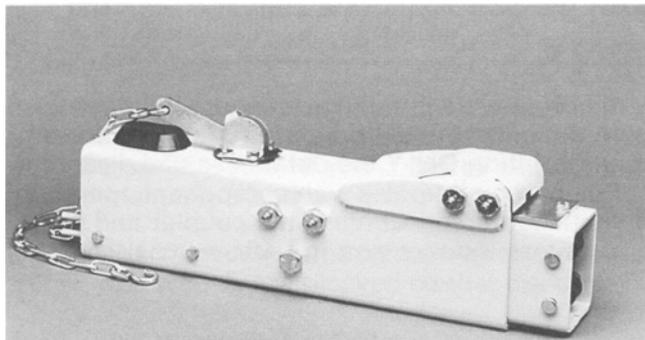


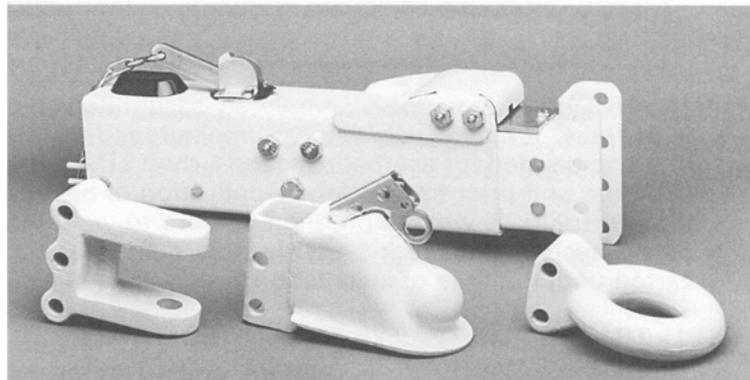
INSTALLATION INSTRUCTION AND SERVICE MANUAL

Actuator/Trailer Dealer – Please provide these instructions to the consumer.
Consumer – Read and follow these instructions. Keep with the trailer for future reference.

TITAN MODEL 20 SURG-O-MATIC ACTUATOR FOR TRAILER BRAKES



1055100



1899100,1811700,1889800,1777800

INTRODUCTION TO SURGE BRAKING

Surge braking is accomplished by replacing a trailer's standard tongue coupler with an actuator and adding hydraulic brake assemblies. The "surge" or "push" of the trailer toward the tow vehicle during deceleration automatically synchronizes these trailer brakes with the tow vehicle brakes. As the trailer pushes against the vehicle, the actuator telescopes together and applies force to its master cylinder, supplying hydraulic pressure to the trailer's brakes.

Surge actuators of this type provide a service life of approximately five years with proper installation, usage, and maintenance. However, a well cared-for actuator can often exceed this estimate. To get the most benefit from your TITAN surge actuator, follow the instructions given in this manual and use common sense in caring for the TITAN Model 20 actuator and your entire trailer brake system.

WARNING:
Do not exceed these ratings.

RATED CAPACITY AND USAGE

MAXIMUM GROSS LOAD is the weight of the trailer fully loaded with all cargo and equipment. To find your trailer's Gross Load, use a commercial vehicle scale at a truck weigh station, grain elevator, etc.

MAXIMUM TONGUE LOAD is the weight applied downwards by the fully loaded trailer's coupler onto the tow vehicle's hitch). Measure your trailer's Tongue Load with the tongue in the horizontal towing position, using either a commercial scale or a bathroom scale if the load is small enough. Upwards tongue loads are not permissible.

Model 20 with:

Fixed Coupler: 20,000 LB Max. Gross Load, 2000 LB Max. Tongue Load Adjustable Clevis Hitch: 20,000 LB Max. Gross Load, 2000 LB Max. Tongue Load Adjustable 2-5/16" Ball: 12,000 LB Max. Gross Load, 1200 LB Max. Tongue Load Adjustable 3" Lunette Eye: 12,000 LB Max. Gross Load, 1200 LB Max. Tongue Load

Recommended Use: For heavy or frequent-use applications, and for trailers pulled by trucks larger than standard pickups. Typical uses include but are not limited to industrial equipment trailers, agricultural spreaders, tank trailers and wagons, utility reel and pole trailers, and military ground support equipment.

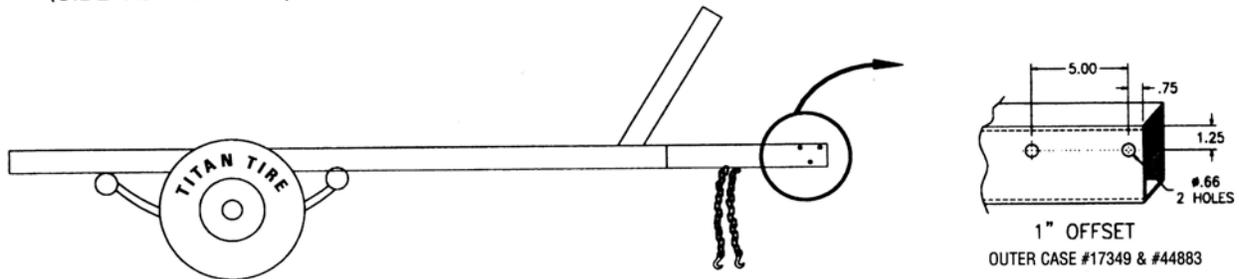
WARNING:

