



Bear Bones Systems Strategy Chassis User's Manual

This User's Manual contains safety information and instructions for your trailer.

You must read this manual before loading or towing your trailer.

You must follow all safety precautions and instructions.

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Table of Contents

1. STRATEGY CHASSIS INTRODUCTION

2. GENERAL SAFETY INFORMATION

3. THE STRATEGY CHASSIS, THE TOW VEHICLE AND TORQUE

- 3.1. LOAD RATING
- 3.2. C of M C of G
- 3.3. TORQUE

4. TIRE SAFETY

- 4.1. DETERMINING LOAD LIMIT
- 4.2. TIRES
- 5. LOAD DISTRIBUTION

6. STRATEGY CHASSIS FEATURES AND FUNCTIONS

- 6.1. HITCH INSERTS
- 6.2. ARTICULATION JOINT
- 6.3. BOLTED FLANGE JOINT
- 6.4. DROP-IN RECEIVERS
- 6.5. LANDING GEAR
- 6.6. LIFTING/LOWERING MECHANISM
- 6.7. AUXILIARY LIGHT PLUG
- 6.8. AIR ADJUSTABLE SHOCK ABSORBERS
- 6.9. FLAG MOUNT
- 6.10. LICENSE PLATE MOUNT

7. COUPLING AND TOWING TIPS

- 7.1. COUPLING
- 7.2. AVOIDING ROAD HAZARDS
- 7.3. DRIVING BEHAVIOR AND TOWING SPEEDS

8. INSPECTION, SERVICE AND MAINTENANCE

- 8.1. BOLTED FLANGE JOINT AND HITCH INSERT BOLTS
- 8.2. TIRE AND TIRE PRESSURE
- 8.3. LUG NUTS
- 8.4. WHEEL BEARINGS
- 8.5. WELDS AND STRUCTURAL FRAME COMPONENTS

1. STRATEGY CHASSIS INTRODUCTION

Bear Bones Systems is proud to present the Strategy Chassis which is part of the Bear Bones trailer system. It should be obvious to the user that the Bear Bones trailer system is different from a conventional trailer. While its purpose is similar to that of a conventional trailer, the way that it accomplishes that purpose is very different and because of that it is very important for the user to understand those differences and how they influence the use of the trailer and affect the tow vehicle.

Please read and understand the information in this User's Manual to help avoid possible damage, injury or death that could result from failure to follow these instructions and heed these warning.

Throughout this manual the term "trailer" and "chassis" are used somewhat interchangeably but the term "chassis" is generally used when referring to the chassis specifically whereas trailer is generally used when referring to the chassis in use or configured for use.

2. GENERAL SAFETY INFORMATION

This User's Manual cannot cover all of the specific details for the proper combination of every trailer, tow vehicle and hitch receiver. Therefor you must read, understand and follow the instruction given by the tow vehicle and hitch receiver manufacturers as well as the instructions in this manual.

Loss of control of the trailer, trailer load, or tow vehicle can result in damage, serious injury or death. Some common causes that should be avoided are:

- Excessive Speed
- Harsh driving
- Failure to adjust driving behavior for trailer towing.
- Overload, improper loading or improper weight distribution.
- Improper tire pressure.
- Improper torque on lug nuts.

3. THE STRATEGY CHASSIS, THE TOW VEHICLE, LOADING AND TORQUE.

3.1. LOAD RATING

The Standard Strategy Chassis has a load rating of 550lbs and the Strategy Overland Chassis has load rating of 500lbs however the chassis is intended to be used in conjunction with other components to fulfill a specific load carrying capability. The load ratings of the components may not be the same as that of the chassis. It is important to always use the lesser of the load ratings when determining load capacity.

3.2. CENTER OF MASS aka CENTER OF GRAVITY

Center of mass is defined as a single point at which the whole mass of the body or system is imagined to be concentrated and all the applied forces act at that point. In other words, if you were to take the entire mass of a system and compress it down to a single tiny ball and place that compressed mass ball at the point in space where all the force acting on the uncompressed mass are balanced, that location is the center of mass of the system. This becomes an important concept to understand when loading the Bear Bones Trailer System because as a load's center of mass moves farther away from the main chassis frame tube, torque is created and increased in the chassis frame components. This torque can be significantly amplified by harsh driving (quick or jerky maneuvering) uneven road surfaces or large bumps. Excessive torque on the chassis can cause damage or failure of chassis components. In short, your loading strategy should be to keep the heaviest cargo as low and close to the frame as possible and drive in a smooth controlled manner avoiding quick or jerky movements and proceeding slowly through uneven surfaces that cause the vehicle to rock side to side. Torque will also affect the tow vehicle as explained in the next section.

