarely and make full contact with the rim? Do the brakes begin to engage within an inch of brake lever movement? Can you apply full braking force at the levers without having them touch the handlebar? If not, your brakes need adjustment. Do not ride the bike until the brakes are properly adjusted by a professional bicycle mechanic.
- **Wheel retention system:** Make sure the front and rear wheels are correctly secured. See Section 4.A
- **Seat post:** If your seat post has an over-center cam action fastener for easy height adjustment, check that it is properly adjusted and in the locked position. See Section 4.B.
- **Handlebar and saddle alignment:** Make sure the saddle and handlebar stem are parallel to the bike's center line and clamped tight enough so that you can't twist them out of alignment. See Sections 3.B and 3.C.
- **Handlebar ends:** Make sure the handlebar grips are secure and in good condition, with no cuts, tears, or worn out areas. If not, have your dealer replace them. Make sure the handlebar ends and extensions are plugged. If not, have your dealer plug them before you ride. If the handlebars have bar end extensions, make sure they are clamped tight enough so you can't twist them.

⚠ WARNING

Loose or damaged handlebar grips or extensions can cause you to lose control and fall. Unplugged handlebars or extensions can cut you and cause serious injury in an otherwise minor accident.

VERY IMPORTANT SAFETY NOTE:
Please also read and become thoroughly familiar with the important information on the lifespan of your bicycle and its components in Appendix B.

D. First ride

When you buckle on your helmet and go for your first familiarization ride on your new bicycle, be sure to pick a controlled environment, away from cars, other cyclists, obstacles or other hazards. Ride to become familiar with the controls, features and performance of your new bike.

Familiarize yourself with the braking action of the bike (see Section 4.D). Test the brakes at slow speed, putting your weight toward the rear and gently applying the brakes, rear brake first. Sudden or excessive application of the front brake could pitch you over the handlebars. Applying brakes too hard can lock up a wheel, which could cause you to lose control and fall. Skidding is an example of what can happen when a wheel locks up.

If your bicycle has toeclips or clipless pedals, practice getting in and out of the pedals. See paragraph B.4 above and Section 4.F.4.

If your bike has suspension, familiarize yourself with how the suspension responds to

brake application and rider weight shifts. See paragraph B.6 above and Section 4.G.
Practice shifting the gears (see Section 4.E). Remember to never move the shifter while pedaling backward, nor pedal backwards immediately after having moved the shifter. This could jam the chain and cause serious damage to the bicycle.
Check out the handling and response of the bike; and check the comfort.
If you have any questions, or if you feel anything about the bike is not as it should be, consult your dealer before you ride again.

2. Safety

A. Basics

⚠ WARNING

The area in which you ride may require specific safety devices. It is your responsibility to familiarize yourself with the laws of the area where you ride and to comply with all applicable laws, including properly equipping yourself and your bike as the law requires.
Observe all local bicycle laws and regulations. Observe regulations about bicycle lighting, licensing of bicycles, riding on sidewalks, laws regulating bike path and trail use, helmet laws, child carrier laws, special bicycle traffic laws. It's your responsibility to know and obey the laws.

1. Always wear a cycling helmet which meets the latest certification standards and is appropriate for the type of riding you do. Always follow the helmet manufacturer's instructions for fit, use and care of your helmet. Most serious bicycle injuries involve head injuries which might have been avoided if the rider had worn an appropriate helmet.

⚠ WARNING

Failure to wear a helmet when riding may result in serious injury or death.

2. Always do the Mechanical safety check (Section 1.C) before you get on a bike.
3. Be thoroughly familiar with the controls of your bicycle: brakes (Section 4.D.); pedals (Section 4.F.); shifting (Section 4.E.)
4. Be careful to keep body parts and other objects away from the sharp teeth of chainrings, the moving chain, the turning pedals and cranks, and the spinning wheels of your bicycle.
5. Always wear:
   - Shoes that will stay on your feet and will grip the pedals. Make sure that shoe laces cannot get into moving parts, and never ride barefoot or in sandals.
   - Bright, visible clothing that is not so loose that it can be tangled in the bicycle or snagged by objects at the side of the road or trail.
   - Protective eyewear, to protect against airborne dirt, dust and bugs — tinted when the sun is bright, clear when it's not.
6. Unless your bicycle was specifically designed for jumping (See Appendix A, "Intended use of your bicycle") don't jump with your bike. Jumping a bike, particularly a BMX or mountain bike, can be fun; but it can put huge and unpredictable stress on the bicycle and its components. Riders who insist on jumping their bikes risk serious damage, to their bicycles as well as to themselves. Before you attempt to jump, do stunt riding or race with your bike, read and understand Section 2.F.
7. Ride at a speed appropriate for conditions. Higher speed means higher risk.

B. Riding safety

1. Obey all Rules of the Road and all local traffic laws.
2. You are sharing the road or the path with others — motorists, pedestrians and other

cyclists. Respect their rights.

3. Ride defensively. Always assume that others do not see you.
4. Look ahead, and be ready to avoid:
   - Vehicles slowing or turning, entering the road or your lane ahead of you, or coming up behind you.
   - Parked car doors opening.
   - Pedestrians stepping out.
   - Children or pets playing near the road.
   - Pot holes, sewer grating, railroad tracks, expansion joints, road or sidewalk construction, debris and other obstructions that could cause you to swerve into traffic, catch your wheel or cause you to have an accident.
   - The many other hazards and distractions which can occur on a bicycle ride.
5. Ride in designated bike lanes, on designated bike paths or as close to the edge of the road as possible, in the direction of traffic flow or as directed by local governing laws.
6. Stop at stop signs and traffic lights; slow down and look both ways at street intersections. Remember that a bicycle always loses in a collision with a motor vehicle, so be prepared to yield even if you have the right of way.
7. Use approved hand signals for turning and stopping.
8. Never ride with headphones. They mask traffic sounds and emergency vehicle sirens, distract you from concentrating on what's going on around you, and their wires can tangle in the moving parts of the bicycle, causing you to lose control.
9. Never carry a passenger; and, before installing a child carrier or trailer, check with your dealer or the bicycle manufacturer to make sure the bicycle is designed for it. If the bicycle is suitable for a child carrier or trailer, make sure that the carrier or trailer is correctly mounted and the child is secured and wearing an approved helmet.
10. Never carry anything which obstructs your vision or your complete control of the bicycle, or which could become entangled in the moving parts of the bicycle.
11. Never hitch a ride by holding on to another vehicle.
12. Don't do stunts, wheelies or jumps. If you intend to do stunts, wheelies, jumps or go racing with your bike despite our advice not to, read Section 2.F, "Extreme, stunt or competition riding", **now**. Think carefully about your skills before deciding to take the large risks that go with this kind of riding.
13. Don't weave through traffic or make any moves that may surprise people with whom you are sharing the road.
14. Observe and yield the right of way.
15. Never ride your bicycle while under the influence of alcohol or drugs.
16. If possible, avoid riding in bad weather, when visibility is obscured, at dawn, dusk or in the dark, or when extremely tired. Each of these conditions increases the risk of accident.

C. Off road safety

We recommend that children not ride on rough terrain unless they are accompanied by an adult.

1. The variable conditions and hazards of off-road riding require close attention and specific skills. Start slowly on easier terrain and build up your skills. If your bike has suspension, the increased speed you may develop also increases your risk of losing control and falling. Get to know how to handle your bike safely before trying increased speed or more difficult terrain.

2. Wear safety gear appropriate to the kind of riding you plan to do.
3. Don't ride alone in remote areas. Even when riding with others, make sure that someone knows where you're going and when you expect to be back.
4. Always take along some kind of identification, so that people know who you are in case of an accident; and take along some cash for food, a cool drink or an emergency phone call.
5. Yield right of way to pedestrians and animals. Ride in a way that does not frighten or endanger them, and give them enough room so that their unexpected moves don't endanger you.
6. Be prepared. If something goes wrong while you're riding off-road, help may not be close.
7. Before you attempt to jump, do stunt riding or race with your bike, read and understand Section 2.F.

Off Road respect

Obey the local laws regulating where and how you can ride off-road, and respect private property. You may be sharing the trail with others — hikers, equestrians, other cyclists. Respect their rights. Stay on the designated trail. Don't contribute to erosion by riding in mud or with unnecessary sliding. Don't disturb the ecosystem by cutting your own trail or shortcut through vegetation or streams. It is your responsibility to minimize your impact on the environment.

Leave things as you found them; and always take out everything you brought in.

D. Wet weather riding

⚠ WARNING

Wet weather impairs traction, braking and visibility, both for the bicyclist and for other vehicles sharing the road. The risk of an accident is dramatically increased in wet conditions.

Under wet conditions, the stopping power of your brakes (as well as the brakes of other vehicles sharing the road) is dramatically reduced and your tires don't grip nearly as well. This makes it harder to control speed and easier to lose control. To make sure that you can slow down and stop safely in wet conditions, ride more slowly and apply your brakes earlier and more gradually than you would under normal, dry conditions. See also Section 4.D.

E. Night riding

Riding a bicycle at night is *much* more dangerous than riding during the day. A bicyclist is very difficult for motorists and pedestrians to see. Therefore, children should never ride at dawn, at dusk or at night. Adults who chose to accept the greatly increased risk of riding at dawn, at dusk or at night need to take extra care both riding and choosing specialized equipment which helps reduce that risk. Consult your dealer about night riding safety equipment.

⚠ WARNING

Reflectors are not a substitute for required lights. Riding at dawn, at dusk, at night or at other times of poor visibility without an adequate bicycle lighting system and without reflectors is dangerous and may result in serious injury or

death.

Bicycle reflectors are designed to pick up and reflect car lights and street lights in a way that may help you to be seen and recognized as a moving bicyclist.

NOTICE

Check reflectors and their mounting brackets regularly to make sure that they are clean, straight, unbroken and securely mounted. Have your dealer replace damaged reflectors and straighten or tighten any that are bent or loose.

The mounting brackets of front and rear reflectors are often designed as brake straddle cable safety catches which prevent the straddle cable from catching on the tire tread if the cable jumps out of its yoke or breaks.

⚠ WARNING

Do not remove the front or rear reflectors or reflector brackets from your bicycle. They are an integral part of the bicycle's safety system.
Removing the reflectors reduces your visibility to others using the roadway. Being struck by other vehicles may result in serious injury or death.
The reflector brackets may protect you from a brake straddle cable catching on the tire in the event of brake cable failure. If a brake straddle cable catches on the tire, it can cause the wheel to stop suddenly, causing you to lose control and fall.

If you choose to ride under conditions of poor visibility, check and be sure you comply with all local laws about night riding, and take the following strongly recommended additional precautions:

- Purchase and install battery or generator powered head and tail lights which meet all regulatory requirements for where you live and provide adequate visibility.
- Wear light colored, reflective clothing and accessories, such as a reflective vest, reflective arm and leg bands, reflective stripes on your helmet, flashing lights attached to your body and/or your bicycle ... any reflective device or light source that moves will help you get the attention of approaching motorists, pedestrians and other traffic.
- Make sure your clothing or anything you may be carrying on the bicycle does not obstruct a reflector or light.
- Make sure that your bicycle is equipped with correctly positioned and securely mounted reflectors.

While riding at dawn, at dusk or at night:

- Ride slowly.
- Avoid dark areas and areas of heavy or fast-moving traffic.
- Avoid road hazards.
- If possible, ride on familiar routes. If riding in traffic:
- Be predictable. Ride so that drivers can see you and predict your movements.
- Be alert. Ride defensively and expect the unexpected.
- If you plan to ride in traffic often, ask your dealer about traffic safety classes or a good book on bicycle traffic safety.

F. Extreme, stunt or competition riding

Whether you call it *Aggro, Hucking, Freeride, North Shore, Downhill, Jumping, Stunt*

Riding, Racing or something else: if you engage in this sort of extreme, aggressive riding *you **will** get hurt,* and you voluntarily assume a greatly increased risk of injury or death.
Not all bicycles are designed for these types of riding, and those that are may not be suitable for all types of aggressive riding. Check with your dealer or the bicycle's manufacturer about the suitability of your bicycle before engaging in extreme riding.
When riding fast down hill, you can reach speeds achieved by motorcycles, and therefore face similar hazards and risks. Have your bicycle and equipment carefully inspected by a qualified mechanic and be sure it is in perfect condition. Consult with expert riders, area site personnel and race officials on conditions and equipment advisable at the site where you plan to ride. Wear appropriate safety gear, including an approved full face helmet, full finger gloves, and body armor. Ultimately, it is your responsibility to have proper equipment and to be familiar with course conditions.

⚠ WARNING

Although many catalogs, advertisements and articles about bicycling depict riders engaged in extreme riding, this activity is extremely dangerous, increases your risk of injury or death, and increases the severity of any injury. Remember that the action depicted is being performed by professionals with many years of training and experience. Know your limits and always wear a helmet and other appropriate safety gear. Even with state-of-the-art protective safety gear, you could be seriously injured or killed when jumping, stunt riding, riding downhill at speed or in competition.

⚠ WARNING

Bicycles and bicycle parts have limitations with regard to strength and integrity, and this type of riding can exceed those limitations or dramatically reduce the length of their safe use.

We recommend against this type of riding because of the increased risks; but if you choose to take the risk, at least:
- Take lessons from a competent instructor first.
- Start with easy learning exercises and slowly develop your skills before trying more difficult or dangerous riding.
- Use only designated areas for stunts, jumping, racing or fast downhill riding.
- Wear a full face helmet, safety pads and other safety gear.
- Understand and recognize that the stresses imposed on your bike by this kind of activity may break or damage parts of the bicycle and void the warranty.
- Take your bicycle to your dealer if anything breaks or bends. Do not ride your bicycle when any part is damaged.

If you ride downhill at speed, do stunt riding or ride in competition, know the limits of your skill and experience. Ultimately, avoiding injury is your responsibility.

G. Changing components or adding accessories

There are many components and accessories available to enhance the comfort, performance and appearance of your bicycle. However, if you change components or add accessories, you do so at your own risk. The bicycle's manufacturer may not have tested that component or accessory for compatibility, reliability or safety on your bicycle.

Before installing any component or accessory, including but not limited to a different size tire, a lighting system, a luggage rack, a child seat, a trailer, etc., make sure that it is compatible with your bicycle by checking with your dealer. Be sure to read, understand and follow the instructions that accompany the products you purchase for your bicycle. See also Appendix A and B.

⚠ WARNING

Failure to confirm compatibility, properly install, operate and maintain any component or accessory can result in serious injury or death.

⚠ WARNING

Exposed springs on the saddle of any bicycle fitted with a child seat can cause serious injury to the child.

⚠ WARNING

Changing the components on your bike with other than genuine replacement parts may compromise the safety of your bicycle and may void the warranty. Check with your dealer before changing the components on your bike.

3. Fit

TIP

Correct fit is an essential element of bicycling safety, performance and comfort. Making the adjustments to your bicycle which result in correct fit for your body and riding conditions requires experience, skill and special tools. Always have your dealer make the adjustments on your bicycle; or, if you have the experience, skill and tools, have your dealer check your work before riding.

⚠ WARNING

If your bicycle does not fit properly, you may lose control and fall. If your new bike doesn't fit, ask your dealer to exchange it before you ride it.

A. Standover height

1. **Diamond frame bicycles**

   Standover height is the basic element of bike fit (fig. 2). It is the distance from the ground to the top of the bicycle's frame at that point where your crotch is when straddling the bike. To check for correct standover height, straddle the bike while wearing the kind of shoes in which you'll be riding, and bounce vigorously on your heels. If your crotch touches the frame, the bike is too big for you. Don't even ride the bike around the block. A bike which you ride only on paved surfaces and never take off-road should give you a minimum standover height clearance of two inches (5 cm). A bike that you'll ride on unpaved surfaces should give you a minimum of three inches (7.5 cm) of standover height clearance. And a bike that you'll use off road should give you four inches (10 cm) or more of clearance.

fig. 2

2. **Step-through frame bicycles**

   Standover height does not apply to bicycles with step-through frames. Instead, the limiting dimension is determined by saddle height range. You must be able to adjust your saddle position as described in Section 3.B without exceeding the limits set by the height of the top of the seat tube and the "Minimum Insertion" or "Maximum Extension" mark on the seat post.

B. Saddle position

fig. 3

Correct saddle adjustment is an important factor in getting the most performance and comfort from your bicycle.
If the saddle position is not comfortable for you, see your dealer.
The saddle can be adjusted in three directions:

1. Up and down adjustment. To check for correct saddle height (fig. 3):
   - Sit on the saddle;
   - Place one heel on a pedal;
   - Rotate the crank until the pedal with your heel on it is in the down position and the crank arm is parallel to the seat tube.

   If your leg is not completely straight, your saddle height needs to be adjusted. If your hips must rock for the heel to reach the pedal, the saddle is too high. If your leg is bent at the knee with your heel on the pedal, the saddle is too low.
   Ask your dealer to set the saddle for your optimal riding position and to show you how to make this adjustment. If you choose to make your own saddle height adjustment:
   - Loosen the seat post clamp.
   - Raise or lower the seat post in the seat tube*.
   - Make sure the saddle is straight fore and aft.
   - Re-tighten the seat post clamp to the recommended torque (Appendix C or the manufacturer's instructions).

