S&S POWER, INC.
350 West 2500 North γ Logan, Utah 84341
USA
Phone: (435) 752-1987 γ Fax: (435) 752-

SERVICE BULLETIN No. 02.03.01-Ace Shock

DATE: March 22, 2002

TO: Owners and Operators of Turbo Drop™ Rides and Turbo Drop™/Space Shot™ Combination Rides

ATTN: Park Management and Maintenance Management

FROM: Scott Holliday, Service Department Manager

SUBJECT: Ride Safety Alert

On March 14, 2002, an incident occurred on an S & S Combo Ride at an amusement park in the U.S. While the ride was in operation, a snap ring failed in a shock absorber at the top of the tower. This failure allowed the internal components of the shock to fall to the ground. There were no injuries as a result of this part failure.

S & S currently has 40 such rides in operation throughout the world using this same model shock with no incident or any failure. Some of these rides have been in operation in excess of four years. While we believe this to be an isolated incident that occurred as a result of a manufacturer's defect with one shock, we have designed a retainer that prevent the internal parts of the shock from falling to the ground should a snap ring ever fail.

The enclosed kit must be installed on all S & S Turbo Drop and Combo Rides prior to your next opening. Enclosed with the kit are easy-to-follow instructions for installation.

Should you have any questions, please phone the S & S Power, Inc. Service Department at (435) 752-1987.

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SERVICE BULLETIN No. 02.11.05

DATE: October 28, 2002

TO: Owners and Operators of Space Shots, Turbo Drops, Double Shots, Turbo Drop/Space Shot Combinations

ATTN: Maintenance Personnel

FROM: Service & Installation Department

SUBJECT: Wire Rope Maintenance

It has come to our attention there has been some confusion concerning service bulletin No. 02.01.1

We would like to clarify the cable retirement criteria for all wire ropes used on S & S tower rides.

1) Annual Criteria: The wire ropes will be retired on an annual basis.
2) Cycle Criteria: If a wire rope exceeds the cycle retirement criteria (contained in bulletin No. 02.01.1) before the annual retirement criteria, it must be retired.
3) Wear Criteria: The wire rope must be retired if any anomaly is noted.

Please be advised that S & S is still working hard to find and test wire ropes that will give you our customers a better service life.

Please implement the following **"Wire Rope Retirement Criteria"** and insert these instructions into your Ride Maintenance handbook.

These instructions supercede any previous instructions!!!

Wire Rope Retirement Criteria:
August 10, 2001(Revised October 28, 2002)

1- **Annual retirement** - All wire rope should be retired on an annual.

2- **Cycles retirement** - All wire rope must be retired if the total number of cycles for that wire rope meets the numbers listed below before the annual retirement criteria.

Ride cycle cable retirement criteria:

a.	**19 x 7**	**30,000 cycles**
b.	**FLEX-X 19 X 7**	**50,000 cycles**
c.	**FLEX-X 19 X 19**	**50,000 cycles**
d.	**FLEX-X 6 X 26**	**50,000 cycles**

3- **Wear retirement** – The wire rope must be retired if any anomaly is noted.

a. All wire ropes should be inspected on a daily basis. This is accomplished with a visual inspection of the cable. The maintenance technician will inspect the upper cable by sighting up the cable. If any broken strand or rope abnormality is noted, the rope will be retired. The lower rope can be inspected by using maintenance mode or (elevator mode for 2001 models and later). The passenger vehicle can then be raised slowly. As the vehicle is moving up, the lower rope can be inspected for any broken wires or abnormalities.

b. The majority of the wear on the wire rope will occur between the outer strands and the inner wire core. Therefore, it is very important to perform a thorough tactile inspection of each cable on a monthly basis.