3.3. TORQUE

The Strategy Chassis has a single wheel and is therefore completely dependent upon the tow vehicle for its roll axis stability. It does this by transferring torque that is a result of an unbalanced load or from a lateral force on the chassis through the frame to the hitch receiver of the tow vehicle.

A WARNING

WARNING: This transfer of torque affects the stability of the tow vehicle. The amount of the affect depends on the size and weight of the tow vehicle and the weight and positioning of the trailer load. Smaller or lighter vehicles can experience a significant decrease in stability and should be driven accordingly. This means decreased travel speeds, slower cornering, and smoother maneuvering. As there are unlimited combinations of towing vehicles and trailer loads, it is impossible to address them all in this manual therefore it is the responsibility of the driver of the tow vehicle to determine how the torque from the trailer will affect the stability of the tow vehicle and adjust his/her driving behavior accordingly.

4. TIRE SAFETY

This section of the User's Manual contains tire safety information as required by 49 CFR 575.6

4.1. DETERMINING LOAD LIMIT – Trailer 10,000 GVWR or Less

Tire and loading information can be found on the Tire and Loading Information placard located on the left side of the Strategy Chassis frame tube. See example figure below.



Locate the statement "The weight of cargo should never exceed 272 kg or 600 lbs." on the placard. This figure equals the total maximum cargo weight limit for the Strategy Chassis.

4.2. TIRES

Each trailer tire has various information branded to its sidewall. The Standard tire supplied with the Strategy Chassis have the following information branded to their sidewall. If an upgrade tire option was chosen at time of purchase or the tire has been replaced, there may be different information on the sidewall.

- Tire Size 4.80-12 which means it has a width of 4.8" and a wheel size of 12"
- Tire Identification Number (TIN) which begins DOT.
- Load range C (Max Load 450 kg or 990lbs), cold inflation pressure of 90psi, and Ply Rating (P.R.) of 6.
- Other information includes construction type (Nylon, Tubeless) and brand name.

Trailer Tire Speed Rating- Unless otherwise noted, trailer tires are rated for 65 mph as their maximum speed. Exceeding that speed rating can cause the tire to heat up and fail.

Trailer Tire Pressure Rating- Trailer tires are designed to be inflated to the cold tire pressure branded on their sidewall. Underinflated tires can heat up and fail however the max load rating of the Strategy Chassis is significantly lower than that of the tire so this is unlikely. Reduced air pressure in the tire can reduce jarring impact on rough surfaces for improved ride comfort but should not be reduced enough to result in visible tire deformation with the trailer loaded.

Overloading- Overloading trailer tires can cause premature wear and tire failure however this should never be a possibility with the Strategy Chassis as the load rating of the tire is significantly higher than that of the Strategy Chassis.

Bear Bones Systems recommends replacing the tire on your Strategy Chassis with a tire of like size and ratings to ensure compatibility.

Tire Safety- Everything Rides on It. The National Traffic Safety Administration (NHTSA) has published a brochure (DOT HS 809 361) that discusses all aspects of Tire Safety, as required by CFR 575.6. This brochure can be downloaded from NHTSA free of charge from the following web site:

https://one.nhtsa.gov/cars/rules/TireSafety/ridesonit/tires_index.html

5. LOAD DISTRIBUTION

NOTICE- Unlike typical trailers that have wheels located midway beneath the cargo area, the Strategy Chassis has the wheel located at the very rear of the chassis. As such, more of the load is distributed to the tow vehicle than would be the case with a typical trailer. How much depends on the load and how far forward or back it is carried on the trailer but it is important to understand this difference as it relates to tongue weight and capacity ratings of the tow vehicle and the hitch receiver. An approximate tongue weight can be calculated using the following equation and the illustration below.

Tongue Weight = Chassis Weight + (L1 * Load Cof M)/LT



So if the Length of the trailer is 100in from the axle to the hitch receiver and the loads C of M is positioned 36in from the axle and the load weighs 300lbs then: Tongue Weight = (300lbs * 36in)/100in = 108lbs Then add 40lbs to include the portion of the chassis weight carried by the receiver (which will vary depending on the trailer configuration) and you get an approximate tongue weight of 148lbs.

Alternatively you can roughly estimate the load distribution by figuring that the load C of M placed half way between the axle and receiver will put half of the weight on the receiver and half on the wheel. Placing the load C of M in front of the midpoint or behind the midpoint increases or decreases the tongue weight respectively and the further from the midpoint the greater the load distribution shift.