   Once the saddle is at the correct height, make sure that the seat post does not project from the frame beyond its "Minimum Insertion" or "Maximum Extension" mark (fig. 4).

fig. 4

* For dropper seat post
To raise the seat post, pull up the seat post slowly while pushing the dropper seat wire into the frame. To lower the seat post, gently push in the seat post while pulling out the dropper seat wire from the frame. (See the right figure and Section 4.C)

NOTICE

- **Do not tighten the seat post tightening the bolt beyond the specified torque. Overtightening may cause the dropper seat to malfunction or failure.**
- **The dropper seat wire is connected to the dropper seat post. When adjusting the seat post, follow the procedure above. Forcibly pulling or pushing in the seat post will damage the dropper seat wire, resulting in malfunction or failure.**
- **Do not completely pull out the dropper seat post from the seat pipe. The dropper seat wire may come**

off the seat post, resulting in malfunction or failure. If the dropper seat wire comes off, please contact your dealer.

TIP

Some bicycles have a sight hole in the seat tube, the purpose of which is to make it easy to see whether the seat post is inserted in the seat tube far enough to be safe. If your bicycle has such a sight hole, use it instead of the “Minimum Insertion” or “Maximum Extension” mark to make sure the seat post is inserted in the seat tube far enough to be visible through the sight hole.

fig. 5

If your bike has an interrupted seat tube, as is the case on some suspension bikes, you must also make sure that the seat post is far enough into the frame so that you can touch it through the bottom of the interrupted seat tube with the tip of your finger without inserting your finger beyond its first knuckle. Also see TIP above and fig. 5.

⚠ WARNING

If your seat post is not inserted in the seat tube as described in B.1 above, the seat post, binder or even frame may break, which could cause you to lose control and fall.

2. Front and back adjustment. The saddle can be adjusted forward or back to help you get the optimal position on the bike. Ask your dealer to set the saddle for your optimal riding position and to show you how to make this adjustment. If you choose to make your own front and back adjustment, make sure that the clamp mechanism is clamping on the straight part of the saddle rails and is not touching the curved part of the rails, and that you are using the recommended torque on the clamping fastener(s) (Appendix C or the manufacturer’s instructions).
3. Saddle angle adjustment. Most people prefer a horizontal saddle; but some riders like the saddle nose angled up or down just a little. Your dealer can adjust saddle angle or teach you how to do it. If you choose to make your own saddle angle adjustment and you have a single bolt saddle clamp on your seat post, it is critical that you loosen the clamp bolt sufficiently to allow any serrations on the mechanism to disengage before changing the saddle’s angle, and then that the serrations fully re-engage before you tighten the clamp bolt to the recommended torque (Appendix C or the manufacturer’s instructions).

⚠ WARNING

When making saddle angle adjustments with a single bolt saddle clamp, always check to make sure that the serrations on the mating surfaces of the clamp are not worn. Worn serrations on the clamp can allow the saddle to move, causing you to lose control and fall.

Always tighten fasteners to the correct torque. Bolts that are too tight can stretch and deform. Bolts that are too loose can move and fatigue. Either mistake can lead to a sudden failure of the bolt, causing you to lose control and fall.

TIP

If your bicycle is equipped with a suspension seat post, the suspension mechanism may require periodic service or maintenance. Ask your dealer for recommended service intervals for your suspension seat post.

Small changes in saddle position can have a substantial effect on performance and comfort. To find your best saddle position, make only one adjustment at a time.

⚠ WARNING

After any saddle adjustment, be sure that the saddle adjusting mechanism is properly seated and tightened before riding.
A loose saddle clamp or seat post clamp can cause damage to the seat post, or can cause you to lose control and fall. A correctly tightened saddle adjusting mechanism will allow no saddle movement in any direction. Periodically check to make sure that the saddle adjusting mechanism is properly tightened.

If, in spite of carefully adjusting the saddle height, tilt and fore-and-aft position, your saddle is still uncomfortable, you may need a different saddle design.
Saddles, like people, come in many different shapes, sizes and resilience. Your dealer can help you select a saddle which, when correctly adjusted for your body and riding style, will be comfortable.

⚠ WARNING

Some people have claimed that extended riding with a saddle which is incorrectly adjusted or which does not support your pelvic area correctly can cause short-term or long-term injury to nerves and blood vessels, or even impotence. If your saddle causes you pain, numbness or other discomfort, listen to your body and stop riding until you see your dealer about saddle adjustment or a different saddle.

C. Handlebar height and angle

Your bike is equipped either with a “threadless” stem, which clamps on to the outside of the steerer tube, or with a “quill” stem, which clamps inside the steerer tube by way of an expanding binder bolt. If you aren’t absolutely sure which type of stem your bike has, ask your dealer.
If your bike has a “threadless” stem (fig. 6) your dealer may be able to change handlebar height by moving height adjustment spacers from below the stem to above the stem, or vice versa. Otherwise, you’ll have to get a stem of different length or rise. Consult your dealer. Do not attempt to do this yourself, as it requires special knowledge.
If your bike has a “quill” stem (fig. 7) you can ask your dealer to adjust the handlebar height a bit by adjusting stem height.
A quill stem has an etched or stamped mark on its shaft which designates the stem’s “Minimum Insertion” or “Maximum Extension”. This mark must not be visible above the headset.

fig. 6

fig. 7

⚠ WARNING

A quill stem's Minimum Insertion Mark must not be visible above the top of the headset. If the stem is extended beyond the Minimum Insertion Mark the stem may break or damage the fork's steerer tube, which could cause you to lose control and fall.

⚠ WARNING

On some bicycles, changing the stem or stem height can affect the tension of the front brake cable, locking the front brake or creating excess cable slack which can make the front brake inoperable. If the front brake pads move in towards the wheel rim or out away from the wheel rim when the stem or stem height is changed, the brakes must be correctly adjusted before you ride the bicycle.

Some bicycles are equipped with an adjustable angle stem. If your bicycle has an adjustable angle stem, ask your dealer to show you how to adjust it. Do not attempt to make the adjustment yourself, as changing stem angle may also require adjustments to the bicycle's controls.

⚠ WARNING

Always tighten fasteners to the correct torque. Bolts that are too tight can stretch and deform. Bolts that are too loose can move and fatigue. Either mistake can lead to a sudden failure of the bolt, causing you to lose control and fall.

Your dealer can also change the angle of the handlebar or bar end extensions.

⚠ WARNING

An insufficiently tightened stem clamp bolt, handlebar clamp bolt or bar end extension clamping bolt may compromise steering action, which could cause you to lose control and fall. Place the front wheel of the bicycle between your legs and attempt to twist the handlebar/stem assembly. If you can twist the stem in relation to the front wheel, turn the handlebars in relation to the stem, or turn the bar end extensions in relation to the handlebar, the bolts are insufficiently tightened.

⚠ WARNING

Be aware that adding aerodynamic extensions to handlebars will change the steering and braking response of the bicycle.

D. Control position adjustments

The angle of the brake and shift control levers and their position on the handlebars can be changed. Ask your dealer to make the adjustments for you. If you choose to make your own control lever angle adjustment, be sure to re-tighten the clamp fasteners to the recommended torque (Appendix C or the manufacturer's instructions).

E. Brake reach

Many bikes have brake levers which can be adjusted for reach. If you have small hands or find it difficult to squeeze the brake levers, your dealer can either adjust the reach or fit shorter reach brake levers.

⚠ WARNING

The shorter the brake lever reach, the more critical it is to have correctly adjusted brakes, so that full braking power can be applied within available brake lever travel. Brake lever travel insufficient to apply full braking power can result in loss of control, which may result in serious injury or death.

4. Tech

It's important to your safety, performance and enjoyment to understand how things work on your bicycle. We urge you to ask your dealer how to do the things described in this section before you attempt them yourself, and that you have your dealer check your work before you ride the bike. If you have even the slightest doubt as to whether you understand something in this section of the manual, talk to your dealer. See also Appendix A, B and C.

A. Wheels

Bicycle wheels are designed to be removable for easier transportation and for repair of a tire puncture. In most cases, the wheel axles are inserted into slots, called "dropouts" in the fork and frame, but some mountain and road bikes use what is called a "through axle" wheel mounting system.

If you have a mountain or road bike equipped with through axle front or rear wheels, make sure that your dealer has given you the manufacturer's instructions, and follow those when installing or removing a through axle wheel. If you don't know what a through axle is, ask your dealer.

If you do not have a bicycle with a through-axle wheel mounting system, it will have wheels secured in one of three ways:

- A hollow axle with a shaft ("skewer") running through it which has an adjustable tension nut on one end and an over-center cam on the other (cam action system, fig. 8 a & b)
- A hollow axle with a shaft ("skewer") running through it which has a nut on one end and a fitting for a hex key, lock lever or other tightening device on the other (through bolt, fig. 9)
- Hex nuts or hex key bolts which are threaded on to or into the hub axle (bolt-on wheel, fig. 10)

Your bicycle may be equipped with a different securing method for the front wheel than for the rear wheel. Discuss the wheel securing method for your bicycle with your dealer.

fig. 8a

fig. 8b

fig. 9

fig. 10

It is very important that you understand the type of wheel securing method on your bicycle, that you know how to secure the wheels correctly, and that you know how to apply the correct clamping force that safely secures the wheel. Ask your dealer to instruct you in correct wheel removal and installation, and ask him to give you any available manufacturer's instructions.

⚠ WARNING

Riding with an improperly secured wheel can allow the wheel to wobble or fall off the bicycle, which can cause serious injury or death. Therefore, it is essential that you:

1. **Ask your dealer to help you make sure you know how to install and remove your wheels safely.**
2. **Understand and apply the correct technique for clamping your wheel in place.**
3. **Each time, before you ride the bike, check that the wheel is securely clamped, and that the lever does not contact any part of the bicycle. If the lever contacts anything, it might not be closed; place the lever on the other side of the hub or replace the quick-release.**

The clamping action of a correctly secured wheel must emboss the surfaces of the dropouts.

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1. **Front wheel secondary retention devices**
   Most bicycles have front forks which utilize a secondary wheel retention device to reduce the risk of the wheel disengaging from the fork if the wheel is incorrectly secured. Secondary retention devices are not a substitute for correctly securing your front wheel.
   Secondary retention devices fall into two basic categories:
   a. The clip-on type is a part which the manufacturer adds to the front wheel hub or front fork.
   b. The integral type is molded, cast or machined into the outer faces of the front fork dropouts.
   Ask your dealer to explain the particular secondary retention device on your bike.

⚠ WARNING

Do not remove or disable the secondary retention device. As its name implies, it serves as a back-up for a critical adjustment. If the wheel is not secured correctly, the secondary retention device can reduce the risk of the wheel disengaging from the fork. Removing or disabling the secondary retention device may also void the warranty.

Secondary retention devices are not a substitute for correctly securing your wheel. Failure to properly secure the wheel can cause the wheel to wobble or disengage, which could cause you to lose control and fall, resulting in serious injury or death.

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2. **Wheels with cam action systems**

There are currently two types of over-center cam wheel retention mechanisms: the traditional over-center cam (fig. 8a) and the cam-and-cup system (fig. 8b). Both use an over-center cam action to clamp the bike's wheel in place. Your bicycle may have a cam-and-cup front wheel retention system and a traditional rear wheel cam action system.

a. **Adjusting the traditional cam action mechanism (fig. 8a)**
The wheel hub is clamped in place by the force of the over-center cam pushing against one dropout and pulling the tension adjusting nut, by way of the skewer, against the other dropout. The amount of clamping force is controlled by the tension adjusting nut. Turning the tension adjusting nut clockwise while keeping the cam lever from rotating increases clamping force; turning it counterclockwise while keeping the cam lever from rotating reduces clamping force. Less than half a turn of the tension adjusting nut can make the difference between safe clamping force and unsafe clamping force.

⚠ WARNING

The full force of the cam action is needed to clamp the wheel securely. Holding the nut with one hand and turning the lever like a wing nut with the other hand until everything is as tight as you can get it will not clamp a cam action wheel safely in the dropouts. See also the first WARNING in this Section.

b. **Adjusting the cam-and-cup mechanism (fig. 8b)**
The cam-and-cup system on your front wheel will have been correctly adjusted for your bicycle by your dealer. Ask your dealer to check the adjustment every six months. **Do not use a cam-and-cup front wheel on any bicycle other than the one for which your dealer adjusted it.**

3. Removing and Installing wheels

⚠ WARNING

If your bike is equipped with a hub brake such as a rear coaster brake, front or rear drum, band or roller brake; or if it has an internal gear rear hub, do not attempt to remove the wheel. The removal and re-installation of most hub brakes and internal gear hubs requires special knowledge. Incorrect removal or assembly can result in brake or gear failure, which can cause you to lose control and fall.

⚠ WARNING

If your bike has a disc brake, exercise care in touching the rotor or caliper. Disc rotors have sharp edges, and both rotor and caliper can get very hot during use.

⚠ WARNING

- **A quick-release that is not correctly adjusted and closed may allow the wheel to be loose or come off unexpectedly. This could cause you to lose control and fall, and may result in serious injury or death. Before every ride, make sure the quick-release is adjusted and closed correctly.**
- **This bicycle wheel is attached by a quick-release, a lever-actuated mechanism that allows you to install and remove the wheel without tools. For information on adjusting and closing a wheel quick-release, see the quick-release adjustment instructions in your owner's manual, or consult your dealer.**
- **Before every rider check that this quick-release is in the CLOSED (locked) position, and that the lever does not contact any part of the bicycle. If the lever contacts anything, it might not be closed; place the lever on the other side of the hub or replace the quick-release.**

a. Removing a disc brake or rim brake Front Wheel

(1) If your bike has rim brakes, disengage the brake's quick-release mechanism to increase the clearance between the tire and the brake pads (See Section 4.D fig. 11 through 15).

(2) If your bike has cam action front wheel retention, move the cam lever from the locked or CLOSED position to the OPEN position (fig. 8a & b). If your bike has through bolt or bolt-on front wheel retention, loosen the fastener(s) a few turns counter-clockwise using an appropriate wrench, lock key or the integral lever.

(3) If your front fork has a clip-on type secondary retention device, disengage it. If your front fork has an integral secondary retention device, and a traditional cam action system (fig. 8a) loosen the tension adjusting nut enough to allow removing the wheel from the dropouts. If your front wheel uses a cam-and-cup system, (fig. 8b) squeeze the cup and cam lever together while removing the wheel. No rotation of any part is necessary with the cam-and-cup system.
You may need to tap the top of the wheel with the palm of your hand to release the wheel from the front fork.

b. Installing a disc brake or rim brake Front Wheel

NOTICE

If your bike is equipped with a front disc brake, be careful not to damage the disc, caliper or brake pads when re-inserting the disc into the caliper. Never activate a disc brake's control lever unless the disc is correctly inserted in the caliper. See also Section 4.D.

(1) If your bike has cam action front wheel retention, move the cam lever so that it curves away from the wheel (fig. 8b). This is the OPEN position. If your bike has through bolt or bolt-on front wheel retention, go to the next step.

(2) With the steering fork facing forward, insert the wheel between the fork blades so that the axle seats firmly at the top of the fork dropouts. The cam lever, if there is one, should be on rider's left side of the bicycle (fig. 8a & b). If your bike has a clip-on type secondary retention device, engage it.

(3) If you have a traditional cam action mechanism: holding the cam lever in the ADJUST position with your right hand, tighten the tension adjusting nut with your left hand until it is finger tight against the fork dropout (fig. 8a). If you have a cam-and-cup system: the nut and cup (fig. 8b) will have snapped into the recessed area of the fork dropouts and no adjustment should be required.

(4) While pushing the wheel firmly to the top of the slots in the fork dropouts, and at the same time centering the wheel rim in the fork:

(a) With a cam action system, move the cam lever upwards and swing it into the CLOSED position (fig. 8a & b). The lever should now be parallel to the fork blade and curved toward the wheel. To apply enough clamping force, you should have to wrap your fingers around the fork blade for leverage, and the lever should leave a clear imprint in the palm of your hand.

(b) With a through-bolt or bolt-on system, tighten the fasteners to the torque specifications in Appendix C or the hub manufacturer's instructions.

TIP

If, on a traditional cam action system, the lever cannot be pushed all the way to a position parallel to the fork blade, return the lever to the OPEN position. Then turn the tension adjusting nut counterclockwise a quarter turn and try tightening the lever again. With a through-bolt or bolt-on system, tighten the fasteners to the torque specifications in Appendix C or the hub manufacturer's instructions.

⚠ WARNING

Securely clamping the wheel with a cam action retention device takes considerable force. If you can fully close the cam lever without wrapping your fingers around the fork blade for leverage, the lever does not leave a clear imprint in the palm of your hand, and the serrations on the wheel fastener do not emboss the surfaces of the dropouts, the tension is insufficient. Open the lever; turn the tension adjusting nut clockwise a quarter turn; then try again. See also the first WARNING in this Section.

(5) If you disengaged the brake quick-release mechanism in 3.a.(1) above, re-engage it to restore correct brake pad-to-rim clearance.
(6) Spin the wheel to make sure that it is centered in the frame and clears the brake pads; then squeeze the brake lever and make sure that the brakes are operating correctly.

c. Removing a disc brake or rim brake Rear Wheel

(1) If you have a multi-speed bike with a derailleur gear system: shift the rear derailleur to high gear (the smallest, outermost rear sprocket).
If you have an internal gear rear hub, consult your dealer or the hub manufacturer's instructions before attempting to remove the rear wheel.
If you have a single-speed bike with rim or disc brake, go to step (4) below.
(2) If your bike has rim brakes, disengage the brake's quick-release mechanism to increase the clearance between the wheel rim and the brake pads (see Section 4.D, fig. 11 through 15).
(3) On a derailleur gear system, pull the derailleur body back with your right hand.
(4) With a cam action mechanism, move the quick-release lever to the OPEN position (fig. 8b). With a through-bolt or bolt-on mechanism, loosen the fastener(s) with an appropriate wrench, lock lever or integral lever; then push the wheel forward far enough to be able to remove the chain from the rear sprocket.
(5) Lift the rear wheel off the ground a few inches and remove it from the rear dropouts.

d. Installing a disc brake or rim brake Rear Wheel

NOTICE

If your bike is equipped with a rear disc brake, be careful not to damage the disc, caliper or brake pads when re-inserting the disc into the caliper. Never activate a disc brake's control lever unless the disc is correctly inserted in the caliper.