DO NOT submerge the actuator. Internal corrosion may result and cause brake failure. Salt water, granular fertilizers, and other corrosive materials are destructive to metal. To minimize the damaging effect of corrosion on a braking system used under corrosive conditions, we recommend that the actuator be externally flushed after use with a high pressure water hose. Be sure to lubricate all moving parts after the unit has dried. Whenever the unit will be out of service for an extended period of time, or after hard use, remove the brake drums and clean inside the brakes. Pack wheel bearings with grease before the drum is installed. Failure to properly and adequately grease and maintain the actuator could weaken it and/or cause it to fail and result in serious injury and/or property damage.

INSTALLATION *

1. The MODEL 20 Actuator is completely assembled and ready to bolt or weld into place onto straight three inch wide trailer tongues. Welding will make repair or replacement difficult but may be preferred. If the actuator must be painted for aesthetic reasons, then TITAN recommends painting ONLY the outer case and disassembling the unit prior to painting. Application of heavy coats of paint may interfere with component operation. If the actuator is welded on, then be sure to weld in a well ventilated area. Confirm the coupler and breakaway mechanisms work properly before operation. Store actuators indoors and in their original shipping carton until the time of installation.

**FIG.1 - TRAILER AND TRAILER TONGUE BOLT PATTERN
(SIDE VIEW SHOWN)**



2. For bolt on applications, bolt the actuator to the tongue using two 5/8 inch by 4 inch grade 5 or better bolts, nuts, and lock washers if using outer case #17349 .or #44883 <1>. Figure 1 shows the standard mounting patterns used on three inch wide trailer tongues. Light weight tongues require spacer tubes inside for reinforcement when bolting. Using a torque wrench, tighten mounting bolts to eighty (80) foot-pounds torque.

3. Install the hydraulic brakes and brake lines on the trailer as described in the installation manual supplied with the brakes. TITAN recommends 3/16 inch brazed double wall tubing per S.A.E. J527 for use with all our actuator and brake products. Use forty-five degree (45°) double-flare tube ends per S.A.E. J533. **DO NOT** remove or modify the orifice connector <42> at the rear of your actuator's master cylinder. It connects directly to the brake tubing and ensures proper fluid flow characteristics. **FLEXIBLE BRAKE LINE HOSE MUST BE USED** to connect the orifice connector at the master cylinder to the hydraulic brake line on the trailer. This is necessary because the master cylinder is spring mounted to provide overload protection and thus moves relative to the outer case.

4. After installation of the actuator, brake, and brake lines as described above, proceed immediately to the "BRAKE FLUID FILLING AND BLEEDING" instructions.

WARNING:

Failure to complete the **BRAKE FLUID FILLING AND BLEEDING** procedures promptly after installation may result in internal master cylinder corrosion and cause brake failure.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

BRAKE FLUID FILLING AND BLEEDING

1. After completing the "INSTALLATION" instructions, remove the master cylinder's cap and fill the reservoir to three-quarters full with DOT-3 or DOT 4 brake fluid. DO NOT allow brake fluid to contact painted surfaces since it will damage the finish. Wipe up any spills immediately and wash the area with water.

WARNING:

Use only fresh brake fluid from a sealed container. DO NOT reuse fluid. After filling and bleeding, remember to refill the actuator. Failure to maintain an adequate fluid level may cause brake failure.

2. Bleed the brake system either manually or with a pressure bleeder. Pressure bleeding equipment simplifies the process, and is available at your local automotive supply store. Use the instructions provided with the pressure bleeder. If you chose to manually bleed the system, an assistant is required. Use the following steps to manually bleed the brake system:
 - A. Disconnect the trailer from the tow vehicle and jack the trailer's tongue until it is horizontal. Make sure that the wheels are blocked so that the trailer will not roll away.
 - B. Fill the master cylinder with fluid as described above. loosen the four break-away mounting bolts <27> enough to keep the break-away locks <32 & 33> from restricting the lever motion. Rotate the break-away lever <30> forward using small strokes until the bubbling stops inside the master cylinder.
 - C. Install a bleeder hose on the bleeder screw of the farthest wheel cylinder from the actuator. If the trailer has tandem axles, bleed the rear axle first. Submerge the other end of the hose in a glass container of brake fluid, so that air bubbles can be observed.
 - D. Open the bleeder screw and have your assistant stroke (but not release) the break-away lever. Brake fluid and/or air bubbles will flow into the jar. Close the bleeder screw. The helper can then allow the break-away lever to return to its rest position.
 - E. Repeat the process until no more bubbles are released with the stroke. Air trapped in the brake lines will greatly reduce your braking efficiency. Be sure to close the bleeder screw securely when the cylinder is fully bled.
 - F. Repeat the bleeding operation at each wheel cylinder. During the bleeding process, replenish the master cylinder reservoir with fresh brake fluid so that the level does not fall below half full. This will ensure that no air is drawn into the system.
3. After all brakes have been bled, refill the master cylinder reservoir to three-quarters full before operating. Retighten the four bolts <27> using a torque wrench to 90-120 inch-pounds of torque. Screw the filler cap back into position and replace the cylinder cover <23>. The filler cap only needs to be finger tight.