WARNING

WARNING- It is the responsibility of the user to be aware of the load ratings of the hitch on the tow vehicle and ensure that it is not exceeded by the load of the trailer.

6. STRATEGY CHASSIS FEATURES AND FUNCTIONS

Now that we have some of the important but less interesting information addressed let's move along to the features and functions of the Strategy Chassis from front to back.



6.1. HITCH INSERTS

The Strategy Chassis does not use a ball and socket couple like most trailers, but instead is coupled directly by inserting its hitch insert into the hitch receiver of the tow vehicle. Note: <u>this operation can be made</u> <u>significantly easier by applying a thin coating of grease to the inside of the receiver before inserting the hitch</u>.

There are two different types of hitch insert available for the Strategy Chassis to accommodate either a Class 3 hitch receiver or Classes 1 or 2 hitch receivers. The hitch inserts can be removed and swapped by removing the bolts that attach it to the Articulation Joint Yoke. After mounting a hitch insert, the bolts should be tightened to 58 ft*lbs and checked before and during each use to ensure they haven't loosened up.

WARNING: Never use any kind of hitch adapter or extension with Bear Bones Systems hitch inserts. The hitch insert must be inserted directly into the tow vehicle's hitch receiver.

Class 3 Hitch Insert- The Class 3 hitch insert features a locking wedge that securely locks the hitch insert into the hitch receiver so that there is no free play between them. The locking wedge is engaged by tightening the Wedge Bolt with the included Magnet Wrench or other 9/16" wrench of similar length after the hitch insert has been secured in the hitch receiver with a hitch pin. See illustration



Class 1 and Class 2 Hitch Insert- The Class 1 and 2 hitch insert uses a hitch binder to eliminate free play between the hitch Insert and the hitch receiver. The hitch binder is applied differently depending on the presence of a receiver collar or not. See illustrations below. The hitch binder is shown as transparent in the illustrations to allow a clear view of the position of the binder cross bars relative to the receiver.

The hitch binder should be slipped over the hitch insert prior to the hitch insert being inserted into the hitch receiver. After a hitch is secured with a hitch pin, the hitch binder can be positioned and tightened by hand to bind the hitch insert to the hitch receiver.



Collared Hitch Receiver

Notice the position of the curved edge and the hitch binder cross bars.

Non-Collared Hitch Receiver



Notice the position of the curved edge and the hitch binder cross bars.

NOTICE: Class 1 and Class 2 hitches are typically installed on smaller vehicles. If this is your case, take the warning in Sec. 3.3 very seriously.

6.2. ARTICULATION JOINT

The Articulation Joint is the key component that makes a one wheeled trailer possible. It allows the trailer to pitch and yaw but not roll.

6.3. BOLTED FLANGE JOINT

The Bolted Flanged Joint in the Strategy Chassis frame allows for the addition of Bear Bones Systems accessories such as a Frame Twister, Frame Extension etc. as well as allowing the frame to be broken down for even more compact storage or transport. The bolts should be torqued to 52 ft*lb and checked before and during each use to ensure they haven't loosened up.

6.4. DROP-IN RECEIVERS

There are two Drop-In Receivers in the main frame tube. These are used for mounting the various Drop-Ins offered by Bear Bones Systems to configure the Strategy Chassis for specific load carrying capabilities. Each Drop-In or accessory item has a User's Manual with specific information pertaining to its use and function that should be consulted.

6.5. LANDING GEAR

Along the main chassis tube are mounting holes for the optional landing gear. To mount the landing gear to the chassis, align the rear chassis tube

holes with the holes in the ear lobe of the landing gear bracket and then inserting the short pin thru both. Next the E clip is pressed into the groove of the short pin. Now swing the bracket forward to align the front holes and insert the long pin thru both. The safety pin gets inserted into the hole in the long pin. See illustrations below

NOTICE: THIS BEAR BONES LANDING GEAR IS DESIGNED TO SUPPORT AND STABILIZE AN UNLOADED BEAR BONES TRAILER SYSTEM ONLY. NEVER USE THIS LANDING GEAR TO SUPPORT A LOADED TRAILER. DOING SO COULD CAUSE DAMAGE TO THE LANDING GEAR AND/OR INSTABILITY RESULTING IN A TIP OVER.

The landing gear is attached to the landing gear bracket by aligning the slots while collapsed with the gripper pins of the mounting bracket and spreading the gear so that the slots engage the pins. Removal is done by simply collapsing the gear. There should be enough friction in the pivot joint to keep the landing gear from unintentionally releasing from the bracket. If not, the nuts and bolts at the pivot point should be tightened a bit until there is sufficient friction.