(1) With a cam action system, move the cam lever to the OPEN position (see fig. 8a & b). The lever should be on the side of the wheel opposite the derailleur and freewheel sprockets.
(2) On a derailleur bike, make sure that the rear derailleur is still in its outermost, high gear, position; then pull the derailleur body back with your right hand. Put the chain on top of the smallest freewheel sprocket.
(3) On single-speed, remove the chain from the front sprocket, so that you have plenty of slack in the chain. Put the chain on the rear wheel sprocket.
(4) Then, insert the wheel into the frame dropouts and pull it all the way in to the dropouts.
(5) On a single speed or an internal gear hub, replace the chain on the chainring; pull the wheel back in the dropouts so that it is straight in the frame and the chain has about 1/4 inches of up-and-down play.
(6) With a cam action system, move the cam lever upwards and swing it into the CLOSED position (fig. 8a & b). The lever should now be parallel to the seat stay or chain stay and curved toward the wheel. To apply enough clamping force, you should have to wrap your fingers around the fork blade for leverage, and the lever should leave a clear imprint in the palm of your hand.
(7) With a through-bolt or bolt-on system, tighten the fasteners to the torque specifications in Appendix C or the hub manufacturer's instructions.

TIP

If, on a traditional cam action system, the lever cannot be pushed all the way to a position parallel to the seat stay or chain stay, return the lever to the OPEN position. Then turn the tension adjusting nut counterclockwise a quarter turn and try tightening the lever again.

⚠ WARNING

Securely clamping the wheel with a cam action retention device takes considerable force. If you can fully close the cam lever without wrapping your fingers around the seat stay or chain stay for leverage, the lever does not leave a clear imprint in the palm of your hand, and the serrations on the wheel fastener do not emboss the surfaces of the dropouts, the tension is insufficient. Open the lever; turn the tension adjusting nut clockwise a quarter turn; then try again. See also the first WARNING in this Section.

(8) If you disengaged the brake quick-release mechanism in 3.c.(2) above, re-engage it to restore correct brake pad-to-rim clearance.
(9) Spin the wheel to make sure that it is centered in the frame and clears the brake pads; then squeeze the brake lever and make sure that the brakes are operating correctly.

B. Seat post cam action clamp

Some bikes are equipped with a cam action seat post binder. The seat post cam action binder works exactly like the traditional wheel cam action fastener (Section 4.A.2) While a cam action binder looks like a long bolt with a lever on one end and a nut on the other, the binder uses an over-center cam action to firmly clamp the seat post (see fig. 8a).

⚠ WARNING

Riding with an improperly tightened seat post can allow the saddle to turn or move and cause you to lose control and fall.
Therefore:

1. **Ask your dealer to help you make sure you know how to correctly clamp your seat post.**
2. **Understand and apply the correct technique for clamping your seat post.**
3. **Before you ride the bike, first check that the seat post is securely clamped.**

Adjusting the seat post cam action mechanism

The action of the cam squeezes the seat collar around the seat post to hold the seat post securely in place. The amount of clamping force is controlled by the tension adjusting nut. Turning the tension adjusting nut clockwise while keeping the cam lever from rotating increases clamping force; turning it counterclockwise while keeping the cam lever from rotating reduces clamping force. Less than half a turn of the tension adjusting nut can make the difference between safe and unsafe clamping force.

⚠ WARNING

The full force of the cam action is needed to clamp the seat post securely. Holding the nut with one hand and turning the lever like a wing nut with the other hand until everything is as tight as you can get it will not clamp the seat post safely.

⚠ WARNING

If you can fully close the cam lever without wrapping your fingers around the seat post or a frame tube for leverage, and the lever does not leave a clear imprint in the palm of your hand, the tension is insufficient. Open the lever; turn the tension adjusting nut clockwise a quarter turn; then try again.

C. Dropper seat lever

The dropper seat lever is equipped on the left side of the handlebar, and the saddle can be operated up and down while riding.
To raise the saddle, lift your hips and push the dropper seat lever. To lower the saddle, apply your weight to the saddle and push the dropper seat lever. (See the right figure and Section 3.B)

D. Brakes

There are three general types of bicycle brakes: rim brakes, which operate by squeezing the wheel rim between two brake pads; disc brakes, which operate by squeezing a hub-mounted disc between two brake pads; and internal hub brakes. All three can be operated by way of a handlebar mounted lever. On some models of bicycle, the internal hub brake is operated by pedaling backwards.
This is called a Coaster.

⚠ WARNING

1. **Riding with improperly adjusted brakes, worn brake pads, or wheels on which the rim wear mark is visible is dangerous and can result in serious injury or death.**
2. **Applying brakes too hard or too suddenly can lock up a wheel, which could cause you to lose control and fall. Sudden or excessive application of the front brake may pitch the rider over the handlebars, which may result in serious injury or death.**
3. **Some bicycle brakes, such as disc brakes (fig. 11) and linear-pull brakes (fig. 12), are extremely powerful. Take extra care in becoming familiar with these brakes and exercise particular care when using them.**
4. **Some bicycle brakes are equipped with a brake force modulator, a small, cylindrical device through which the brake control cable runs and which is designed to provide a more progressive application of braking force. A modulator makes the initial brake lever force more gentle, progressively increasing force until full force is achieved. If your bike is equipped with a brake force modulator, take extra care in becoming familiar with its performance characteristics. Some brake force modulators are adjustable. If you don't like the feel of your brakes, ask your dealer about adjusting the brake force modulation.**
5. **Disc brakes can get extremely hot with extended use. Be careful not to touch a disc brake until it has had plenty of time to cool.**
6. **See the brake manufacturer's instructions for operation and care of your brakes, and for when brake pads must be replaced. If you do not have the manufacturer's instructions, see your dealer or contact the brake manufacturer.**
7. **If replacing worn or damaged parts, use only manufacturer-approved genuine replacement parts.**

fig. 11

fig. 12

fig. 13

fig. 14

fig. 15

1. Brake controls and features

It's very important to your safety that you learn and remember which brake lever controls which brake on your bike. Traditionally, in the U.S. the right brake lever controls the rear brake and the left brake lever controls the front brake; but, to check how your bike's brakes are set up, squeeze one brake lever and look to see which brake, front or rear, engages. Now do the same with the other brake lever.

Make sure that your hands can reach and squeeze the brake levers comfortably. If your hands are too small to operate the levers comfortably, consult your dealer before riding the bike. The lever reach may be adjustable; or you may need a different brake lever design.

Most rim brakes have some form of quick-release mechanism to allow the brake pads to clear the tire when a wheel is

removed or reinstalled. When the brake quick release is in the open position, the brakes are inoperative. Ask your dealer to make sure that you understand the way the brake quick release works on your bike (see fig. 12, 13, 14 & 15) and check each time to make sure both brakes work correctly before you get on the bike.

2. How brakes work

The braking action of a bicycle is a function of the friction between the braking surfaces. To make sure that you have maximum friction available, keep your wheel rims and brake pads or the disc rotor and caliper clean and free of dirt, lubricants, waxes or polishes.

Brakes are designed to control your speed, not just to stop the bike. Maximum braking force for each wheel occurs at the point just before the wheel “locks up” (stops rotating) and starts to skid. Once the tire skids, you actually lose most of your stopping force and all directional control. You need to practice slowing and stopping smoothly without locking up a wheel.

The technique is called progressive brake modulation. Instead of jerking the brake lever to the position where you think you’ll generate appropriate braking force, squeeze the lever, progressively increasing the braking force. If you feel the wheel begin to lock up, release pressure just a little to keep the wheel rotating just short of lockup. It’s important to develop a feel for the amount of brake lever pressure required for each wheel at different speeds and on different surfaces. To better understand this, experiment a little by walking your bike and applying different amounts of pressure to each brake lever, until the wheel locks.

When you apply one or both brakes, the bike begins to slow, but your body wants to continue at the speed at which it was going. This causes a transfer of weight to the front wheel (or, under heavy braking, around the front wheel hub, which could send you flying over the handlebars).

A wheel with more weight on it will accept greater brake pressure before lockup; a wheel with less weight will lock up with less brake pressure. So, as you apply brakes and your weight is transferred forward, you need to shift your body toward the rear of the bike, to transfer weight back on to the rear wheel; and at the same time, you need to both decrease rear braking and increase front braking force.

This is even more important on descents, because descents shift weight forward.

Two keys to effective speed control and safe stopping are controlling wheel lockup and weight transfer. This weight transfer is even more pronounced if your bike has a front suspension fork. Front suspension “dips” under braking, increasing the weight transfer (see also Section 4.G). Practice braking and weight transfer techniques where there is no traffic or other hazards and distractions.

Everything changes when you ride on loose surfaces or in wet weather. It will take longer to stop on loose surfaces or in wet weather. Tire adhesion is reduced, so the wheels have less cornering and braking traction and can lock up with less brake force. Moisture or dirt on the brake pads reduces their ability to grip. The way to maintain control on loose or wet surfaces is to go more slowly.

E. Shifting gears

Your multi-speed bicycle will have a derailleur drivetrain (see 1. below), an internal gear hub drivetrain (see 2. below) or, in some special cases, a combination of the two.

1. How a derailleur drivetrain works

If your bicycle has a derailleur drivetrain, the gear-changing mechanism will have:

- A rear cassette or freewheel sprocket cluster
- A rear derailleur

- Usually a front derailleur
- One or two shifters
- One, two or three front sprockets called chainrings
- A drive chain

a. Shifting Gears

There are several different types and styles of shifting controls: levers, twist grips, triggers, combination shift/brake controls and push-buttons. Ask your dealer to explain the type of shifting controls that are on your bike, and to show you how they work.

The vocabulary of shifting can be pretty confusing. A downshift is a shift to a “lower” or “slower” gear, one which is easier to pedal. An upshift is a shift to a “higher” or “faster”, harder to pedal gear. What’s confusing is that what’s happening at the front derailleur is the opposite of what’s happening at the rear derailleur (for details, read the instructions on Shifting the rear derailleur and Shifting the front derailleur below). For example, you can select a gear which will make pedaling easier on a hill (make a downshift) in one of two ways: shift the chain down the gear “steps” to a smaller gear at the front, or up the gear “steps” to a larger gear at the rear. So, at the rear gear cluster, what is called a downshift looks like an upshift. The way to keep things straight is to remember that shifting the chain in towards the centerline of the bike is for accelerating and climbing and is called a downshift. Moving the chain out or away from the centerline of the bike is for speed and is called an upshift.

Whether upshifting or downshifting, the bicycle derailleur system design requires that the drive chain be moving forward and be under at least some tension. A derailleur will shift only if you are pedaling forward.

NOTICE

Never move the shifter while pedaling backward, nor pedal backwards immediately after having moved the shifter. This could jam the chain and cause serious damage to the bicycle.

b. Shifting the rear derailleur

The rear derailleur is controlled by the right shifter.

The function of the rear derailleur is to move the drive chain from one gear sprocket to another. The smaller sprockets on the gear cluster produce higher gear ratios. Pedaling in the higher gears requires greater pedaling effort, but takes you a greater distance with each revolution of the pedal cranks. The larger sprockets produce lower gear ratios. Using them requires less pedaling effort, but takes you a shorter distance with each pedal crank revolution. Moving the chain from a smaller sprocket of the gear cluster to a larger sprocket results in a downshift. Moving the chain from a larger sprocket to a smaller sprocket results in an upshift. In order for the derailleur to move the chain from one sprocket to another, the rider must be pedaling forward.

c. Shifting the front derailleur:

The front derailleur, which is controlled by the left shifter, shifts the chain between the larger and smaller chainrings. Shifting the chain onto a smaller chainring makes pedaling easier (a downshift). Shifting to a larger chainring makes pedaling harder (an upshift).

d. Which gear should I be in?

The combination of largest rear and smallest front gears (fig. 16) is for the steepest hills. The smallest rear and largest front combination is for the greatest speed. It is not necessary to shift gears in sequence. Instead, find the "starting gear" which is right for your level of ability — a gear which is hard enough for quick acceleration but easy enough to let you start from a stop without wobbling — and experiment with upshifting and downshifting to get a feel for the different gear combinations. At first, practice shifting where there are no obstacles, hazards or other traffic, until you've built up your confidence. Learn not to use either the "smallest to smallest" or "largest to largest" gear combinations because they may cause unacceptable stress on the drive train. Learn to anticipate the need to shift, and shift to a lower gear before the hill gets too steep. If you have difficulties with shifting, the problem could be mechanical adjustment. See your dealer for help.

fig.16

⚠ WARNING

Never shift a derailleur onto the largest or the smallest sprocket if the derailleur is not shifting smoothly. The derailleur may be out of adjustment and the chain could jam, causing you to lose control and fall.

e. What if it won't shift gears?

If moving the shift control one click repeatedly fails to result in a smooth shift to the next gear chances are that the mechanism is out of adjustment. Take the bike to your dealer to have it adjusted.

2. How an internal gear hub drivetrain works

If your bicycle has an internal gear hub drivetrain, the gear changing mechanism will consist of:

- A 3, 5, 7, 8, 12 speed or possibly an infinitely variable internal gear hub
- One, or sometimes two shifters
- One or two control cables
- One front sprocket called a chainring
- A drive chain

a. Shifting internal gear hub gears

Shifting with an internal gear hub drivetrain is simply a matter of moving the shifter to the indicated position for the desired gear ratio. After you have moved the shifter to the gear position of your choice, ease the pressure on the pedals for an instant to allow the hub to complete the shift.

b. Which gear should I be in?

The numerically lowest gear (1) is for the steepest hills. The numerically largest gear is for the greatest speed.

Shifting from an easier, “slower” gear (like 1) to a harder, “faster” gear (like 2 or 3) is called an upshift. Shifting from a harder, “faster” gear to an easier, “slower” gear is called a downshift. It is not necessary to shift gears in sequence. Instead, find the “starting gear” for the conditions — a gear which is hard enough for quick acceleration but easy enough to let you start from a stop without wobbling — and experiment with upshifting and downshifting to get a feel for the different gears. At first, practice shifting where there are no obstacles, hazards or other traffic, until you’ve built up your confidence. Learn to anticipate the need to shift, and shift to a lower gear before the hill gets too steep. If you have difficulties with shifting, the problem could be mechanical adjustment. See your dealer for help.

c. **What if it won’t shift gears?**
If moving the shift control one click repeatedly fails to result in a smooth shift to the next gear chances are that the mechanism is out of adjustment. Take the bike to your dealer to have it adjusted.

F. Pedals

1. Toe Overlap is when your toe can touch the front wheel when you turn the handlebars to steer while a pedal is in the forwardmost position. This is common on small-framed bicycles, and is avoided by keeping the inside pedal up and the outside pedal down when making sharp turns. On any bicycle, this technique will also prevent the inside pedal from striking the ground in a turn.

⚠ WARNING

Toe Overlap could cause you to lose control and fall. Ask your dealer to help you determine if the combination of frame size, crank arm length, pedal design and shoes you will use results in pedal overlap. Whether you have overlap or not, you must keep the inside pedal up and the outside pedal down when making sharp turns.

TIP

Changing tire size or pedal crank arm length affects Toe Overlap.

2. Some bicycles come equipped with pedals that have sharp and potentially dangerous surfaces. These surfaces are designed to add safety by increasing grip between the rider’s shoe and the pedal. If your bicycle has this type of high-performance pedal, you must take extra care to avoid serious injury from the pedals’ sharp surfaces. Based on your riding style or skill level, you may prefer a less aggressive pedal design, or chose to ride with shin pads. Your dealer can show you a number of options and make suitable recommendations.

3. Toeclips and straps are a means to keep feet correctly positioned and engaged with the pedals. The toeclip positions the ball of the foot over the pedal spindle, which gives maximum pedaling power. The toe strap, when tightened, keeps the foot engaged throughout the rotation cycle of the pedal. While toeclips and straps give some benefit with any kind of shoe, they work most effectively with cycling shoes designed for use with toeclips. Your dealer can explain how toeclips and straps work. Shoes with deep treaded soles or welts which might make it more difficult for you to insert or remove your foot should not be used with toeclips and straps.

⚠ WARNING

Getting into and out of pedals with toeclips and straps requires skill which can only be acquired with practice. Until it becomes a reflex action, the technique requires concentration which can distract your attention and cause you to lose control and fall. Practice the use of toeclips and straps where there are no obstacles, hazards or traffic. Keep the straps loose, and don't tighten them until your technique and confidence in getting in and out of the pedals warrants it. Never ride in traffic with your toe straps tight.

4. Clipless pedals (sometimes called "step-in pedals") are another means to keep feet securely in the correct position for maximum pedaling efficiency. They have a plate, called a "cleat," on the sole of the shoe, which clicks into a mating spring-loaded fixture on the pedal. They only engage or disengage with a very specific motion which must be practiced until it becomes instinctive. Clipless pedals require shoes and cleats which are compatible with the make and model pedal being used.
   Many clipless pedals are designed to allow the rider to adjust the amount of force needed to engage or disengage the foot. Follow the pedal manufacturer's instructions, or ask your dealer to show you how to make this adjustment. Use the easiest setting until engaging and disengaging becomes a reflex action, but always make sure that there is sufficient tension to prevent unintended release of your foot from the pedal.