TESTING TITAN SURGE BRAKE SYSTEMS

Hydraulic surge actuator systems provide automatic and smooth trailer braking without special application by the tow vehicle driver. While this is extremely convenient it can sometimes be difficult to determine if the surge setup is functioning properly. The following steps provide a quick field-test to confirm that the trailer brake system is operational.

WARNING:

It should be noted that the field-test procedure indicates only if the trailer brake system is functional, but DOES NOT provide information on how efficiently it will operate. Regular inspection, maintenance, and adjustment of all brake system components (including the surge actuator, tubing, hoses, brake clusters, drums, and associated hardware/support structure) are still required to ensure maximum brake performance and smooth, even brake operation.

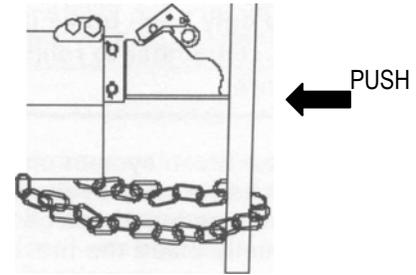
1. Move the trailer to flat, level ground, pulling **FORWARD** several feet before parking. This forward motion will ensure trailers equipped with free-backing brakes are in their normal operating mode. Disconnect the trailer from the tow vehicle and jack up the trailer's tongue until it is horizontal.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

2. Hook the trailer's safety chains (NOT the actuator's break-away cable/chain) together to form a loop, which is centered below the actuator's coupler as shown in Figure 2.

3. Place a sturdy board, such as a 2 inch by 4 inch piece of lumber, into the chain loop below the coupler. The board should be 4 feet or longer so it will extend several feet above the actuator. Keep the end of the board a few inches off the ground, and position it to press against the front end of the actuator's coupler. Press the board towards the rear of the trailer.

FIG. 2 - TESTING SURGE BRAKE



4. Keep pressing the top of the board to stroke the actuator and its internal master cylinder. If the trailer brake system is operational, the brakes will apply and keep the trailer from rolling away from you. Properly adjusted uni-servo or duo-servo type brakes will prevent you from moving the trailer back more than a few inches. Free-backing type brakes will initially provide rolling resistance, but continued force on the board will switch them into free-backing mode, and you'll be able to move the trailer backwards.

5. If you have uni-servo or duo-servo brakes, and stroking the actuator (as described above) causes the trailer to roll away from you freely or with only minimal resistance, the brakes are NOT applying properly. If you have free-backing brakes and stroking the actuator (as described above) causes the trailer to roll away without initial resistance, then the brakes are NOT applying properly. The brake system MUST be evaluated to determine the cause of the problem and corrective action MUST be taken before the trailer is used.

Use this procedure each time you tow your trailer to check your surge brake system operation.

HITCHING TRAILER

1. Confirm the towing hitch and ball have a rating equal to or greater than the trailer G.V.W.R. and are properly. At and securely attached to the tow vehicle. The hitch MUST be installed so the trailer tongue is level (horizontal) when coupled to the tow vehicle.

WARNING:
To ensure proper engagement of the actuator's coupler to the tow ball, DO NOT use a multipiece ball, an incorrectly sized ball, or a worn/damaged ball.

2. To hitch the 2-5/16 inch coupler to the tow vehicle, perform the following procedure. Open the coupler by lifting the handle assembly's lock trigger so it unhooks from the locked position, and then by swinging the top of the handle toward the rear of the actuator. Lower the coupler onto the ball confirming that the ball is fully seated in the coupler socket. Swing the handle back forward until the lock trigger hooks into the locked position to secure the ball. Check that the ball has been trapped in the coupler socket. A properly adjusted coupler will have between 1/64 inch and 1/32 inch of free play between the ball and ball socket. Do not tow the trailer if the coupler is damaged.

3. Check that the actuator's coupler, lunette eye, or clevis is securely attached to the tow vehicle by extending the trailer's tongue jack to the ground. Use it to lift the trailer tongue and tow vehicle hitch two to four inches. The actuator and hitch should remain engaged. DO NOT tow the trailer unless the actuator is securely connected to the tow vehicle. Retract the trailer tongue jack before towing.

WARNING:
The break-away system is not designed to operate if the trailer does not separate completely from the tow vehicle, or if the trailer tongue "submarines" and goes beneath the tow vehicle. DO NOT use the break-away system as a parking brake.