Occasionally there is a need to pivot the landing gear back before attaching or detaching it from the bracket. For example when raising the trailer after storing it directly on the floor or to remove the landing gear when the trailer is coupled to a vehicle with a low hitch receiver. This is done by removing the long (front) pin. See illustration below.



Attaching the landing gear to a chassis that is not coupled to a tow vehicle should be done as a two person operation. One person to lift and stabilize the chassis while the other attaches the landing gear. This should also only be done with the chassis in the lowered position.

6.6. LIFTING/LOWERING MECHANISM

The Lifting/Lowering Mechanism, from here on referred to as simply "lifter", uses a screw actuator to lift and lower the rear of the chassis. It is useful in a variety of different applications and works in conjunction with many of the optional Drop-Ins and accessories. A few examples are: adjusting the ride height of the trailer, adjusting the height of the hitch insert in preparation for insertion into the hitch receiver, and kneeling the trailer for easier loading. The keeper cap is pressed onto the hex to keep it from turning on its own from vibration. The lifter can also be used to put the trailer wheel into a position that allows the chassis to sit directly on the ground if you prefer that option for storage. See illustrations below.



A hand crank is supplied with the Strategy Chassis to drive the actuator. An electric drill motor can be used instead to speed the process but must be done cautiously and slowly as you approach the end of travel of the actuator! I strongly suggest that if you use a drill motor you do so slowly and hold the drill motor with both hands.

A WARNING

WARNING- THE SCREW ACTUATOR FOR THE LIFTING/LOWERING MECHANISM STOPS ABRUPTLY AT THE END OF TRAVEL. SEVERE ARM, HAND AND WRIST INJURY AND ACTUATOR DAMAGE CAN RESULT FROM DRIVING THE SCREW TOO FAST!

6.7. AUXILIARY LIGHT PLUG

The auxiliary light plug is used to connect remotely located lights used when the signal lights of the trailer are obscured by a load.

6.8. AIR ADJUSTABLE SHOCK ABSORBERS

The Strategy Chassis is equipped with two air adjustable shock absorbers that when properly adjusted are very effective at absorbing bumps and vibrations from the road surface. This means far less cargo shaking and a much more pleasant ride for the occupants of the tow vehicle. Both shocks are pressurized simultaneously using the valve stem located between the signal lights at the rear of the chassis. See illustration below



Prior to loading, the shocks should be pressurized with an air pump to well above the expected pressure (but not above 150 psi) and then after the trailer has been loaded, slowly depressurized until the suspension settles a small amount or only a small amount of added force with your hand causes the trailer suspension to compress slightly. You want the suspension running at or near full extension yet soft enough that only a small amount of force will compress them a little. If you feel bumps being transferred to the tow vehicle you most likely have the suspension over pressurized. Remember that adding to or removing from the trailer load may require shock pressure adjustment. Always check and pressurize the shocks before each use as pressure may decrease in the shocks over time. **Notice**: If by chance you forget to pre-pressurize the shocks and you attempt to raise the trailer with the lifter while loaded, you may find that instead of the trailer rising, the shocks compress. If you do not notice the shocks compressing and continue to actuate the lifter, you will eventually displace the S/T/T (Stop/Turn/Tail) light bracket which is magnetically mounted and designed to yield as a safeguard against this mistake. Once the mistake is corrected i.e. the shocks are pressurized, the S/T/T light bracket can be easily repositioned on the magnets.

NOTICE: The maximum unloaded pressure limit in the shocks is 150 psi. Do not exceed 150 psi.

NOTE: If the shocks absorbers feel like they are rebounding without any dampening, decrease the pressure so that you can manually compress the shocks by pressing down on the trailer chassis. Compressing the shocks to near their full travel a few times should recharge the shock cylinders with oil and restore the dampening effect.

Pressurizing the shocks for heavier loads will require a high pressure pump. I suggest having a high pressure tire pump along and conveniently stowed when using the trailer.

6.9. FLAG MOUNT

Because the trailer can be difficult to see when unloaded or when carrying a low profile load, there is a location on the fender frame for mounting a flag holder. A flag can make the trailer visible for backing and visible to high profile vehicles that approach from behind.

6.10. LICENSE PLATE MOUNT

Some states require that all trailers be licensed. For this purpose there is an optional license plate mounting kit that can be installed at the back of the fender.