⚠ WARNING

Clipless pedals are intended for use with shoes specifically made to fit them and are designed to firmly keep the foot engaged with the pedal. Do not use shoes which do not engage the pedals correctly.

Practice is required to learn to engage and disengage the foot safely. Until engaging and disengaging the foot becomes a reflex action, the technique requires concentration which can distract your attention and cause you to lose control and fall. Practice engaging and disengaging clipless pedals in a place where there are no obstacles, hazards or traffic; and be sure to follow the pedal manufacturer's setup and service instructions. If you do not have the manufacturer's instructions, see your dealer or contact the manufacturer.

G. Bicycle suspension

Many bicycles are equipped with suspension systems. There are many different types of suspension systems — too many to deal with individually in this manual. If your bicycle has a suspension system of any kind, be sure to read and follow the suspension manufacturer's setup and service instructions. If you do not have the manufacturer's instructions, see your dealer or contact the manufacturer.

⚠ WARNING

Failure to maintain, check and properly adjust the suspension system may result in suspension malfunction, which may cause you to lose control and fall.

If your bike has suspension, the increased speed you may develop also increases your risk of injury. For example, when braking, the front of a suspended bike dips. You could lose control and fall if you do not have experience with this system. Learn to handle your

suspension system safely. See also Section 4.D.

⚠ WARNING

Changing suspension adjustment can change the handling and braking characteristics of your bicycle. Never change suspension adjustment unless you are thoroughly familiar with the suspension system manufacturer's instructions and recommendations, and always check for changes in the handling and braking characteristics of the bicycle after a suspension adjustment by taking a careful test ride in a hazard-free area.

Suspension can increase control and comfort by allowing the wheels to better follow the terrain. This enhanced capability may allow you to ride faster; but you must not confuse the enhanced capabilities of the bicycle with your own capabilities as a rider. Increasing your skill will take time and practice. Proceed carefully until you have learned to handle the full capabilities of your bike.

⚠ WARNING

Not all bicycles can be safely retrofitted with some types of suspension systems. Before retrofitting a bicycle with any suspension, check with the bicycle's manufacturer to make sure that what you want to do is compatible with the bicycle's design. Failing to do so can result in catastrophic frame failure.

H. Tires and tubes

⚠ WARNING

Some bicycles intended for competition are fitted with tires which are glued on to specially made rims. These are called "sew-up" or "tubular" tires. Properly mounting these tires requires specialized knowledge and skills. Ask your dealer to teach you how to mount tubulars before you attempt it on your own. An incorrectly installed tubular tire can come off the rim, causing you to lose control and fall.

1. Tires

Bicycle tires are available in many designs and specifications, ranging from general-purpose designs to tires designed to perform best under very specific weather or terrain conditions. If, once you've gained experience with your new bike, you feel that a different tire might better suit your riding needs, your dealer can help you select the most appropriate design.

The size, pressure rating, and on some high-performance tires the specific recommended use, are marked on the sidewall of the tire (see fig. 17). The part of this information which is most

fig. 17

important to you is Tire Pressure. But some wheel rim manufacturers also specify maximum tire pressure with a label on the rim.

⚠ WARNING

Never inflate a tire beyond the maximum pressure marked on the tire's sidewall or the wheel rim. If the maximum pressure rating for the wheel rim is lower than the maximum pressure shown on the tire, always use the lower rating. Exceeding the recommended maximum pressure may blow the tire off the rim or damage the wheel rim, which could cause damage to the bike and injury to the rider and bystanders.

The best and safest way to inflate a bicycle tire to the correct pressure is with a bicycle pump which has a built-in pressure gauge.

⚠ WARNING

There is a safety risk in using gas station air hoses or other air compressors. They are not made for bicycle tires. They move a large volume of air very rapidly, and will raise the pressure in your tire very rapidly, which could cause the tube to explode.

Tire pressure is given either as maximum pressure or as a pressure range.
How a tire performs under different terrain or weather conditions depends largely on tire pressure. Inflating the tire to near its maximum recommended pressure gives the lowest rolling resistance; but also produces the harshest ride. High pressures work best on smooth, dry pavement.
Very low pressures, at the bottom of the recommended pressure range, give the best performance on smooth, slick terrain such as hard-packed clay, and on deep, loose surfaces such as deep, dry sand.
Tire pressure that is too low for your weight and the riding conditions can cause a puncture of the tube by allowing the tire to deform sufficiently to pinch the inner tube between the rim and the riding surface.

NOTICE

Pencil type automotive tire gauges can be inaccurate and should not be relied upon for consistent, accurate pressure readings. Instead, use a high quality dial gauge.

Ask your dealer to recommend the best tire pressure for the kind of riding you will most often do, and have the dealer inflate your tires to that pressure. Then, check inflation as described in Section 1.C so you'll know how correctly inflated tires should look and feel when you don't have access to a gauge. Some tires may need to be brought up to pressure every week or two, so it is important to check your tire pressures before every ride.
Some special high-performance tires have unidirectional treads: their tread pattern is designed to work better in one direction than in the other. The sidewall marking of a unidirectional tire will have an arrow showing the correct rotation direction. If your bike has unidirectional tires, be sure that they are mounted to rotate in the correct direction.

2. Tire Valves

There are primarily two kinds of bicycle tire valves: The Schraeder Valve and the Presta Valve. The bicycle pump you use must have the fitting appropriate to the valve stems on your bicycle.

The Schraeder valve (fig. 18a) is like the valve on a car tire. To inflate a Schraeder valve tire, remove the valve cap and clamp the pump fitting onto the end of the valve stem. To let air out of a Schraeder valve, depress the pin in the end of the valve stem with the end of a key or other appropriate object.

fig 18a

The Presta valve (fig. 18b) has a narrower diameter and is only found on bicycle tires. To inflate a Presta valve tire using a Presta headed bicycle pump, remove the valve cap; unscrew (counterclockwise) the valve stem lock nut; and push down on the valve stem to free it up. Then push the pump head on to the valve head, and inflate. To inflate a Presta valve with a Schraeder pump fitting, you'll need a Presta adapter (available at your bike shop) which screws on to the valve stem once you've freed up the valve. The adapter fits into the Schraeder pump fitting. Close the valve after inflation. To let air out of a Presta valve, open up the valve stem lock nut and depress the valve stem.

fig.18b

⚠ WARNING

We highly recommend that you carry a spare inner tube when you ride your bike, unless the bike is fitted with tubeless tires.

Patching a tube is an emergency repair. If you do not apply the patch correctly or apply several patches, the tube can fail, resulting in possible tube failure, which could cause you to lose control and fall. Replace a patched tube as soon as possible.

5. Electric bike components

A. Introduction

The Bluetooth® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by YAMAHA MOTOR CO., LTD. is under license.

B. Location of the warning and specification labels

Read and understand all of the labels on your bicycle, battery pack and battery charger. These labels contain important information for safe and proper operation. Never remove any labels from your bicycle, battery pack and battery charger:

(YDX-MORO Pro)

C. Description

Right side
(YDX-MORO Pro)

Left side
(YDX-MORO Pro)

Around handlebars
(YDX-MORO Pro)

D. E-Bike Systems

The e-Bike Systems are designed to give you the optimal amount of power assist.

It assists you within a standard range based on factors such as your pedaling strength, bicycle speed, and current gear.
The e-Bike Systems do not assist in the following situations:

- When the display unit's power is off.
- When you are moving 20 mph (32 km/h) or faster.
- When you are not pedaling and the pushing assist switch is released.
- When there is no residual battery capacity.
- When the automatic power off function* is operating.
  * Power turns off automatically when you do not use the e-Bike Systems for 5 minutes.
- When the assist mode is set to Off mode.

Multiple power assist modes are available.

Choose from Extra power mode, MTB mode, High-Performance mode, Standard mode, Eco mode and Off mode to suit your riding conditions.
See "Displaying and switching the assist mode" for information on switching between assist modes.

Extra power mode	Use when climbing rough terrain.
MTB mode	Use when riding on various terrain.
High-Performance mode	Use when you want to ride more comfortably, such as when climbing a steep hill.
Standard mode	Use when riding on flat roads or climbing gentle hills.
Eco mode	Use when you want to ride as far as possible.
Off mode	Use when you want to ride without power assist. You can still use the other display unit functions.

Automatic Support mode is available.

The Automatic Support mode, which enables automatic change to the optimal assist mode (eco mode, standard mode, high-performance mode) according to the riding conditions, can also be used. The automatic assist mode automatically changes to weak assist on flat roads and stronger assist on steep slopes.

Conditions that could decrease remaining assist distance

The remaining assist distance will decrease when riding in the following conditions:

- Frequent starts and stops
- Numerous steep inclines
- Poor road surface conditions
- Riding into a strong head wind
- Low air temperature
- Worn-out battery pack
- When using the headlight (applies only to models equipped with lights powered by the battery pack)
- Frequent acceleration
- Heavier rider and luggage weight
- Higher assist mode
- Higher riding speed

Remaining assist distance will also decrease if the bicycle is not maintained properly.
Examples of inadequate maintenance that could decrease remaining assist distance:

- Low tire pressure
- Chain not turning smoothly
- Brake engaged constantly

Range

Following range gives an idea of how far you can ride on a single charge.

- 10 to 65 miles*

  * This data was prepared by Yamaha based on the original riding pattern.
  This figure could vary depending on several factors.

E. ⚠ Safety information

Never use this battery charger to charge other electrical appliances.

Do not use any other charger or charging method to recharge the special batteries. Using any other charger could result in fire, explosion, or damage the batteries.

This battery charger can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the battery charger in a safe way and understand the hazards involved. Children shall not play with the battery charger. Cleaning and user maintenance shall not be made by children without supervision.

Although the battery charger is waterproof, never allow it to become immersed in water or other fluids. In addition, never use the battery charger if the terminals are wet.

Never handle the power plug, charging plug or touch the charger contacts with wet hands. This could result in electric shock.

Do not touch charger contacts with metallic objects. Do not allow foreign material to cause short circuit of the contacts. This could result in electric shock, fire, or damage the battery charger.

Periodically remove dust from the power plug. Dampness or other issues could reduce the effectiveness of the insulation, resulting in fire.

Never disassemble or modify the battery charger. This could result in fire or electric shock.

Do not use with a power strip or extension cord. Using a power strip or similar methods may exceed rated current and can result in fire.

Do not use with the cable tied or rolled up, and do not store with the cable wrapped around the charger main body. Cable damage can result in fire or electric shock.

Firmly insert the power plug and the charging plug into the socket. Failure to insert the power plug and the charging plug completely can result in fire caused by electric shock or overheating.

Do not use the battery charger near flammable material or gas. This could result in fire or explosion.

Never cover the battery charger or place other objects on top of it while charging. This could result in internal overheating leading to fire.

Do not drop the battery charger or expose it to strong impacts. Otherwise, it could cause a fire or electric shock.

Store the battery pack and battery charger out of reach of children.

Do not touch the battery pack or battery charger while it is charging. As the battery pack or battery charger reaches 104–158 °F (40–70 °C) during charging, touching it could result in burns.

Do not use if the battery pack case is damaged, cracked, or if you smell any unusual odors. Leaking battery fluid can cause serious injury.

Do not short the contacts of the battery pack. Doing so could cause the battery pack to become hot or catch fire, resulting in serious injury or property damage.

Do not disassemble or modify the battery pack. Doing so could cause the battery pack to become hot or catch fire, resulting in serious injury or property damage.

If the power cable is damaged, stop using the battery charger and have it inspected at an authorized dealer.

Do not turn the pedals or move the bicycle while the battery charger is connected. Doing so could cause the power cable to become tangled in the pedals, resulting in damage to the battery charger, power cable, and/or plug.

Handle the power cable with care. Connecting the battery charger from indoors while the bicycle is outdoors could result in the power cable becoming pinched and damaged in a doorway or window.

Do not run over the power cable or plug with the wheels of the bicycle. Doing so could result in damage to the power cable or plug.

Do not drop the battery pack or subject it to impact. Doing so could cause the battery pack to become hot or catch fire, resulting in serious injury or property damage.

Do not dispose of the battery pack in a fire or expose it to a heat source. Doing so could cause fire, or explosion, resulting in serious injury or property damage.

Do not modify or disassemble the e-Bike Systems. Do not install anything other than genuine parts and accessories. Doing so could result in product damage, malfunction, or increase your risk of injury.

When stopped, be sure to apply the front and rear brakes and keep both feet on the ground. Placing one's foot on the pedal when stopped may unintentionally engage the power assist function, which could result in loss of control and serious injury.

Do not ride the bicycle if there is any irregularity with the battery pack or e-Bike Systems. Doing so could lead to loss of control and serious injury.

Be sure to check the residual battery capacity before riding at night. The headlight powered by the battery pack will turn off soon after the residual battery capacity has decreased to where power assisted riding is no longer possible. Riding without an operating headlight can increase your risk of injury.

Do not start off by running with one foot on a pedal and one foot on the ground and then mounting the bicycle after it has reached a certain speed. Doing so could result in loss of control or serious injury. Be sure to start riding only after you are seated properly on the bicycle seat.

Do not press the pushing assist switch if the rear tire is off the ground. Otherwise, the tire will turn at high speed in the air and you could be injured.

Do not use the wireless function with Bluetooth low energy technology in areas such as hospitals or medical institutions where use of electronic equipment or wireless equipment is prohibited. Otherwise, this could affect the medical equipment, etc. and cause an accident.

When using the wireless function with Bluetooth low energy technology, keep the display at a safe distance from heart pacemakers in use. Otherwise, the radio waves could affect the heart pacemaker function.

Do not use the wireless function with Bluetooth low energy technology near automatic control equipment such as automatic doors, fire alarms, etc. Otherwise, the radio waves could affect the equipment and cause an accident through possible malfunction or unintentional operation.

Before equipping the bicycle with a battery pack, make sure that there is no foreign matter or water in the charging port on the bicycle. Otherwise, it could lead to heat generation, smoke and/or a fire owing to short-circuiting of the terminals.

F. Instrument and control functions

Display unit

Display unit

NOTICE

This device complies with part 15 of the FCC Rules and Industry Canada licence exempt RSS-247 standard. Operations is subject to the following two conditions (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

FCC ID : 2ADBKX1V
IC : 740A-X1V
CAN ICES-3 (B)/NMB-3 (B)

Brand name : YAMAHA
Product name : X1V Meter
Model no. : X1V00
Manufacturer name : YAMAHA MOTOR CO., LTD.

MADE IN CHINA

NOTICE

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- **Reorient or relocate the receiving antenna.**
- **Increase the separation between the equipment and receiver.**
- **Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.**
- **Consult the dealer or an experienced radio/TV technician for help.**

FCC Caution:

To assure continued compliance, any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. (Example - use only shielded interface cables when connecting to computer or peripheral devices.)

FCC Radiation Exposure Statement:

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

IC Radiation Exposure Statement:

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 0.5 cm between the radiator and your body.

The display unit offers the following operations and information displays.

○ Installing the battery

The display unit needs to be removed and installed for changing the battery.

- Remove the two display bolts on back side of the clamp, and then remove the display unit.
- When installing the display unit, tighten the two display bolts from the back side of the clamp.

⚠ WARNING

Tighten the display bolts to 2.0 N·m (0.20 kgf·m, 1.5 lb·ft). Otherwise, during riding, vibration could cause the display bolts to come loose with the risk that the display unit may fall off. A loose display could distract the rider or interfere with control.

○ Battery

Check if the rated battery (CR2032) is installed in the rear of the display unit.
If a battery is not installed, or if there is not sufficient battery power remaining, install a new battery.
To adjust the time, see “Stopwatch and settings”.

TIP

- Make sure that the O-ring is installed correctly.
- Use a new type CR2032 button cell battery (sold separately).
- When a battery is drained, whenever it turns on the vehicle power supply, the clock begins to count from 11:00. Please replace the battery, if such a condition appears.

○ Adjusting the display angle

Adjust the display angle by loosening the clamp bolt. The angle depends on each rider.
After adjustment, tighten the clamp bolt.

⚠ WARNING

Tighten the clamp bolt to 3.8 N·m (0.38 kgf·m, 2.8 lb·ft). During riding, vibration could cause the clamp bolt to come loose with the risk that the clamp may fall off. A loose display could distract the rider or interfere with control.

○ Power “On/Off”

Each time you press the power switch, the power switches between “On” and “Off”.
When you turn on the power, the animation will be displayed.
After that, the battery capacity indicator, speedometer, assist power meter, Bluetooth indicator, the function display, and “OFF” of assist mode indicator are displayed.

TIP

- When you turn on the power, the assist mode is automatically set to Off mode.
- Keep your feet off the pedals when turning on the display unit. Also, do not start riding immediately after turning on the display unit. Doing so could weaken the assist power. (Weak assist power in either of these cases is not a malfunction.) If you did either of the above by accident, remove your feet from the pedals, turn on the power again, and wait a moment (approximately two seconds) before starting to ride.

○ Displaying and switching the assist mode

You can select the assist mode by using the assist mode switches (up & down).
The selected assist mode is displayed by the assist mode indicator and assist mode lamp color.