4. The 2-5/16 ball coupler mechanism may be further secured by performing the following steps. With the handle in the locked (down) position, insert either a standard padlock or spring pin through the hole in the

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

side of the handle assembly. This will lock the handle in the down position and further prevent the handle ball latch assembly from swinging upward and opening. Do not use padlocks or pins which interfere with the telescoping action of the actuator and thereby compromise braking performance.

To uncouple the trailer, first block the wheels to keep the trailer from rolling. Lift the actuator handle fully to allow the ball latch to rotate. Lift the trailer tongue off the tow ball using a tongue jack if necessary.

WARNING:

The trailer safety chains' length MUST be set short enough so the actuator's break-away cable is NOT pulled if the coupler separates from the tow vehicle's hitch but remains connected by the safety chains. The break-away system should only be activated after BOTH the trailer's coupler AND safety chains have failed and allowed the trailer to completely separate from the tow vehicle. Provide just enough slack in the trailer safety chains to allow tight turns. The chains should not drag on the ground. Safety chains must be used. When towing, AVOID sharp turns which can cause the actuator to bind against the tow vehicle. This can damage the actuator and trailer, causing brake failure. AVOID towing across severe bumps or dips which may cause the tow hitch to lever against the actuator/coupler and compromise the connection.

6. As shown in Figure 3, your tow vehicle's hitch provides a safety chain hole or ring on each side. Consult your trailer manufacturer for proper safety chain recommendations. Attach your trailer's safety chains securely to these connection points, being sure to cross the chains UNDER the trailer tongue. Safety chains MUST be used. This will prevent the trailer tongue from dropping to the road if the coupler separates from the tow vehicle's hitch. If your tow vehicle's hitch does not provide safety chain connection points, have appropriate ones added by a reputable hitch installer.

- 7. Attach the actuator's break-away chain S-hook securely to one of the tow vehicle hitch's safety chain connection points. Confirm that the trailer's safety chains are adjusted relative to the actuator's breakaway chain as noted above. DO NOT loop the breakaway chain around a bracket and hook it back onto itself.
- 8. Before towing, check that the break-away lever and chain are properly positioned as shown in Figure 4. If the break-away lever and chain are not located correctly as described above, due to either the cable being pulled during use or by accident, it MUST be reset prior to the trailer being moved.
- 9. Resetting is accomplished by first removing the two rearward bolts <27>, one located on each side of the breakaway lever <30>. These two bolts hold down the break-away locks <32 & 33>. Loosen, but do not remove the two remaining bolts <27>. This will allow the two locks to be swung aside and the lever can be pushed back into its resting position. Replace the break-away locks to their original positions and retighten the four bolts using a torque wrench to 90120 inch-pounds of torque.

FIG.3 - SAFETY CHAIN ATTACHMENT (TOP VIEW SHOWN)

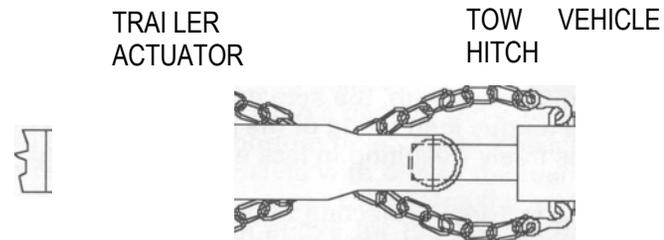
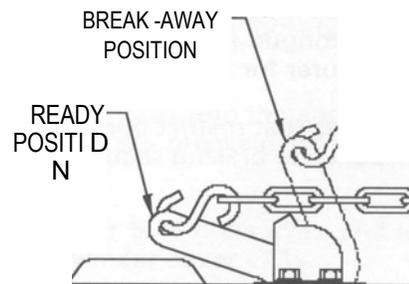


FIG.4 - BREAK-AWAY LEVER AND CABLE POSITION



WARNING:

The hydraulic pressure held in the system may cause the lever to snap back quickly. Keep hands and fingers clear as you reset the break-away mechanism.

10. Using TITAN Actuators with Weight Distributing Hitches

Weight distributing (equalizing) hitches have been an important part of trailering for many years., They shift excess tongue weight from the end of the tow vehicle by distributing it across all vehicle and trailer axles. Leveling the tow vehicle and the trailer reduces the stress on the suspension components and increases towing stability.

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

All TITAN surge brake actuators are fully compatible with equalizing hitches. When using weight distributing hitches with TITAN actuators, observe the following rules:

- 1) Allow six to eight inches of free chain length,
- 2) The chains must be vertical (straight up and down) under pulling load, and
- 3) Tongue weight beyond the specified actuator rating WILL interfere with brake performance.

This statement summarizes TITAN's three "rules of thumb" for equalizer/actuator compatibility. Each rule contributes to optimum trailer braking.

RULE #1: Allow six to eight inches of free chain length. This means that the equalizer's chains must be at least six to eight inches long between the spring bars and the hook-up brackets (which attach the chains to the trailer). Surge brake actuators must be free to compress their internal master cylinder. Shorter lengths of chain will limit the distance the actuator can move, and this restricts the unit's braking.