7. COUPLING AND TOWING TIPS

7.1. COUPLING

As mentioned earlier in this manual, applying a thin coating of grease to the inside of the hitch receiver can avoid some frustration in the coupling process as powder coat and rusty steel don't slide well against each other without it. The sliding surfaces of the hitch insert wedge should also be greased periodically to keep it working properly. If you are using the landing gear discussed in Section 6.5, coupling is a fairly simple one person process. If you are not, it is a fairly simple two person process but should not be done without the assistance of a second person.

Remember that the trailer should always be coupled to a tow vehicle prior to loading it with any cargo.

Coupling with landing gear installed- Position the trailer behind the tow vehicle with the hitch insert roughly aligned with the hitch receiver of the tow vehicle. Using the lifter, raise the hitch insert to an elevation just below that of the hitch receiver. The hitch insert when placed on the edge of the hitch receiver should drop down at some slight angle as depicted in the Illustration below.



With the hitch insert partially inserted in the hitch receiver and tilted down at a slight angle as depicted in the above Illustration, Take the trailer by the handle and in one motion, lift and push the insert into the hitch receiver. Align the pin holes and insert a hitch pin. Lock the hitch insert into the hitch receiver by tightening the wedge bolt with the included magnet wrench or a different wrench of similar size until it is snug. Rocking the trailer while tightening will ensure that the hitch insert is well seated and properly wedged.

Coupling without landing gear- Coupling and moving the trailer around manually without the landing gear requires the help of a second person to stabilize the trailer so that it doesn't tip over which could result in damage or injury. The process of coupling is basically the same except that positioning with the lifter is not necessary and the assistance of a second person is.

When decoupling the trailer, if the wedge does not release after the wedge bolt is loosened, try rocking the trailer. If it still doesn't release,

back the wedge bolt out until there is a gap of about 1/8 inch between the bolt head and the steel plate of the hitch insert and rap on the head of the wedge bolt with a plastic mallet or something that will produce a similar blow without damaging the head of the bolt.

CAUTION: backing the bolt out too far will disengage it from the draw link inside and you will have to fish the bolt around inside there to reconnect it.

7.2. AVOIDING ROAD HAZARDS

When avoiding pot holes or other road hazards it is important to remember that the trailer tracks in the center of the tow vehicle so you need to straddle the hazard to one side or the other of center to avoid hitting it with the trailer wheel.

7.3. DRIVING BEHAVIOR AND TOWING SPEEDS

Because towing The Bear Bones Trailer is a relatively pleasant towing experience, it is easy to forget that you are towing a trailer at all or get complacent and overdrive the trailer. As explained in Section 3, the cargo combined with the characteristics of the tow vehicle will determine the degree to which driving behavior should be modified but in no case should the towing speed exceed 70 mph. Avoid jerky maneuvers, slow down for turns, slow down for bumps and uneven surfaces that cause the tow vehicle to rock side to side like gutters and avoid jerky maneuvers. A good rule of thumb is to drive as if you are towing a trailer loaded with eggs.

8. INSPECTION, SERVICE AND MAINTENANCE

It is important to inspect, maintain and service your trailer regularly to ensure safe and reliable operation. If you cannot or are unsure how to perform the maintenance, any automotive shop should be able to perform it for you.

8.1. BOLTED FLANGE JOINT AND HITCH INSERT BOLTS

Before each use, check the bolts at the bolted flange joint of the chassis frame and at the hitch insert connection for tightness. It is also recommended to check these bolts during use especially if the connection has been disconnected recently as the joint can settle with vibration causing the bolts to require tightening. The torque for these bolts is 58 ft*lbs.

8.2. TIRE AND TIRE PRESSURE

The tire should be inspected periodically for wear or damage. A worn or damaged tire should be replaced. The tire pressure should be checked often as tire pressure can decrease over time.

8.3. LUG NUTS

Inadequate or inappropriate lug nut torque is a major reason that lug nuts loosen in service. Loose lug nuts can lead to a wheel separation with serious safety consequences. Lug nuts are prone to loosen soon after a wheel is mounted to a hub. When driving on a new or remounted wheel, check the lug nut tightness during the first 25-50 miles of use. Recommended torque is 60-65ft*lbs

8.4. WHEEL BEARING

The wheel bearing should be inspected periodically for wear or damage. With the wheel elevated off the ground, first rotate it to see if it rotates quietly and smoothly. Next check for any side to side play. If the wheel is loose or spins with a wobble or does not rotate smoothly, the bearings must be serviced or replaced.

8.5. WELDS AND STRUCTURAL FRAME COMPONENTS

Inspect structural frame components and welds for cracks, deformation, dents or other damage at least once a year. Have any damaged parts repaired or replaced to avoid a structural failure.

Proper care and maintenance of your Strategy Chassis will ensure many years of reliable service.

Happy Trailering.