- When you press the assist mode switch (up), the mode changes from “OFF” to “ECO”, or “ECO” to “STD”, or “STD” to “HIGH”, or “HIGH” to “MTB”, or “MTB” to “EXPW”.
- When you press the assist mode switch (down), the mode changes from “EXPW” to “MTB”, or “MTB” to “HIGH”, or “HIGH” to “STD”, or “STD” to “ECO”, or “ECO” to “OFF”.

Assist mode	Assist mode indicator	Assist mode lamp
EXPW	EXPW	Yellow
▲▼		
MTB	MTB	White
▲▼		
HIGH	HIGH	Blue
▲▼		
STD	STD	Blue
▲▼		
ECO	ECO	Green
▲▼		
OFF	OFF	Hide

TIP

- Further pressing of the assist mode switch will not cycle the assist mode selections.
- In the Off mode, the assist power meter are not displayed.
- You can keep the assist mode lamp unlit.
  For more information, see “Stopwatch and settings”.

The Automatic Support mode, which enables automatic change to the optimal assist mode according to the riding conditions, can also be used.

- To use the Automatic Support mode, press the assist mode switch (up) for 1 second or longer. “A:” will be added to the assist mode indicator and the mode will be changed to the Automatic Support mode.
- To cancel the Automatic Support mode, press the assist mode switch (up) for 1 second or longer. “A:” will disappear from the assist mode indicator and the Automatic Support mode will be canceled.

TIP

Even if you press the assist mode switches (up & down) while in Automatic Support mode, the assist mode cannot be changed.

○ Speedometer

The speedometer displays your bicycle speed (in mile per hour or kilometer per hour). To select the mile/km, see “Stopwatch and settings”.

TIP

If your bicycle speed is less than 0.3 MPH or 0.5 km/h, the speedometer displays “0.0 MPH” or “0.0 km/h”.

○ Battery capacity indicator

The battery capacity indicator displays an estimate of how much capacity is left in the battery.

○ Assist power meter

The assist power meter displays an estimate of the assist power during riding.
When the e-Bike Systems are not in operation, none of the segments of the assist power meter are displayed. When the e-Bike Systems are operating, as the assist power increases, the segments of the assist power meter are added one by one.

○ Function display

The function display can display the following functions.

- Odometer
- Trip meter
- Average bicycle speed
- Maximum bicycle speed
- Remaining assist distance
- Battery capacity (%)
- Cadence
- Clock

Push the function select switch, the display changes as follows:
Odometer → Trip meter → Average bicycle speed → Maximum bicycle speed → Remaining assist distance → Battery capacity (%) → Cadence → Clock → Odometer

You can select the items to be displayed.
For more information, see “Stopwatch and settings”.

You can reset the data for trip meter, average bicycle speed, and maximum bicycle speed.
For more information, see “Stopwatch and settings”.

● Odometer

This displays the total distance (in miles or kilometers) ridden while the power was on.
The odometer cannot be reset.

● Trip meter

This displays the total riding distance (in miles or kilometers) since it was last reset.
When you turn off the power, the data up to that point will remain in the display.
For the procedure of resetting the trip meter to measure a new distance travelled, see “Stopwatch and settings”.

● Average bicycle speed

This displays the average bicycle speed (in miles per hour or kilometers per hour) since it was last reset.
When you turn off the power, the data up to that point will remain in the display.
For the procedure of resetting the average bicycle speed, see “Stopwatch and settings”.

● Maximum bicycle speed

This displays the maximum bicycle speed (in miles per hour or kilometers per hour) since it was last reset.
When you turn off the power, the data up to that point will remain in the display.
For the procedure of resetting the maximum bicycle speed, see “Stopwatch and settings”.

● Remaining assist distance

This displays an estimate of the distance (in miles or kilometers) that can be ridden with assist on the residual battery capacity of the battery installed. If you switch the assist mode when the remaining assist distance is displayed, the estimate of the distance that can be ridden with assist changes.
The remaining assist distance estimate cannot be reset.

TIP

- The remaining assist distance changes depending on the riding situation (hills, headwind, etc.) and as the battery runs down.
- If in Off mode, “- - - -” is displayed.

● Battery capacity (%)

This displays the power remaining in the battery.
The residual battery capacity display cannot be reset.

● Cadence

This displays your pedaling speed in revolutions per minute.
The pedaling cadence display cannot be reset.

TIP

If you pedal in backward, “0” is displayed.

● Clock

Displays the current time in 24 hour format. To adjust the time, see “Stopwatch and settings”.

○ Backlight

Each time the backlight switch is pressed, the backlight of the function display repeats on and off.

Main riding display

○ Stopwatch and settings

The display enables the following.

- STOPWATCH
  Stopwatch function
- TIME ADJ (TIME ADJUST)
  Clock setting
- DIST UNIT (DISTANCE UNIT)
  mile/km setting
- DSPL ITEM (DISPLAY ITEM)
  Sets the items to be displayed in the function display during normal riding.
- RESET
  Resets the values of the trip meter, average bicycle speed, and maximum bicycle speed.
- BLE (Bluetooth low energy technology)
  Switches the profiles and turns off the wireless function.
- USB
  Switches the USB receptacle between a power supply port and a wired communication port.
- LED
  Changes between lighting the assist mode lamp and keeping the assist mode lamp unlit.

1. Press the function select switch for 2 seconds or longer.
2. Select an item by using the assist mode switches (up & down).
   Press the function select switch at the displayed item that you want to select, and the selected item will then be displayed.
   Selecting “EXIT” returns to the main riding display.

⚠ WARNING

For all setting procedures, be sure to stop the bicycle and perform the required settings in a safe location. Otherwise, lack of attention to surrounding traffic or other hazards could cause an accident.

[S---] ···· Press the function select switch for 2 seconds or longer
[S] ····· Press the function select switch
[▲] ····· Press the assist mode switch (up)
[▼] ····· Press the assist mode switch (down)

● STOPWATCH

The stopwatch counts time in seconds up to a maximum of 9 hours 59 minutes 59 seconds.
If this maximum is reached, it will automatically start over from 0 (zero) and continue counting.

- TIME MEASUREMENT
  Use the function select switch to start and stop time measurement.
  Press the function select switch for 2 seconds or longer to “RESET” the measured time.
- RESET
  When the function select switch is pressed, the measured time will be reset and the measuring display will be shown.
  Use the assist mode switches (up & down) to go to the “EXIT” display.
- EXIT
  When the function select switch is pressed, the display will return to the main riding display.
  Use the assist mode switches (up & down) to go to the “RESET” display.

TIP

- It is possible to return to the main riding display without interrupting time measurement.
- When the power is turned off, the measured time will be reset.

● TIME ADJ (TIME ADJUST)

You can adjust the time of the clock.

1. Check that the “Hour” is flashing and adjust the hour by using the assist mode switches (up & down).
2. Press the function select switch to adjust the minutes.
3. Check that the “Minute” is flashing and adjust the minutes by using the assist mode switches (up & down).
4. Press the function select switch to return to the main riding display.

● DIST UNIT (DISTANCE UNIT)

You can select the display units for distance and speed.
When “mile” is selected, the travelled distance will be indicated in miles and the speed in mph.
When “km” is selected, the travelled distance will be indicated in kilometers and the speed in km/h.

1. Select “mile” or “km” by using the assist mode switches (up & down).
2. Press the function select switch when the desired unit is indicated in the display. This setting will then be kept and the display will return to the main riding display.

● DSPL ITEM (DISPLAY ITEM)

You can select to show or hide different items in the function display during normal riding.
The items which you can select to show or hide are: TRIP (trip meter), AVE (average bicycle speed), MAX (maximum bicycle speed), RANGE (remaining assist distance), BATTERY (battery capacity (%)), CADENCE (cadence), and TIME (clock).

TIP

You cannot hide the odometer indication.

1. Select an item by using the assist mode switches (up & down).
2. Use the function select switch to show or hide the selected item. (When an item is shown, a check mark will be shown in the check box.)
3. When you press the function select switch in the “EXIT” display, the setting will be kept and the display will return to the main riding display.

● RESET

You can reset the TRIP (trip meter), AVE (average bicycle speed), and MAX (maximum bicycle speed) values.

TIP

- You cannot reset the odometer.
- To reset the accumulated energy that is displayed on the device connected via the Bluetooth low energy technology, select “CPP” on the “BLE” (Bluetooth low energy technology) display. “CALORIE” will be added in the “RESET” display. Then, select “CALORIE” to reset the accumulated energy.

1. Select an item by using the assist mode switches (up & down) and use the function select switch to place a check mark in the check box for the item that you want to reset.
2. When you press the function select switch in the “EXIT” display, the items with check marks will be reset and the display will return to the main riding display.

● BLE (Bluetooth low energy technology)

You can set the profile to use the wireless function with Bluetooth low energy technology, or you can select not to use the wireless function.
When “CSCP” is selected, the Cycling Speed and Cadence Profile will be available.
When “CPP” is selected, the Cycling Power Profile will be available.
When “OFF” is selected, the wireless function will be inactive.

TIP

- Set the profile according to the wireless communication equipment that communicates via Bluetooth low energy technology.
- For the output power level of each profile, see “Specifications”.
- Even if the power is turned off, the setting will be kept. When the power is turned on the next time, the last used setting will be selected.

1. Select “CSCP”, “CPP”, or “OFF” by using the assist mode switches (up & down).
2. When you press the function select switch at the desired item display, the setting will be kept and the main riding display will be shown.

● USB

You can use the USB receptacle as a power supply.

TIP

- Normally you should not use “COMM” because this is a service mode used for wired communication.
- When the power is turned off, the mode automatically changes to “PWR SPLY”.

● LED

You can select to light up the assist mode lamp according to the assist mode or keep the assist mode lamp unlit all the time.
When “ON” is selected, the assist mode lamp will light up according to the assist mode.
When “OFF” is selected, the assist mode lamp will remain unlit all the time.

TIP

Even if the assist mode lamp is set to “OFF”, it will light up in red if an error occurs.

1. Select “ON” or “OFF” by using the assist mode switches (up & down).
2. When you press the function select switch at the desired item display, the setting will be kept and the main riding display will be shown.

○ Pushing assist

When you are on or off the bicycle and start moving it, you can use pushing assist without pedaling the bicycle.
To use pushing assist, press and hold the pushing assist switch.
Pushing assist will not work in the following situations:

- When you release the pushing assist switch.
- If you press another switch at the same time.
- When you start to pedal.
- If your bicycle speed exceeds 6 km/h.
- If you select Off mode.
- If the wheels are not turning (when braking or coming into contact with an obstacle, etc.).

Displays alternately

○ Diagnosis mode

The e-Bike Systems are equipped with a diagnosis mode. If a malfunction or fault occurs in the e-Bike Systems, the assist mode lamp will light up in red, and the main riding display and “ER” will be shown alternately, while an error description will inform you of the type of error in the function display. See “Troubleshooting” regarding symptoms and remedies for abnormal displays and abnormal flashing.

⚠ WARNING

If the problem cannot be solved, have your bicycle inspected by a dealer as soon as possible.

TIP

Even if the assist mode lamp is set to “OFF”, it will light up in red if a malfunction or fault occurs.

○ Power supply to external devices

Power can be supplied to most external devices (e.g. various smart phones etc.) by connecting a commercial USB 2.0 OTG cable.

[To supply power]
1. Open the USB receptacle cap of the display.
2. Connect the USB cable to the display and external device.
3. Turn on the power of the vehicle.

[To stop the power supply]
1. Turn off the power of the vehicle.
2. Disconnect the USB cable and put on the cap of the USB receptacle.

NOTICE

- **Do not apply unreasonable force on the USB plug or pull the USB cable.**
- **Check that the USB plug is facing the right way and not totally out-of-position with the USB receptacle or slanted, and make sure it is fully inserted all the way in.**
- **Do not connect the USB receptacle and the USB plug in a wet state.**
- **Use a USB 2.0 OTG cable that conforms to the standards.**
- **Do not insert foreign objects into the USB receptacle unit.**

Otherwise, the display unit and external device may malfunction.

TIP

- Power is supplied automatically when an external device is connected with the USB cable.
- No power is supplied if the remaining capacity of the battery pack is low.
- The power supply of the vehicle will go off and power supplied by the USB connection will also stop if the vehicle is not operated for 5 minutes.

○ Communication with Bluetooth low energy technology

The wireless equipment corresponding to the CSCP or CPP profiles can provide the communication via Bluetooth low energy technology.

1. Set the profiles of the display unit by referring to “Stopwatch and settings”.
   Also confirm that they are in accordance with the connection settings of your wireless communication equipment.
2. Check that the Bluetooth indicator is displayed.
3. Select “Yamaha #######*” from the user menu of your wireless communication equipment.
   For more information, see the instruction manual of the wireless communication equipment.

   * “#######” of “Yamaha #######” is a combination of irregular alphanumeric characters.

TIP

- Keep the distance between the display and wireless communication equipment within 3 ft (1 m). The maximum communication distance of this equipment is 3 ft (1 m).
  If the wireless communication equipment is kept in a bag, etc., the actual communication distance might be shorter.
- Do not use the equipment in places with magnetic fields, static electricity, or electromagnetic interference.
  If the equipment is used near transmitters, broadcasting stations or the following type of equipment, wireless communication may not be possible.
  - Microwave ovens
  - Digital cordless phones
  - Wireless communication devices
  - Near other wireless equipment using the 2.4 GHz band.
- Do not cover the display with objects such as aluminum sheets that block the radio waves. Otherwise, wireless communication may not be possible.
- For the output power level of each profile, see the “Specifications”.

G. Battery pack and charging procedure

The battery pack equipped for the Yamaha e-Bike Systems is a lithium-ion battery. The lithium-ion battery is lightweight and offers superior capacity. However, it does have the following characteristics.

- Its performance decreases in extremely hot or cold environments.
- It naturally loses its charge.

The battery pack for the Yamaha e-Bike Systems also has an embedded computer which notifies you of estimated residual battery capacity and suspected faults via the battery capacity indicator lamp.
By pressing the battery capacity indicator button, you can display the residual battery capacity for approximately 5 seconds.
See “Checking the residual battery capacity” for the estimate of the residual battery capacity. See “Troubleshooting” for information on fault flashing.

⚠ WARNING

Do not use any other charger or charging method to recharge the special batteries. Using any other charger could result in fire, explosion, or damage the batteries.

⚠ WARNING

IMPORTANT SAFETY INSTRUCTIONS — SAVE THESE INSTRUCTIONS
TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, CAREFULLY FOLLOW THESE INSTRUCTIONS
For connection to a supply not in the U.S.A., use an attachment plug adapter of the proper configuration for the power outlet, if needed.
This manual contains important safety and operating instructions for battery charger Type PASC8.
Before using battery charger, read all instructions and cautionary markings on battery charger, battery and product using battery.
Charge only PASB6 type batteries for Yamaha e-Bike Systems. Other types of batteries may burst causing injury to persons and damage.

NOTICE

Do not apply grease on the terminal of the battery.

NOTICE

This battery charger has been tested and found to comply with the limits for a ClassB digital device, pursuant to part 15 of FCC Rules.
These limits are designed to provide reasonable protection against harmful interference in a residential installation.
This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.
However, there is no guarantee that interference will not occur in a particular installation.
If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures;

- **Reorient or relocate the receiving antenna.**
- **Increase the separation between the equipment and receiver.**
- **Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.**
- **Consult the dealer or an experienced radio/TV technician for help.**

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Appropriate charging environments

For safe and efficient charging, charge the battery pack in a location that is:

- Flat and stable
- Free of rain or moisture
- Out of direct sunlight
- Well-ventilated and dry
- Not accessible to children or pets
- Temperature between 59–77 °F (15–25 °C)

Inappropriate charging environments and solutions

The hot and cold environments described below can cause charging to enter standby or suspension without fully charging the battery.

- Summertime charging standby/suspension
  If charging in a location receiving direct summer sunlight, temperature more than 104 °F (40 °C) or immediately after riding, the battery pack might enter charging standby (all four battery capacity indicator lamps flash slowly). See “Reading the charging status”. This is to automatically stop charging in order to protect the battery from exceeding the specified temperature while charging. You can avoid charging suspension by starting to charge with the battery cold or at a room temperature of 59–77 °F (15–25 °C). If charging suspension occurs, move the battery pack to a cool location to reduce the charging standby time.
- Wintertime charging standby/suspension
  Charging standby will occur if the temperature is less than 32 °F (0 °C). If charging is started and the temperature drops below this level due to late-night cooling or other factors, charging is suspended and standby mode is entered to protect the battery. In such cases, restart charging at an indoor location with a temperature of 59–77 °F (15–25 °C).
- Noise on televisions/radios/computers
  Charging next to televisions, radios, or similar appliances might cause static, flickering images, and other interference. If this occurs, recharge in a location further away from the television or radio (such as in another room).

⚠ WARNING

If a charging fault occurs during charging, remove the power plug of the battery charger from the socket and wait for the battery pack/battery charger to cool.

Charging the battery pack mounted on the bicycle

1. Connect the power plug of the battery charger to a household power outlet.
2. Open the lid of the charging port, and connect the charging plug to the charging port on the cover.

NOTICE

- **Do not connect the charging plug of the battery charger with the charging port on the cover in a wet state.**
  Otherwise, the battery charger and battery pack may malfunction.
- **Be sure to connect the charging plug only after the charging port on the cover is completely dry.**
  Otherwise, the battery charger and battery pack may malfunction.
- **Do not apply excessive force to the charging plug or pull on the cord with the charging plug connected to the charging port on the cover.**
  Otherwise, the plug or port may be damaged.
- **Do not pedal while the charging plug is connected.**

3. See “Reading the charging status” or “Checking the residual battery capacity”, and check that the battery charger is charging the battery pack.