RULE #2: The chains must be vertical (straight up and down) under pulling load. During towing, these chains must be aligned straight up and down. This should be confirmed on level ground with the trailer coupled (using the equalizing hitch) to the tow vehicle. After checking that the actuator is in its towing position (not compressed), adjust the position of the hook-up brackets on the trailer until the chains are vertical. If the chains are angled forward or back on the TITAN actuator, they have a tendency to either impede the braking action by limiting the distance the actuator can stroke or prematurely apply the brakes by pulling the trailer forward relative to the tow vehicle.

RULE #3: Tongue weight beyond the specified actuator rating WILL interfere with brake performance. Weight distributing hitches spread tongue weight over the axles of both the tow vehicle and the trailer by applying leverage against the trailer tongue and actuator/coupler. This additional force and torque on the trailer system approximately doubles the load on the actuator, potentially exceeding its load rating.

For example, a fully-loaded trailer with a hitched tongue weight of 350 pounds might be equipped with a TITAN Model 20 actuator. A weight distributing hitch would then cause the actuator to receive the equivalent of a 700 pound tongue load. Since 700 pounds is less than the TITAN Model 20 actuator's tongue load rating, this set-up would be acceptable. If a similar trailer has a 1100 pound tongue weight, and once again an equalizer is hooked up, the actuator would perceive a 2200 pound tongue load. That would put the system above

the tongue load rating of the actuator. Since the excess tongue load on a surge actuator can cause it to stroke less freely (resulting in less effective braking), this would be an inappropriate set-up.

Two factors in selecting towing equipment are gross trailer weight (GTW) and tongue load (TL). GTW is the weight of the trailer fully loaded in its actual towing condition. This can be measured by placing the fully loaded trailer on a vehicle scale. TL is the downward force exerted on the trailer hitch ball by the trailer coupler. In most cases it is 10% to 15% of the GTW.

11. Sway control devices that restrict operation of the actuator CANNOT be used. The actuator MUST be free to telescope in response to braking requirements.

MAINTENANCE

1. Before each towing, perform the following steps:

- Check that the brake fluid reservoir is three-quarters full of DOT-3 or DOT-4 brake fluid. Check for leaks and repair as required.
- Examine the actuator for wear, bent parts, corroded/seized parts, or other damage. Have the affected components replaced with genuine TITAN service parts. Check to determine that the actuator mounting bolts (where applicable) are tightened to eighty (80) foot-pounds torque using a torque wrench.
- Test the actuator and brake function as described in the "TESTING TITAN SURGE BRAKE SYSTEMS" section

of this manual. Actuator travel over one inch indicates that the brakes need adjustment (or that the actuator has been structurally damaged). Actuator travel is the distance the coupler case assembly moves relative

*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual.

to the outer case <1> during braking. Adjust the brakes following the instructions given in the brake installation manual. In general, back off adjusters ten clicks from locked drum rotation. Adjust free-backing brakes by rotating in the forward direction only. Failure to adjust brakes will result in loss of braking.

2. A film of clean grease on the ball will minimize squeaking. Wipe the ball clean and renew film each time the trailer is used.
3. Before storage or after extended use, TITAN recommends applying motor oil to the coupler components and the internal rollers to keep them moving freely and to prevent corrosion. Also apply grease to the front roller <4> via the zerk fitting <8>. Grease every 5000 miles or 90 days of use.

MODEL 20 ASSEMBLY

WARNING:

An incorrect lever or chain position may cause the trailer brakes to drag and overheat, or may keep the brakes from being applied in a break-away situation. After any usage of the break-away mechanism, either real or accidental, check all system components (lever, chain, S-hooks, spring, push rod assembly, etc.) for damage. Replace any damaged items with genuine TITAN service parts.

1. Over time, you may need to disassemble your TITAN Model 20 for service or to replace components. Use the following steps to put the actuator back together, checking this manual's assembly diagram and parts list for reference.
2. With the actuator completely disassembled, place the front roller cover <9> into position. Hold the front roller <4> from the bottom, lining up the holes and thread the front roller bolt <5> through the cover and roller into place. Secure bolt <5> with lock washer <7> and nut <6>. Repeat for rear roller. Tighten nuts to 75 ft-lbs.
3. Place the centering plate on the inner slide <2> and secure in place with two 5/16 bolts <27> and lockwashers <41>. Reach through from the rear of the inner slide with the damper <17>. Using a damper pin <18>, secure the small end into the top hole. Repeat this with the second damper in the bottom hole. Insert a spacer tube <15> into the top slot of the inner slide. Reach in from the rear of the inner slide with one of the rear rollers <10> (chamfered edge out) and thread it onto the spacer tube. Next on the spacer tube place the end of the damper, and finally the other rear roller (chamfered edge out). Repeat the above for the bottom damper. Insert the third and final spacer tube <15> into the top slot of the inner slide. Reach in from the rear of the inner slide with one of the rear rollers <10> (chamfered edge out) and thread it onto the spacer tube. Next on the spacer tube place a spacer <13>, then the final roller (chamfered edge out). Carefully insert the inner slide <2> into the outer case <1> so as not to dislodge the spacer tube assemblies. Insert a rear roller bolt <47> into the front top spacer tube and loosely secure the bolt with a castle nut <12>. Repeat the above for the bottom spacer tube. Thread the final top bolt <11> through the final spacer tube and loosely secure. Run down the castle nuts on the three bolts and secure with cotter pins <16>.
4. Next assemble the breakaway. Place the breakaway lever assembly <30> into the appropriate hole. Position the weather seal <31> on top of it. Attach the left <33> and right <32> breakaway locks next using the 5/16 bolts <27> and lockwashers <41>.
5. Finally slide the master cylinder into place. Secure it with the four 5/16 bolts <21> and lockwashers <22>. Screw the cap onto the master cylinder, and finally, replace the cylinder cover <23>.
6. The actuator should now be fully assembled and ready for installation as described in this manual.

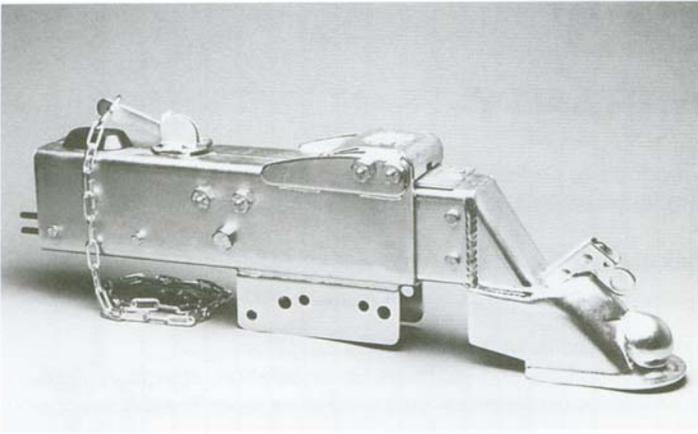
*NOTE: <#> Is the reference number shown in the assembly diagram of the actuator located at the end of this manual

MODEL 20 ACTUATOR PARTS LIST

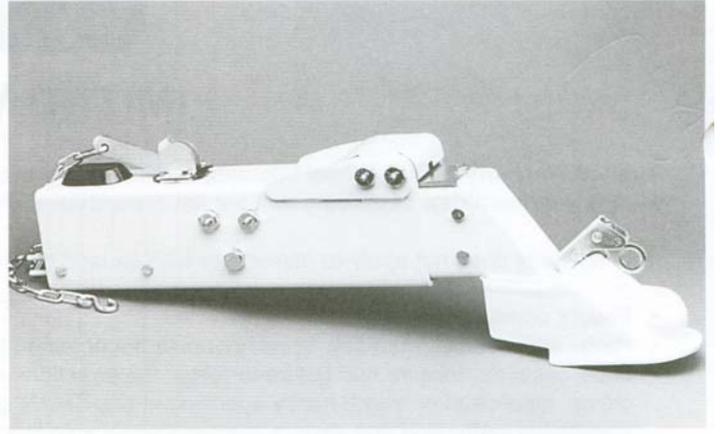
KEY NO.	PART NO.	DESCRIPTION	MODEL 20 ACTUATOR ASSEMBLY PART NUMBERS										
			1055100	1297400	1521000	1734700	1735100	1777800	1811700	1889800	1899100	4042700	4053400
			QUANTITY REQUIRED PER ASSEMBLY NUMBER										
36	1297600	Inner Slide - 3" Lunette Eye		1									
37	1058200317	Inner Slide - Leveler Channel						1	1	1	1		
38	1807800	Clevis Hitch - For 1" Pin							1				
39	0909300	Bolt 5/8 X 4 1/4 NC, Grade 5						2	3	2			
40	1040500	Locknut 5/8 NC						2	3	2			
41	0793800	Lockwasher 5/16 STD	6	6	6	6	6	6	6	6	6	6	6
42	1209900	Orifice Connector	1	1	1	1	1	1	1	1	1	1	1
43	0774500	Gasket	1	1	1	1	1	1	1	1	1	1	1
44	1278800	Inner Slide - 2 5/16" Coupler			1								
44	4488400	Inner Slide - 2 5/16" Coupler, Plated											1
45	1882000	Adjustable Ball Coupler - 2 5/16"								1			
46	1613700	Lunette Eye - 3" Adjustable						1					
47	0829500	Bolt 5/8 X 5 NF, Grade 5	1	1	1	1	1	1	1	1	1	1	1
	1018700	1 1/4" Master Cylinder Repair Kit	1	1	1	1	1	1	1	1	1	1	1
	1848700	2 5/16" Ball Coupler Repair Kit	1	1	1	1	1	1	1	1	1	1	1
	4750400	Backup Valve Kit											
	2374600	Drum Brake Master Cylinder Assembly complete w/brackets											
	2374601	Drum Brake Master Cylinder Assembly complete w/brackets, painted black											
	4749500	Disc Brake Master Cylinder Assembly complete w/brackets											
	4749501042	Disc Brake Master Cylinder Assembly complete w/brackets, painted black											