4. Confirm that charging is complete, and then disconnect the charging plug from the charging port on the cover.
   - When charging is complete, the battery charger lamp goes off. Grasp the top of the charging plug and pull it out straight.

NOTICE

Do not apply excessive force to the charging plug or pull on the cord with the charging plug connected to the charging port on the cover. Otherwise, the plug or port may be damaged.

5. Put down the lid of the charging port.

⚠ WARNING

Never handle the power plug, charging plug or touch the charger contacts with wet hands. This could result in electric shock.

TIP

- Charging will start automatically.
- If the display unit is turned on while the battery pack is charging, all normal displays will be shown, including the battery capacity indicator, but the assist system will not function.

Charging the battery pack removed from the bicycle

1. Turn the display unit off.
2. Remove the battery cover.
   - Remove the two bolts and collars securing the battery cover.
   - Remove the battery cover along the frame, paying attention to the hooks on the battery cover.
3. Remove the battery.
   - While supporting the battery with your hands, loosen the bolt and pull it out until you can see the painted surface.
   - Pull the collar away from the battery and rotate it 180° to release the battery.
   - Pull the battery slowly out of the frame and the charging port.

TIP

The bolt cannot be completely removed.

⚠ WARNING

Use both hands when removing the battery pack. Do not drop the battery pack or subject it to impact. Doing so could cause the battery pack to become hot or catch fire, resulting in serious injury or property damage.

4. Connect the power plug of the battery charger to a household power outlet.
5. Connect the charging plug to the battery pack.

NOTICE

- **Do not connect the charging plug of the battery charger with the charging port of the battery pack in a wet state.**
  Otherwise, the battery charger and battery pack may malfunction.
- **Be sure to connect the charging plug only after the charging port of the battery pack is completely dry. Otherwise, the battery charger and battery pack may malfunction.**
- **Do not apply excessive force to the charging plug or pull on the cord with the charging plug connected to the charging port of the battery pack.**
  Otherwise, the plug or port may be damaged.

6. See “Reading the charging status”, and check that the battery charger is charging the battery pack.
7. The battery capacity indicator lamps will light up one by one until all four are on. Then, when charging is complete, all of the lamps will go off.
8. Confirm that charging is complete, and then disconnect the charging plug from the battery pack.
9. Mount the battery pack on the bicycle. (See the left figure)
   - Insert the battery towards the frame.
   - Holding the battery by hand, rotate the collar 180° and inset the protrusion of the collar into the hole of the battery.
   - Tighten the bolts to fix the battery.

TIP

The collar has a magnet and plays a role of preventing it from falling off by sticking to the battery body.

10. Attach the battery cover along the frame.
    Tighten the two bolts and collars to fix the battery cover.

⚠ WARNING

- **Do not touch charger contacts with metallic objects. Do not allow foreign material to cause short circuit of the contacts. This could result in electric shock, fire, or damage the battery charger.**

- **Periodically remove dust from the power plug. Dampness or other issues could reduce the effectiveness of the insulation, resulting in fire.**
- **Never disassemble or modify the battery charger. This could result in fire or electric shock.**
- **Do not use with a power strip or extension cord. Using a power strip or similar methods may exceed rated current and can result in fire.**
- **Do not use with the cable tied or rolled up, and do not store with the cable wrapped around the charger main body. Cable damage can result in fire or electric shock.**
- **Firmly insert the power plug and the charging plug into the socket. Failure to insert the power plug and the charging plug completely can result in fire caused by electric shock or overheating.**
- **Do not use the battery charger near flammable material or gas. This could result in fire or explosion.**
- **Never cover the battery charger or place other objects on top of it while charging. This could result in internal overheating leading to fire.**
- **Before equipping the bicycle with a battery pack, make sure that there is no foreign matter or water in the charging port on the bicycle. Otherwise, it could lead to heat generation, smoke and/or a fire owing to short-circuiting of the terminals.**

11. Make sure that it is securely attached by pulling the battery pack after installation.

⚠ WARNING

- **Do not short the contacts of the battery pack. Doing so could cause the battery pack to become hot or catch fire, resulting in serious injury or property damage.**
- **Do not disassemble or modify the battery pack. Doing so could cause the battery pack to become hot or catch fire, resulting in serious injury or property damage.**
- **Do not dispose of the battery pack in a fire or expose it to a heat source. Doing so could cause an explosion, resulting in serious injury or property damage.**
- **Do not drop the battery pack or subject it to impact. Doing so could cause the battery pack to become hot or catch fire, resulting in serious injury or property damage.**

NOTICE

Make sure there is no foreign matter on the battery pack contacts before inserting the battery pack.

Reading the charging status

When charging the battery pack mounted on the bicycle, check the battery charger lamp on the battery charger or the remaining battery level on the display unit. (See “Checking the residual battery capacity”)

Battery charger lamp	Battery capacity indicator lamps	Display unit	Current status	Details
BATTERY CHARGE YAMAHA On	Lit power lamps indicate the amount of charging completed. A flashing power lamp indicates current progress. (Example: Battery is approximately 50–75 % charged.)	The battery capacity indicator slowly increases. 11–99% 1–10% <0.5 second intervals> 0% <0.2 second intervals>	Charging	During charging, the battery capacity indicator lamps light up one by one.
BATTERY CHARGE YAMAHA Off	Off	All segments of the battery capacity indicator light up.	Charging completed	When charging is complete, the charging lamp on the battery charger and the battery capacity indicator lamp on the battery pack go off.
	Four lamps flash simultaneously.	All function display items are flashing.	Battery is in standby mode. * The battery internal temperature is too high or too low.	Charging will automatically restart when a temperature is reached that allows charging. (See “Appropriate charging environments”.) When possible, always perform charging at the optimal temperature of 59–77 °F (15–25 °C).

TIP

For example, even if normal charging is started, if the battery temperature or the surrounding temperature is too high or too low, the charging may be extended or charging may be stopped without the battery being charged sufficiently in order to protect the battery.

Charging time guidelines

Although charging time varies depending on residual battery capacity and external temperature, if the battery has been exhausted, it generally takes approximately 4 hours (500 Wh).

If the battery pack enters standby mode while charging, charging time will increase by an equal amount.

* If charging after a long period of disuse, the charging time will be lengthened depending on the battery status. However, note that if the battery capacity indicator lamps do not flash in fault pattern (See “Reading the charging status”), there is no malfunction.

H. Checking the residual battery capacity

You can check the estimate of how much capacity is left in the battery and to what extent it is charged. The check can be performed using either the display unit's residual battery capacity indicator or the battery's residual battery capacity indicator lamps.

TIP

- Even if the battery's capacity reaches 0 (zero), you can still ride the bicycle as a regular bicycle.
- If you are using an old battery pack, the residual battery capacity indicator may suddenly display very little power when you start moving. This is not a malfunction. Once riding stabilizes and the load is reduced, the proper value is displayed.

Residual battery capacity indicator display and estimate of residual battery capacity for display unit

The residual battery capacity can be displayed as a numerical value on the display unit.

Display of the residual battery capacity for the display unit	Display of the residual battery capacity	Applicable situation
	100–11 %	When you turn on the power of the display unit and ride continually after the battery is fully charged, the segments for the residual battery capacity indicator go out one by one each time the residual battery capacity is reduced by 10 %.
 Slow flashing <every 0.5 seconds>	10–1 %	There is very little residual battery capacity left. Please charge the battery soon.
 Fast flashing <every 0.2 seconds>	0 %	There is no more residual battery capacity. Turn off the power for the display unit and charge the battery pack soon. * Assist is stopped, but you can still ride the bicycle as a regular bicycle.

Display of the battery capacity indicator lamps and the estimate of the residual battery capacity

When checking the residual battery capacity, push the battery capacity indicator button “”.

Display of the battery capacity indicator lamps	Estimate of the residual battery capacity	Applicable situation
	100–76 %	From full charge (100 %), the battery capacity indicator lamps turn off, one by one.
	75–51 %	
	50–26 %	
	25–11 %	
 The bottom of lamp slow flashing <0.5 second interval>	10–1 %	There is very little battery capacity left.
 The bottom of lamp fast flashing <0.2 second interval>	0 %	The battery capacity has reached 0 (zero). Please charge the battery pack.

I. Pre-operation check

⚠ WARNING

Be sure to perform the inspection before riding the bicycle.
If there is anything you do not understand or find difficult, please consult a bicycle dealer.

NOTICE

- **If you confirm there is a fault, have your bicycle inspected at a dealer as soon as possible.**
- **The power assist mechanism consists of precision parts. Do not disassemble it.**

Along with performing the regular inspection before riding the bicycle, also perform the following inspections.

No.	Inspection item	Inspection contents
1	Residual battery capacity	Is enough capacity left in the battery?
2	Installation status of the battery pack	Is it properly installed?
3	Operation of the e-Bike Systems	Do the e-Bike Systems operate when you begin moving?

J. Cleaning, maintenance and storage

NOTICE

Do not use high-pressure washers or steam jet cleaners since they can cause water seepage, resulting in property damage or malfunction of the Drive Unit or display unit or battery pack. Should water get inside one of these units, have an authorized dealer inspect your bicycle.

Caring for the battery pack

Use a moist, tightly-wrung towel to wipe off dirt on the battery pack. Do not pour water directly on the battery pack, such as with a hose.

NOTICE

Do not clean the contacts by polishing them with a file or using a wire, etc. Doing so could result in a fault.

Maintenance for the Drive Unit

NOTICE

Because a Drive Unit is a precision machinery, do not disassemble or exert any strong force on it (for example, do NOT hit this product with a hammer).
Especially since the crank axle is directly connected to the inside of the Drive Unit, any large damages inflicted on the crank axle may lead to failures.

Storage

Store the bicycle in a place that is:
- Flat and stable
- Well ventilated and free from moisture
- Sheltered from the elements and from direct sunlight

Long storage period (1 month or longer) and using it again after a long storage period

- When storing the bicycle for a long period (1 month or longer), remove the battery pack and store it using the following procedure.
- Decrease the residual battery capacity to where one or two battery capacity indicator lamps are lit, and store it indoors in a cool (59–77 °F (15–25 °C)), dry place.
- Check the residual battery capacity once a month, and if only one battery capacity indicator lamp is flashing, charge the battery pack for about 10 minutes. Do not let the residual battery capacity become too low.

TIP

- If you leave the battery pack at “full charge” or “empty”, it will deteriorate quicker.
- Due to self-discharge, the battery slowly loses its charge during storage.
- The battery’s capacity decreases over time but proper storage will maximize its service life.

- When using it again after a long storage period, be sure to charge the battery pack before using it. Also, if you are using it again after storing it for 6 months or longer, have your bicycle inspected and maintained at a dealer.

K. Transport

The batteries are subject to the Dangerous Goods Legislation requirements. When being transported by third parties (e.g. via air transport or forwarding agency), special requirements on packaging and labels must be observed. To prepare the item for shipping, consult a hazardous materials expert. The customer can transport the batteries by road without further requirements. Do not transport damaged batteries.
Tape or mask off open contacts and pack up the battery pack in such a manner that it cannot move around in the packaging. Be sure to observe all local and national regulations. In case of questions concerning transport of the batteries, please refer to an authorized bicycle dealer.

L. Consumer information

Disposal

The Drive Unit, battery pack, battery charger, display unit, speed sensor set, accessories and packaging should be sorted for environmental-friendly recycling.
Do not dispose of the bicycle or its components as household waste.

⚠ WARNING

Do not dispose of the battery pack in a fire or expose it to a heat source. Doing so could cause fire, or explosion, resulting in serious injury or property damage.

You may recycle your battery pack by calling 1-800-822-8837.

M. Troubleshooting

E-Bike Systems

Symptom	Check	Action
Pedaling is difficult.	Is the display unit's power on?	**Press the power switch on the display unit to turn the power on.**
	Is the battery pack installed?	**Install a charged battery pack.**
	Is the battery pack charged?	**Charge the battery pack.**
	Has the bicycle remained stationary for 5 minutes or longer?	**Turn the power on again.**
	Are you riding on a long inclined road or carrying a heavy load during summertime?	**This is not a malfunction. It is a safeguard engaged when the temperature of the battery pack or the Drive Unit is too high. Power assist will be restored once the temperature of the battery pack or the Drive Unit has decreased. Also, you can make this less likely to occur by shifting to a lower gear than you would usually use (for example, by shifting from second to first gear).**
	Is the air temperature low (roughly 50 °F (10 °C) or below)?	**During the wintertime, store the battery pack indoors before use.**
	Are you charging the battery pack while it is mounted on the bicycle?	**Stop charging the battery pack.**
The Drive Unit turns on and off while riding.	Is the battery pack correctly installed?	**Check to make sure the battery pack is locked in place. If this problem still occurs with the battery pack firmly locked in place, there may be a loose connection with the battery pack terminals or wires. Have an authorized dealer inspect your bicycle.**
Strange rumbling or crunching noises come from the Drive Unit.		**There could be a problem inside the Drive Unit. Have an authorized dealer inspect your bicycle.**
Smoke or unusual odor comes from the Drive Unit.		**There could be a problem inside the Drive Unit. Have an authorized dealer inspect your bicycle.**

Symptom	Check	Action
The assist mode lamp lights up in red, the main riding display and “ER” are displayed alternately, and an error description is indicated in the function display. Displays alternately Error displays		**There is a problem in the e-Bike Systems. Turn off the power and then turn it on again.** **If the problem cannot be solved, have your bicycle inspected by a dealer as soon as possible.**
The display unit shuts down immediately (approx. 4 seconds later) after switching the power on.	Are the bicycle’s battery pack connection terminals dirty?	**Remove the battery pack, clean the bicycle’s terminals with a dry cloth or cotton swab, and then install the battery pack again.**
Traveling range has decreased.	Are you fully charging the battery pack?	**Charge the battery pack until full (F).**
	Are you using the system under low-temperature conditions?	**Normal traveling range will be restored when the ambient temperature rises. Additionally, storing the battery pack indoors (in a warm location) before use will improve traveling range under cold conditions.**
	Is the battery pack worn out?	**Replace the battery pack.**

Symptom	Check	Action
An assist mode lamp lights up in red and an error description is indicated in the function display. Error displays		**The speed sensor cannot detect a correct signal.** **Turn off the power to the display unit and then turn it on again.** **Select the assist mode and then ride for a short distance.** **Also, make sure the magnet is mounted correctly on the spokes of the wheels.**
The assist mode indicator and function display are flashing. (Power assist is stopped.)		**This is not a malfunction. It is in a state that the operation of the power assist system is normal. This state may occur depending on the pedaling strength and riding speed, but it returns to normal condition if it is confirmed that the system is normal.**

Pushing assist function

Symptom	Check	Action
The pushing assist function turns off.	Is the tire locked for a few seconds?	**Release your finger from the pushing assist switch for a moment, and after making sure that the tires turn, push the switch again.**
	Did you pedal while the pushing assist function was running?	**Take your feet off the pedals and remove your finger from the pushing assist switch for a moment.** **Then press the switch again.**

Power supply of external devices via USB connection

Symptom	Check	Action
Power is not supplied.	Is the display unit's power on?	**Press the power switch on the display unit to turn the power on.**
	Is the USB version correct?	**Use an external device that complies with USB 2.0.**
	Is the USB cable type correct?	**Use an OTG cable. Also connect the host side to the display.**
	Is the USB cable firmly connected?	**Re-connect the USB cable.**
	Is the USB receptacle or USB plug terminal dirty or wet?	**Disconnect the USB cable from the display unit and external device. Remove the dirt and water on the USB receptacle and USB plug terminal and re-connect the cable.**
	Is USB setting set to "COMM"?	**Set the USB settings to "PWR SPLY" by referring to "Stopwatch and settings" or turn off the power and then turn it on again.**

Wireless communication with Bluetooth low energy technology

Symptom	Check	Action
Wireless communication cannot be used.	Are both the wireless communication settings of the display unit and your wireless communication equipment turned on?	**Set the communication profiles by referring to "Stopwatch and settings", and then set the correct communication profiles of the wireless equipment or application software.**
	Are the communication profiles of the wireless equipment or application software that communicates wirelessly with the communication profiles of the display correct?	
The display values of the external wireless communication equipment are wrong.	Did you change the settings of the communication profiles?	**Reset pairing for a moment, set the communication profiles of the display, and then establish pairing again. For resetting of pairing and the procedure of establishing pairing, refer to the instruction manual supplied with the wireless communication equipment.**

Battery pack and charger

Symptom	Check	Action
Cannot charge	Is the power plug firmly connected? Is the charging plug firmly inserted in the battery pack?	**Reconnect and try charging again. If the battery pack still does not charge, the battery charger might be malfunctioning.**
	Are the residual battery capacity indicator lamps lit?	**Review charging method and try charging again. If the battery pack still does not charge, the battery charger might be malfunctioning.**
	Are the battery charger or battery pack contact terminals dirty or wet?	**Remove the battery pack from the battery charger and the charger plug from the socket. Use a dry cloth or cotton swab to clean the charger and battery contact terminals. Then reconnect both the battery pack and the battery charger.**
	There is a contact fault in the contact terminals.	**Remove the battery pack from the bicycle. Then connect the charging plug into the battery pack. (If battery capacity indicator lamps still flash alternatively, there might be a fault in the battery pack). When the battery pack is remounted on the bicycle and the power switch of the display unit is pressed, if battery capacity indicator lamps still flash alternately, there might be a fault in the Drive Unit.**
	There is a contact fault in the contact terminals.	**Remove the battery pack from the battery charger, mount the battery on the bicycle and press the power switch of display unit. When the charging plug is reconnected into the battery pack, if battery capacity indicator lamps still flash simultaneously, there might be a fault in the battery charger.**
	Is the charging port on the battery pack wet?	**Clean the charging port and charging plug. Then dry them. Afterwards, connect the charging plug to the charging port.**
Both side battery capacity indicator lamps are flashing simultaneously.		**The battery pack protection feature has been activated and the system cannot be used. Replace the battery pack at an authorized dealer as soon as possible.**