DISC BRAKE	DRUM BRAKE	DESCRIPTION
4749700	1055100	No hitch
	1297400	3" lunette eye
4750500	1521000	2 5/16" coupler
	1734700	2 5/16" drop coupler w/mounting channel
	1735100	2 5/16" drop coupler
4750100	1777800	Adjustable leveler channel w/lunette eye
4749900	1811700	Adjustable leveler channel w/clevis hitch, 1" pin
4750000	1889800	Adjustable leveler channel w/2 5/16" coupler
4749800	1899100	Adjustable leveler channel
4750700	4042700	2 5/16" drop coupler, plated, w/mtg channel
	4053400	2 5/16" coupler, plated, w/mtg channel

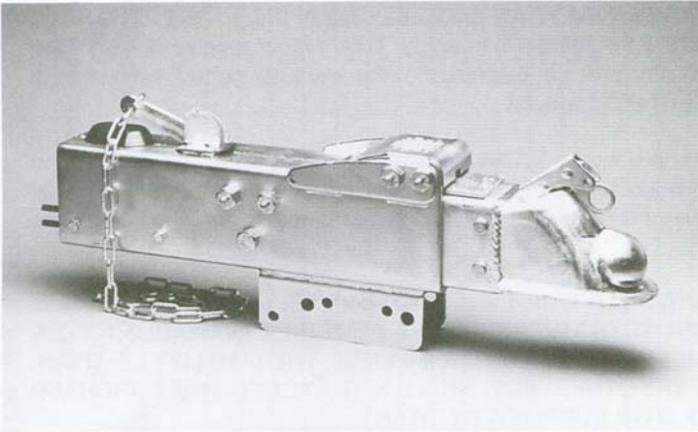
MODEL 20 ACTUATOR PRODUCT LIST



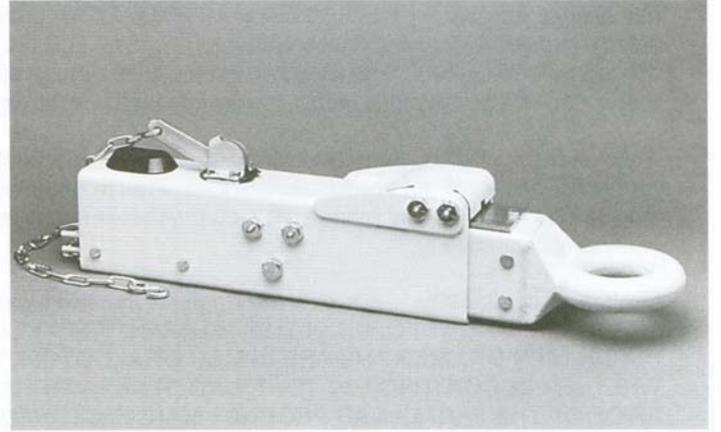
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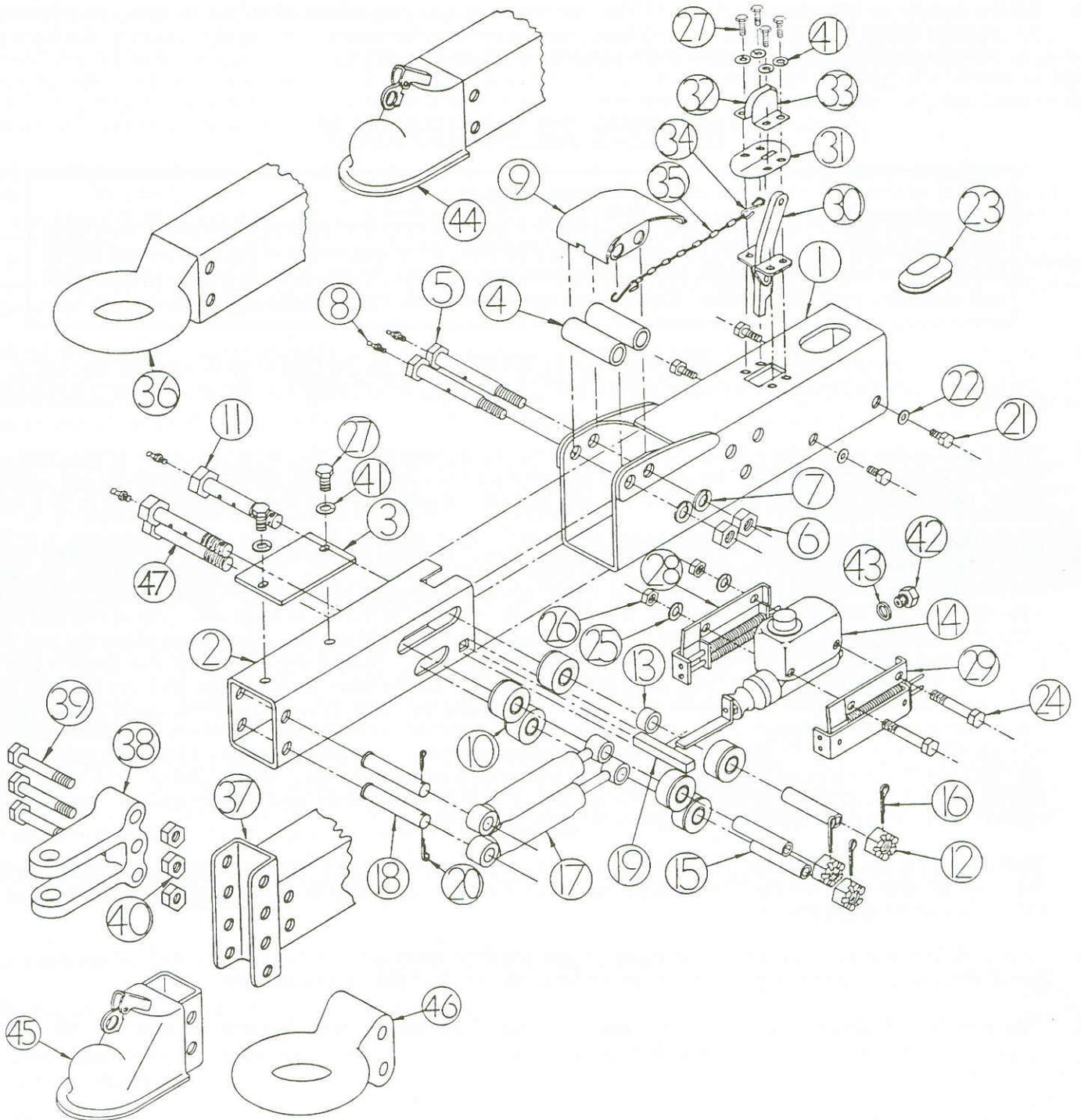