Symptom	Check	Action
The battery charger emits abnormal noises, foul odors or smoke.		**Unplug the charger plug and immediately cease operation. Have an authorized dealer inspect your bicycle.**
The battery charger becomes hot.	It is normal for the battery charger to become somewhat warm during charging.	**If the battery charger is too hot to be touched by hand, unplug the charger plug, wait for it to cool, and consult an authorized dealer.**
After charging, all of the battery capacity indicator lamps do not light up when the battery capacity indicator button "(☝)" is pressed.	Has the charger plug been unplugged or the battery pack removed during charging?	**Charge the battery pack again.**
	Did you start charging with the battery pack at a high temperature, such as immediately after use?	**Move to a location where the battery temperature can reach the range where charging is possible (59–77 °F (15–25 °C)), and then start charging again.**
After disconnecting the charging plug on the battery charger from the battery pack, the battery capacity indicator lamps continue to light up.	Is the charging port on the battery pack wet?	**Clean the charging port and charging plug. Then dry them.**

N. Specifications

Range of assist speed		0 to less than 20 mph
Electric motor	Type	Brushless DC type
	Maximum 30 minutes power	500 W
Assist power control method		Control method depends on pedaling torque and bicycle speed
Battery 500 Wh	Type	PASB6 (X1V-00) (Lithium-ion battery)
	Voltage	36.0 V
	Capacity	13.4 Ah
	Number of battery cells	40
Charger	Type	PASC8
	Input voltage	AC 100–240 V/50–60 Hz
	Maximum output voltage	DC 42 V
	Maximum output current	DC 4.0 A
	Maximum consumed power	190 W (Charged at AC 100 V)
	Applicable type battery	PASB6
Display unit (Power supply portion)	USB receptacle type	USB2.0 Micro-B
	Output current	Max. 1000 mA
	Rated voltage	5 V

Display unit (Wireless communication portion)	Communication system	Bluetooth version 4.0 (Bluetooth low energy technology)
	Output power	–9.27 dBm (e.i.r.p.)
	Communication range	Line-of-sight distance approx. 3 ft (1 m) without interference
	Frequency band	2.4 GHz band (2.400–2.4835 GHz)
	Modulation method	GFSK
	Supported profiles	CSCP*1 CPP*2
Display unit (Product information) CE	Model No.	X1V00
	Manufacturer	YAMAHA MOTOR CO., LTD. 2500 Shingai, Iwata, Shizuoka 438-8501, Japan
	Trade mark/Trade name	YAMAHA

*1 CSCP (Cycling Speed and Cadence Profile)
Corresponds to the wheel revolution data and crank revolution data.

*2 CPP (Cycling Power Profile)
Corresponds to the wheel revolution data, crank revolution data, instantaneous power, and accumulated energy.

- Communication is not necessarily guaranteed with all wireless communication devices that have the same profiles as this system.
  Even when a device complies with the specification for Bluetooth low energy technology, there may be cases where the characteristics, specifications, or communicative environment of the device with this technology make it impossible to connect, or may result in different control methods, display or operation.
- YAMAHA MOTOR CO., LTD. can not be held liable in any way for damages or other loss resulting from information leaks during the communication via Bluetooth low energy technology.

6. Service

⚠ WARNING

Technological advances have made bicycles and bicycle components more complex, and the pace of innovation is increasing.
It is impossible for this manual to provide all the information required to properly repair and/or maintain your bicycle. In order to help minimize the chances of an accident and possible injury, it is critical that you have any repair or maintenance which is not specifically described in this manual performed by your dealer. Equally important is that your individual maintenance requirements will be determined by everything from your riding style to geographic location. Consult your dealer for help in determining your maintenance requirements.

⚠ WARNING

Many bicycle service and repair tasks require special knowledge and tools. Do not begin any adjustments or service on your bicycle until you have learned from your dealer how to properly complete them. Improper adjustment or service may result in damage to the bicycle or in an accident which can cause serious injury or death.

If you want to learn to do major service and repair work on your bike:
1. Ask your dealer for copies of the manufacturer's installation and service instructions for the components on your bike, or contact the component manufacturer.
2. Ask your dealer to recommend a book on bicycle repair.
3. Ask your dealer about the availability of bicycle repair courses in your area.

We recommend that you ask your dealer to check the quality of your work the first time you work on something and before you ride the bike, just to make sure that you did everything correctly. Since that will require the time of a mechanic, there may be a modest charge for this service.

We also recommend that you ask your dealer for guidance on what spare parts, such as tires, inner tubes, light bulbs, batteries, Patch kit, lubricants etc. it would be appropriate for you to have once you have learned how to replace such parts when they require replacement.

A. Service Intervals

Some service and maintenance can and should be performed by the owner, and require no special tools or knowledge beyond what is presented in this manual.
The following are examples of the type of service you should perform yourself.
All other service, maintenance and repair should be performed in a properly equipped facility by a qualified bicycle mechanic using the correct tools and procedures specified by the manufacturer.

1. Break-in Period: Your bike will last longer and work better if you break it in before riding it hard. Control cables and wheel spokes may stretch or "seat" when a new

bike is first used and may require readjustment by your dealer. Your Mechanical Safety Check (Section 1.C) will help you identify some things that need readjustment. But even if everything seems fine to you, it's best to take your bike back to the dealer for a checkup. Dealers typically suggest you bring the bike in for a 30 day checkup. Another way to judge when it's time for the first checkup is to bring the bike in after three to five hours of hard off-road use, or about 10 to 15 hours of on-road or more casual off-road use. But if you think something is wrong with the bike, take it to your dealer before riding it again.

2. Before every ride: Mechanical safety check (Section 1.C)
3. After every long or hard ride; if the bike has been exposed to water or grit; or at least every 100 miles: Clean the bike and lightly lubricate the chain's rollers with a good quality bicycle chain lubricant. Wipe off excess lubricant with a lint- free cloth. Lubrication is a function of climate. Talk to your dealer about the best lubricants and the recommended lubrication frequency for your area.
4. After every long or hard ride or after every 10 to 20 hours of riding:
   - Squeeze the front brake and rock the bike forward and back. Everything feel solid? If you feel a clunk with each forward or backward movement of the bike, you probably have a loose headset. Have your dealer check it.
   - Lift the front wheel off the ground and swing it from side to side. Feel smooth? If you feel any binding or roughness in the steering, you may have a tight headset. Have your dealer check it.
   - Grab one pedal and rock it toward and away from the centerline of the bike; then do the same with the other pedal. Anything feel loose? If so, have your dealer check it.
   - Take a look at the brake pads. Starting to look worn or not hitting the wheel rim squarely? Time to have the dealer adjust or replace them.
   - Carefully check the control cables and cable housings. Any rust? Kinks? Fraying? If so, have your dealer replace them.
   - Squeeze each adjoining pair of spokes on either side of each wheel between your thumb and index finger. Do they all feel about the same? If any feel loose, have your dealer check the wheel for tension and trueness.
   - Check the tires for excess wear, cuts or bruises. Have your dealer replace them if necessary.
   - Check the wheel rims for excess wear, dings, dents and scratches. Consult your dealer if you see any rim damage.
   - Check to make sure that all parts and accessories are still secure, and tighten any which are not.
   - Check the frame, particularly in the area around all tube joints; the handlebars; the stem; and the seatpost for any deep scratches, cracks or discoloration. These are signs of stress-caused fatigue and indicate that a part is at the end of its useful life and needs to be replaced. See also Appendix B.

⚠ WARNING

Like any mechanical device, a bicycle and its components are subject to wear and stress. Different materials and mechanisms wear or fatigue from stress at different rates and have different life cycles. If a component's life cycle is exceeded, the component can suddenly and catastrophically fail, causing serious injury or death to the rider. Scratches, cracks, fraying and discoloration are signs of stress-caused fatigue and indicate that a part is at the end of its useful life and needs to be replaced. While the materials and workmanship of

your bicycle or of individual components may be covered by a warranty for a specified period of time by the manufacturer, this is no guarantee that the product will last the term of the warranty. Product life is often related to the kind of riding you do and to the treatment to which you submit the bicycle. The bicycle's warranty is not meant to suggest that the bicycle cannot be broken or will last forever. It only means that the bicycle is covered subject to the terms of the warranty. Please be sure to read Appendix A, "Intended use of your bicycle" and Appendix B, "The lifespan of your bike and its components".

5. As required: If either brake lever fails the Mechanical safety check (Section 1.C), don't ride the bike. Have your dealer check the brakes.
   If the chain won't shift smoothly and quietly from gear to gear, the derailleur is out of adjustment. See your dealer.
6. Every 25 (hard off-road) to 50 (on-road) hours of riding: Take your bike to your dealer for a complete checkup.

B. If your bicycle sustains an impact:

First, check yourself for injuries, and take care of them as best you can. Seek medical help if necessary.
Next, check your bike for damage.
After any crash, take your bike to your dealer for a thorough check. Carbon composite components, including fames, wheels, handlebars, stems, cranksets, brakes, etc. which have sustained an impact must not be ridden until they have been disassembled and thoroughly inspected by a qualified mechanic.
See also Appendix B, "The lifespan of your bike and its components".

⚠ WARNING

A crash or other impact can put extraordinary stress on bicycle components, causing them to fatigue prematurely.
Components suffering from stress fatigue can fail suddenly and catastrophically, causing loss of control, serious injury or death.

Appendix A

Intended use of your bicycle

⚠ WARNING

Understand your bike and its intended use. Choosing the wrong bicycle for your purpose can be hazardous. Using your bike the wrong way is dangerous.

No one type of bicycle is suited for all purposes. Your retailer can help you pick the "right tool for the job" and help you understand its limitations. There are many types of bicycles and many variations within each type. There are many types of mountain, road, racing, hybrid, touring, cyclocross and tandem bicycles.
There are also bicycles that mix features. For example, there are road/racing bikes with triple cranks. These bikes have the low gearing of a touring bike, the quick handling of a racing bike, but are not well suited for carrying heavy loads on a tour. For that purpose you want a touring bike.
Within each of type of bicycle, one can optimize for certain purposes. Visit your bicycle shop and find someone with expertise in the area that interests you. Do your own homework. Seemingly small changes such as the choice of tires can improve or diminish the performance of a bicycle for a certain purpose.
On the following pages, we generally outline the intended uses of various types of bikes. **Industry usage conditions are generalized and evolving. Consult your dealer about how you intend to use your bike.**

MAXIMUM WEIGHT LIMIT

LUGGAGE	TOTAL*
lbs / kg	lbs / kg
55 / 25	254 / 115

* Total weight includes the weight of the rider, the weight of the bike itself, and any cargo being carried.

High-Performance Road

CONDITION 1
Bikes designed for riding on a paved surface where the tires do not lose ground contact.
INTENDED To be ridden on paved roads only.
NOT INTENDED For off-road, cyclocross, or touring with racks or panniers.
TRADE OFF Material use is optimized to deliver both light weight and specific performance. You must understand that (1) these types of bikes are intended to give an aggressive racer or competitive cyclist a performance advantage over a relatively short product life, (2) a less aggressive rider will enjoy longer frame life, (3) you are choosing light weight (shorter frame life) over more frame weight and a longer frame life, (4) you are choosing light weight over more dent resistant or rugged frames that weigh more. All frames that are very light need frequent inspection. These frames are likely to be damaged or broken in a crash. They are not designed to take abuse or be a rugged workhorse. See also Appendix B.

General Purpose Riding

CONDITION 2

Bikes designed for riding Condition 1, plus smooth gravel roads and improved trails with moderate grades where the tires do not lose ground contact.

INTENDED For paved roads, gravel or dirt roads that are in good condition, and bike paths.

NOT INTENDED For off-road or mountain bike use, or for any kind of jumping. Some of these bikes have suspension features, but these features are designed to add comfort, not off-road capability. Some come with relatively wide tires that are well suited to gravel or dirt paths. Some come with relatively narrow tires that are best suited to faster riding on pavement. If you ride on gravel or dirt paths, carry heavier loads or want more tire durability talk to your dealer about wider tires.

Cross-Country, Marathon, Hardtails

CONDITION 3

Bikes designed for riding Conditions 1 and 2, plus rough trails, small obstacles, and smooth technical areas, including areas where momentary loss of tire contact with the ground may occur. NOT jumping. All mountain bikes without rear suspension are Condition 3, and so are some lightweight rear suspension models.

INTENDED For cross-country riding and racing which ranges from mild to aggressive over intermediate terrain (e.g., hilly with small obstacles like roots, rocks, loose surfaces and hard pack and depressions). Cross-country and marathon equipment (tires, shocks, frames, drive trains) are light-weight, favoring nimble speed over brute force. Suspension travel is relatively short since the bike is intended to move quickly on the ground.

NOT INTENDED For Hardcore Freeriding, Extreme Downhill, Dirt Jumping, Slopestyle, or very aggressive or extreme riding. No spending time in the air landing hard and hammering through obstacles.

TRADE OFF Cross-Country bikes are lighter, faster to ride uphill, and more nimble than All-Mountain bikes. Cross-Country and Marathon bikes trade off some ruggedness for pedaling efficiency and uphill speed.

All Mountain

CONDITION 4

Bikes designed for riding Conditions 1, 2, and 3, plus rough technical areas, moderately sized obstacles, and small jumps.

INTENDED For trail and uphill riding. All-Mountain bicycles are: (1) more heavy duty than cross country bikes, but less heavy duty than Freeride bikes, (2) lighter and more nimble than Freeride bikes, (3) heavier and have more suspension travel than a cross country bike, allowing them to be ridden in more difficult terrain, over larger obstacles and moderate jumps, (4) intermediate in suspension travel and use components that fit the intermediate intended use, (5) cover a fairly wide range of intended use, and within this range are models that are more or less heavy duty. Talk to your retailer about your needs and these models.

NOT INTENDED For use in extreme forms of jumping/riding such as hardcore mountain, Freeriding, Downhill, North Shore, Dirt Jumping, Hucking etc. No large drop offs, jumps or launches (wooden structures, dirt embankments) requiring long suspension travel or heavy duty components; and no spending time in the air landing hard and hammering through obstacles.

TRADE OFF All-Mountain bikes are more rugged than cross country bikes, for riding more difficult terrain. All-Mountain bikes are heavier and harder to ride uphill than cross country bikes. All-Mountain bikes are lighter, more nimble and easier to ride uphill than Freeride bikes. All-Mountain bikes are not as rugged as Freeride bikes and must not be used for more extreme riding and terrain.

Gravity, Freeride, and Downhill

CONDITION 5

Bikes designed for jumping, hucking, high speeds, or aggressive riding on rougher surfaces, or landing on flat surfaces. However, this type of riding is extremely hazardous and puts unpredictable forces on a bicycle which may overload the frame, fork, or parts. If you choose to ride in Condition 5 terrain, you should take appropriate safety precautions such as more frequent bike inspections and replacement of equipment.

You should also wear comprehensive safety equipment such as a full-face helmet, pads, and body armor.

INTENDED For riding that includes the most difficult terrain that only very skilled riders should attempt.

Gravity, Freeride, and Downhill are terms which describe hardcore mountain, north shore, slopestyle. This is “extreme” riding and the terms describing it are constantly evolving.

Gravity, Freeride, and Downhill bikes are: (1) heavier and have more suspension travel than All-Mountain bikes, allowing them to be ridden in more difficult terrain, over larger obstacles and larger jumps, (2) the longest in suspension travel and use components that fit heavy duty intended use. While all that is true, there is no guarantee that extreme riding will not break a Freeride bike.

The terrain and type of riding that Freeride bikes are designed for is inherently dangerous. Appropriate equipment, such as a Freeride bike, does not change this

reality. In this kind of riding, bad judgment, bad luck, or riding beyond your capabilities can easily result in an accident, where you could be seriously injured, paralyzed or killed.
NOT INTENDED To be an excuse to try anything. Read Section 2.F.
TRADE OFF Freeride bikes are more rugged than All-Mountain bikes, for riding more difficult terrain. Freeride bikes are heavier and harder to ride uphill than All-Mountain bikes.

Dirt Jump

CONDITION 5
Bikes designed for jumping, hucking, high speeds, or aggressive riding on rougher surfaces, or landing on flat surfaces. However, this type of riding is extremely hazardous and puts unpredictable forces on a bicycle which may overload the frame, fork, or parts. If you choose to ride in Condition 5 terrain, you should take appropriate safety precautions such as more frequent bike inspections and replacement of equipment. You should also wear comprehensive safety equipment such as a full-face helmet, pads, and body armor.
INTENDED For man-made dirt jumps, ramps, skate parks other predictable obstacles and terrain where riders need and use skill and bike control, rather than suspension. Dirt Jumping bikes are used much like heavy duty BMX bikes. A Dirt Jumping bike does not give you skills to jump. Read Section 2.F.
NOT INTENDED For terrain, drop offs or landings where large amounts of suspension travel are needed to help absorb the shock of landing and help maintain control.
TRADE OFF Dirt Jumping bikes are lighter and more nimble than Freeride bikes, but they have no rear suspension and the suspension travel in the front is much shorter.

Cyclo-cross

CONDITION 2
Bikes designed for riding Condition 1, plus smooth gravel roads and improved trails with moderate grades where the tires do not lose ground contact.
INTENDED For cyclo-cross riding, training and racing.
Cyclo-cross involves riding on a variety of terrain and surfaces including dirt or mud surfaces. Cyclo-cross bikes also work well for all weather rough road riding and commuting.
NOT INTENDED For off road or mountain bike use, or jumping. Cyclo-cross riders and racers dismount before reaching an obstacle, carry their bike over the obstacle and then remount. Cyclo-cross bikes are not intended for mountain bike use. The relatively large road bike size wheels are faster than the smaller mountain bike wheels, but not as strong.

Road Tandems

CONDITION 1
Bikes designed for riding on a paved surface where the tires do not lose ground contact.
INTENDED Are designed to be ridden on paved roads only.
They are not designed for mountain biking or off-road use.
NOT INTENDED Road tandem should not be taken off-road or used as a mountain tandem.

Mountain Tandems

CONDITION 2
Bikes designed for riding Condition 1, plus smooth gravel roads and improved trails with moderate grades where the tires do not lose ground contact.
INTENDED The challenges of mountain biking are obvious. The added challenges of tandem riding mean that you should limit off-road tandem riding to easy-moderate terrain.
NOT INTENDED For very aggressive mountain bike riding. Mountain tandems are most definitely NOT for Downhill, Freeriding, North Shore. Choose terrain with the abilities of both the Tandem's captain and stoker in mind.

Appendix B

The lifespan of your bike and its components

1. Nothing Lasts Forever, Including Your Bike

When the useful life of your bike or its components is over, continued use is hazardous. Every bicycle and its component parts have a finite, limited useful life. The length of that life will vary with the construction and materials used in the frame and components; the maintenance and care the frame and components receive over their life; and the type and amount of use to which the frame and components are subjected. Use in competitive events, trick riding, ramp riding, jumping, aggressive riding, riding on severe terrain, riding in severe climates, riding with heavy loads, commercial activities and other types of non-standard use can dramatically shorten the life of the frame and components. Any one or a combination of these conditions may result in an unpredictable failure.

All aspects of use being identical, lightweight bicycles and their components will usually have a shorter life than heavier bicycles and their components. In selecting a lightweight bicycle or components you are making a tradeoff, favoring the higher performance that comes with lighter weight over longevity. So, If you choose lightweight, high performance equipment, be sure to have it inspected frequently.

You should have your bicycle and its components checked periodically by your dealer for indicators of stress and/or potential failure, including cracks, deformation, corrosion, paint peeling, dents, and any other indicators of potential problems, inappropriate use or abuse. These are important safety checks and very important to help prevent accidents, bodily injury to the rider and shortened product life.

2. Perspective

Today's high-performance bicycles require frequent and careful inspection and service. In this Appendix we try to explain some underlying material science basics and how they relate to your bicycle. We discuss some of the trade-offs made in designing your bicycle and what you can expect from your bicycle; and we provide important, basic guidelines on how to maintain and inspect it. We cannot teach you everything you need to know to properly inspect and service your bicycle; and that is why we repeatedly urge you to take your bicycle to your dealer for professional care and attention.

⚠ WARNING

Frequent inspection of your bike is important to your safety. Follow the "Mechanical safety check" in Section 1.C of this manual before every ride.

Periodic, more detailed inspection of your bicycle is important. How often this more detailed inspection is needed depends upon you.

You, the rider/owner, have control and knowledge of how often you use your bike, how hard you use it and where you use it. Because your dealer cannot track your use, you must take responsibility for periodically bringing your bike to your dealer for inspection and service. Your dealer will help you decide what frequency of inspection and service is appropriate for how and where you use your bike.

For your safety, understanding and communication with your dealer, we urge you to read this Appendix in its entirety. The materials used to make your bike

determine how and how frequently to inspect.
Ignoring this WARNING can lead to frame, fork or other component failure, which can result in serious injury or death.

A. Understanding metals

Steel is the traditional material for building bicycle frames. It has good characteristics, but in high performance bicycles, steel has been largely replaced by aluminum and some titanium. The main factor driving this change is interest by cycling enthusiasts in lighter bicycles.

Properties of Metals

Please understand that there is no simple statement that can be made that characterizes the use of different metals for bicycles. What is true is how the metal chosen is applied is much more important than the material alone. One must look at the way the bike is designed, tested, manufactured, supported along with the characteristics of the metal rather than seeking a simplistic answer.

Metals vary widely in their resistance to corrosion. Steel must be protected or rust will attack it. Aluminum and Titanium quickly develop an oxide film that protects the metal from further corrosion. Both are therefore quite resistant to corrosion. Aluminum is not perfectly corrosion resistant, and particular care must be used where it contacts other metals and galvanic corrosion can occur.

Metals are comparatively ductile. Ductile means bending, buckling and stretching before breaking. Generally speaking, of the common bicycle frame building materials steel is the most ductile, titanium less ductile, followed by aluminum.

Metals vary in density. Density is weight per unit of material. Steel weighs 7.8 g/cm^3 (grams per cubic centimeter), titanium 4.5 g/cm^3, aluminum 2.75 g/cm^3. Contrast these numbers with carbon fiber composite at 1.45 g/cm^3.

Metals are subject to fatigue. With enough cycles of use, at high enough loads, metals will eventually develop cracks that lead to failure. It is very important that you read The basics of metal fatigue below.

Let's say you hit a curb, ditch, rock, car, another cyclist or other object. At any speed above a fast walk, your body will continue to move forward, momentum carrying you over the front of the bike. You cannot and will not stay on the bike, and what happens to the frame, fork and other components is irrelevant to what happens to your body.

What should you expect from your metal frame? It depends on many complex factors, which is why we tell you that crashworthiness cannot be a design criteria. With that important note, we can tell you that if the impact is hard enough the fork or frame may be bent or buckled. On a steel bike, the steel fork may be severely bent and the frame undamaged. Aluminum is less ductile than steel, but you can expect the fork and frame to be bent or buckled. Hit harder and the top tube may be broken in tension and the down tube buckled. Hit harder and the top tube may be broken, the down tube buckled and broken, leaving the head tube and fork separated from the main triangle.

When a metal bike crashes, you will usually see some evidence of this ductility in bent, buckled or folded metal.

It is now common for the main frame to be made of metal and the fork of carbon fiber. See paragraph B, "Understanding composites" below. The relative ductility of metals and the lack of ductility of carbon fiber means that in a crash scenario you can expect some bending or bucking in the metal but none in the carbon. Below some load the carbon fork may be intact even though the frame is damaged. Above some load the carbon fork will be completely broken.

The basics of metal fatigue

Common sense tells us that nothing that is used lasts forever. The more you use something, and the harder you use it, and the worse the conditions you use it in, the shorter its life.

Fatigue is the term used to describe accumulated damage to a part caused by repeated loading. To cause fatigue damage, the load the part receives must be great enough. A crude, often-used example is bending a paper clip back and forth (repeated loading) until it breaks. This simple definition will help you understand that fatigue has nothing to do with time or age. A bicycle in a garage does not fatigue. Fatigue happens only through use.

So what kind of “damage” are we talking about? On a microscopic level, a crack forms in a highly stressed area. As the load is repeatedly applied, the crack grows. At some point the crack becomes visible to the naked eye. Eventually it becomes so large that the part is too weak to carry the load that it could carry without the crack. At that point there can be a complete and immediate failure of the part.

One can design a part that is so strong that fatigue life is nearly infinite. This requires a lot of material and a lot of weight. Any structure that must be light and strong will have a finite fatigue life. Aircraft, race cars, motorcycles all have parts with finite fatigue lives. If you wanted a bicycle with an infinite fatigue life, it would weigh far more than any bicycle sold today. So we all make a tradeoff: the wonderful, lightweight performance we want requires that we inspect the structure.

What to look for

• ONCE A CRACK STARTS IT CAN GROW AND GROW FAST. Think about the crack as forming a pathway to failure. This means that any crack is potentially dangerous and will only become more dangerous.	SIMPLE RULE 1 : If you find crack, replace the part.
• CORROSION SPEEDS DAMAGE. Cracks grow more quickly when they are in a corrosive environment. Think about the corrosive solution as further weakening and extending the crack.	SIMPLE RULE 2 : Clean your bike, lubricate your bike, protect your bike from salt, remove any salt as soon as you can.
• STAINS AND DISCOLORATION CAN OCCUR NEAR A CRACK. Such staining may be a warning sign that a crack exists.	SIMPLE RULE 3 : Inspect and investigate any staining to see if it is associated with a crack.
• SIGNIFICANT SCRATCHES, GOUGES, DENTS OR SCORING CREATE STARTING POINTS FOR CRACKS. Think about the cut surface as a focal point for stress (in fact engineers call such areas “stress risers,” areas where the stress is increased). Perhaps you have seen glass cut? Recall how the glass was scored and then broke on the scored line.	SIMPLE RULE 4 : Do not scratch, gouge or score any surface. If you do, pay frequent attention to this area or replace the part.

• SOME CRACKS (particularly larger ones) MAY MAKE CREAKING NOISE AS YOU RIDE. Think about such a noise as a serious warning signal. Note that a well-maintained bicycle will be very quiet and free of creaks and squeaks.	SIMPLE RULE 5 : Investigate and find the source of any noise. It may not a be a crack, but whatever is causing the noise should be fixed promptly.

In most cases a fatigue crack is not a defect. It is a sign that the part has been worn out, a sign the part has reached the end of its useful life. When your car tires wear down to the point that the tread bars are contacting the road, those tires are not defective. Those tires are worn out and the tread bar says “time for replacement.” When a metal part shows a fatigue crack, it is worn out. The crack says “time for replacement.”

Fatigue Is Not A Perfectly Predictable Science
Fatigue is not a perfectly predictable science, but here are some general factors to help you and your dealer determine how often your bicycle should be inspected. The more you fit the “shorten product life” profile, the more frequent your need to inspect. The more you fit the “lengthen product life” profile, the less frequent your need to inspect.

Factors that shorten product life:
- ***Hard, harsh riding style***
- ***“Hits”, crashes, jumps, other “shots” to the bike***
- ***High mileage***
- ***Higher body weight***
- ***Stronger, more fit, more aggressive rider***
- ***Corrosive environment (wet, salt air, winter road salt, accumulated sweat)***
- ***Presence of abrasive mud, dirt, sand, soil in riding environment***

Factors that lengthen product life:
- ***Smooth, fluid riding style***
- ***No “hits”, crashes, jumps, other “shots” to the bike***
- ***Low mileage***
- ***Lower body weight***
- ***Less aggressive rider***
- ***Non-corrosive environment (dry, salt-free air)***
- ***Clean riding environment***

⚠ WARNING

Do not ride a bicycle or component with any crack, bulge or dent, even a small one. Riding a cracked frame, fork or component could lead to complete failure, with risk of serious injury or death.

B. Understanding composites
All riders must understand a fundamental reality of composites. Composite materials constructed of carbon fibers are strong and light, but when crashed or overloaded, carbon fibers do not bend, they break.

What Are Composites?
The term “composites” refers to the fact that a part or parts are made up of different components or materials. You’ve heard the term “carbon fiber bike.” This really means

“composite bike.”
Carbon fiber composites are typically a strong, light fiber in a matrix of plastic, molded to form a shape. Carbon composites are light relative to metals. Steel weighs 7.8 g/cm^3 (grams per cubic centimeter), titanium 4.5 g/cm^3, aluminum 2.75 g/cm^3. Contrast these numbers with carbon fiber composite at 1.45 g/cm^3.
The composites with the best strength-to-weight ratios are made of carbon fiber in a matrix of epoxy plastic. The epoxy matrix bonds the carbon fibers together, transfers load to other fibers, and provides a smooth outer surface. The carbon fibers are the “skeleton” that carries the load.

Why Are Composites Used?
Unlike metals, which have uniform properties in all directions (engineers call this isotropic), carbon fibers can be placed in specific orientations to optimize the structure for particular loads. The choice of where to place the carbon fibers gives engineers a powerful tool to create strong, light bicycles. Engineers may also orient fibers to suit other goals such as comfort and vibration damping.
Carbon fiber composites are very corrosion resistant, much more so than most metals. Think about carbon fiber or fiberglass boats.
Carbon fiber materials have a very high strength-to-weight ratio.

What Are The Limits Of Composites?
Well designed “composite” or carbon fiber bicycles and components have long fatigue lives, usually better than their metal equivalents.
While fatigue life is an advantage of carbon fiber, you must still regularly inspect your carbon fiber frame, fork, or components.
Carbon fiber composites are not ductile. Once a carbon structure is overloaded, it will not bend; it will break. At and near the break, there will be rough, sharp edges and maybe delamination of carbon fiber or carbon fiber fabric layers. There will be no bending, buckling, or stretching.

If You Hit Something Or Have A Crash, What Can You Expect From Your Carbon Fiber Bike?
Let’s say you hit a curb, ditch, rock, car, other cyclist or other object. At any speed above a fast walk, your body will continue to move forward, the momentum carrying you over the front of the bike. You cannot and will not stay on the bike and what happens to the frame, fork and other components is irrelevant to what happens to your body.
What should you expect from your carbon frame? It depends on many complex factors. But we can tell you that if the impact is hard enough, the fork or frame may be completely broken. Note the significant difference in behavior between carbon and metal. See paragraph 2.A, “Understanding metals” in this Appendix. Even if the carbon frame was twice as strong as a metal frame, once the carbon frame is overloaded it will not bend, it will break completely.

⚠ WARNING

Be aware that high temperature in a confined environment can affect the integrity of composite materials, resulting in component failure which could cause you to lose control and fall.

Inspection of Composite Frame, Fork, and Components

Cracks:
Inspect for cracks, broken, or splintered areas. Any crack is serious. Do not ride any bicycle or component that has a crack of any size.

Delamination:
Delamination is serious damage. Composites are made from layers of fabric. Delamination means that the layers of fabric are no longer bonded together. Do not ride any bicycle or component that has any delamination. These are some delamination clues:

- A cloudy or white area. This kind of area looks different from the ordinary undamaged areas. Undamaged areas will look glassy, shiny, or “deep,” as if one was looking into a clear liquid. Delaminated areas will look opaque and cloudy.
- Bulging or deformed shape. If delamination occurs, the surface shape may change. The surface may have a bump, a bulge, soft spot, or not be smooth and fair.
- A difference in sound when tapping the surface. If you gently tap the surface of an undamaged composite you will hear a consistent sound, usually a hard, sharp sound. If you then tap a delaminated area, you will hear a different sound, usually duller, less sharp.

Unusual Noises:
Either a crack or delamination can cause creaking noises while riding. Think about such a noise as a serious warning signal. A well maintained bicycle will be very quiet and free of creaks and squeaks. Investigate and find the source of any noise. It may not be a crack or delamination, but whatever is causing the noise must be fixed or replaced before riding.

⚠ WARNING

Do not ride a bicycle or component with any delamination or crack. Riding a delaminated or cracked frame, fork or other component could lead to complete failure, with risk of serious injury or death.

C. Understanding components

It is often necessary to remove and disassemble components in order to properly and carefully inspect them. This is a job for a professional bicycle mechanic with the special tools, skills and experience to inspect and service today’s high-tech high-performance bicycles and their components.

Aftermarket “Super Light” components
Think carefully about your rider profile as outlined above. The more you fit the “shorten product life” profile, the more you must question the use of super light components. The more you fit the “lengthen product life” profile, the more likely it is that lighter components may be suitable for you. Discuss your needs and your profile very honestly with your dealer.
Take these choices seriously and understand that you are responsible for the changes.
A useful slogan to discuss with your dealer if you contemplate changing components is “Strong, Light, Cheap — pick two.”

Original Equipment components
Bicycle and component manufacturers tests the fatigue life of the components that are original equipment on your bike. This means that they have met test criteria and have

reasonable fatigue life. It does not mean that the original components will last forever. They won't.

Appendix C

Fastener torque specifications

Correct tightening torque of threaded fasteners is very important to your safety. Always tighten fasteners to the correct torque. In case of a conflict between the instructions in this manual and information provided by a component manufacturer, consult with your dealer or the manufacturer's customer service representative for clarification. Bolts that are too tight can stretch and deform. Bolts that are too loose can move and fatigue. Either mistake can lead to a sudden failure of the bolt.

Always use a correctly calibrated torque wrench to tighten critical fasteners on your bike. Carefully follow the torque wrench manufacturer's instructions on the correct way to set and use the torque wrench for accurate results.

FASTENER RECOMMENDED TORQUE

Item		Tightening torque
WHEELS	FRONT	11 N·m (1.1 kgf·m, 8.1 lb·ft)*
	REAR	14 N·m (1.4 kgf·m, 10 lb·ft)
PEDALS		40 N·m (4.0 kgf·m, 30 lb·ft)
SEAT POST CLAMP		4.5 N·m (0.45 kgf·m, 3.3 lb·ft)
SADDLE CLAMP		9 N·m (0.9 kgf·m, 6.6 lb·ft)
STEERER CLAMP		8 N·m (0.8 kgf·m, 5.9 lb·ft)
HANDLEBAR CLAMP		6 N·m (0.6 kgf·m, 4.4 lb·ft)
CONTROL LEVER CLAMPS		3.0 N·m (0.30 kgf·m, 2.2 lb·ft)

* YDX-MORO Pro

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