4053400



1297400

MODEL 20 ACTUATOR PARTS DIAGRAM



TITAN LIMITED WARRANTY

Limited Warranty Titan Wheel International (Titan) warrants its products to be free from defects in material and workmanship for one year from date of delivery to the original purchaser when properly installed, used and maintained by the purchaser.

This warranty does not apply to damage or loss caused by any or all of the following circumstances or conditions:

- . Freight damage.
- . Parts, accessories, materials or components not obtained from or approved in writing by TITAN.
- . Misapplication, misuse and failure to follow the directions or observe cautions and warnings on installation, operation, applies
caution, inspection or maintenance specified in any TITAN quotation, acknowledgement, sales literature, specification sheet or installation instruction and service manual ("applicable literature").

If any TITAN products are found upon TITAN's examination to have been defective when supplied, TITAN will either: credit the purchaser's account for the purchase price of the TITAN product; replace the TITAN product; or repair the product. TITAN has sole discretion in choosing which option to provide. For this LIMITED WARRANTY to apply, TITAN must receive notice of the alleged defect within 30 days of either the discovery of the alleged defect or the expiration of the warranty period, whichever is earlier. Any claim not made within this period shall conclusively be deemed waived.

If requested by TITAN, purchaser shall return the alleged defective product to TITAN for examination at TITAN's direction and expense. TITAN will not pay for expenses incurred in returning a product to TITAN without TITAN's prior written authority. TITAN shall not be liable for any other expenses purchaser incurs to remedy any defect. Purchasers waive subrogation on all claims under any insurance.

Limitation of Liability It is expressly agreed that the liability of TITAN is limited and TITAN does not function as an insurer. THE REMEDIES SET FORTH IN THIS WARRANTY SHALL CONSTITUTE THE EXCLUSIVE REMEDIES AVAILABLE TO THE PURCHASER OR USER AND ARE IN LIEU OF ALL OTHER REMEDIES, EXPRESS OR IMPLIED. THE LIABILITY OF TITAN, WHETHER IN CONTRACT, IN TORT, UNDER ANY WARRANTY OR OTHERWISE, SHALL NOT EXCEED THE PURCHASE PRICE OF THE PARTICULAR PRODUCT MANUFACTURED, SOLD OR SUPPLIED BY TITAN.

To Obtain Technical Assistance To enable TITAN to respond to a request for assistance or evaluation of customer or user operating difficulty, please provide at a minimum the following information by calling 1-800-247-1781 or within Iowa 1-515-265-9200:

- . Model number, serial number and all other data on the specific component which appears to be involved in the difficulty.
- . The date and from whom you purchased your TITAN product.
- . State your difficulty, Being sure to mention at least the following: Application, Nature of load involved, and Weight of the load.

Field Service If field service at the request of the purchaser is rendered and the difficulty is found not to be with TITAN's product, the purchaser shall pay the time and expense (at the prevailing rate at the time of service) of seller's field representative(s). Charges for service, labor and other expenses that have been incurred by the purchaser, its customer or agent without prior written authorization of TITAN will not be accepted.

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