NOTE: THE TACTILE INSPECTION SHOULD BE DONE WITH NO TENSION ON THE WIRE ROPE.

c. The following is a list of steps to accomplish a tactile inspection:

- Remove the tension on the wire rope loop by loosening the turnbuckle.
- Retighten the turnbuckle jam nuts after loosening the turnbuckles to prevent the wire ropes from rotating and possibly separating during the inspection process.
- Remove the shear pin.
- Remove the upper and lower cable seals. Removing the seals will allow the piston to move freely in the cylinder without causing compression or vacuum.

LOWER WIRE ROPE INSPECTION:

1) Standing at the base of the tower, one maintenance technician will hold a cloth lightly on the lower wire rope.
2) A second technician will slowly pull up on the upper wire rope.
3) The inspecting technician will note any lower wire rope anomalies by both visual and tactile means.

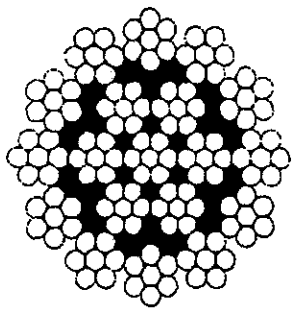
When the lower wire rope inspection is complete, the piston will be positioned at the bottom of the cylinder and the turnbuckle will be at the top of the tower. A piston inspection could also be performed at this time.

UPPER WIRE ROPE INSPECTION:

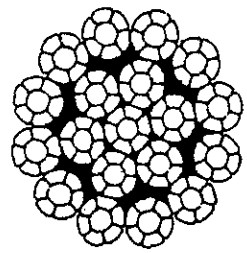
1) The inspecting technician will need to be at the top of the tower and inspect the area of upper wire rope between the upper cable seal and the upper sheave.
2) The second technician at ground level will pull the lower wire rope down slowly. The inspecting technician will accomplish the tactile inspection as the upper wire rope moves out of the cable guide and around the upper sheave. **While working near the sheave, the inspecting technician must use extreme caution while the wire rope is in motion.**
3) The inspecting technician will note any upper wire rope anomalies by both visual and tactile means.

If any wire ropes are found to be in question, replace the wire ropes before opening the ride to the public.

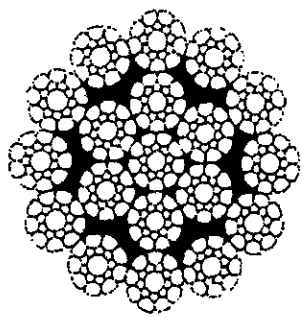
Please refer to the illustrations below to determine the different cable types.



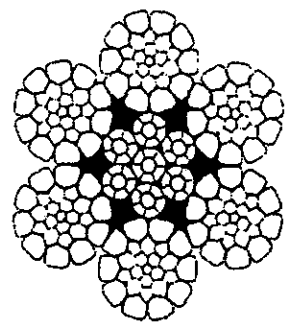
19 X 7



FLEX-X 19X7



FLEX-X 19X19



FLEX-X 626

SECTION 5: General Maintenance Procedures

5.3: Cart (cont.)

4. Check the wheels.
   (a) See that the wheels are adjusted and fastened.
   (b) Make sure the wheels are inflated properly.
   (c) Check to see that the wheels still have even treads on bearing surfaces. Replace the tire if the tire treads are worn off or if there is excessive cracking in the tire.
   (d) Ensure that the wheels turn freely and have no bearing noise while in operation. Replace tire if the bearings have excessive wobble, do not spin freely or ar
5. Ensure that all signs and banners are secure with no loose ropes or strings.
6. Ensure that there are no sharp objects or torn materials.

5.4: Cable System

5.4.1: Cables

REPLACE THE CABLE IF ANY OF THE FOLLOWING CONDITIONS ARE TRUE.

(Refer to the illustration immediately following this list.)

1. If any of the individual wires in a strand have a flat spot of more than ½ the diameter the smallest wire (refer to figure 1). This is for 19 x7 cable.
2. For Flex-x cable replace when the gap distance drops to ½.. You can distinguish Flex-x from 19x7 because the flex-x has drawn strands. Refer to figure #2. Use an untouched area near the cable end for comparison.
3. If there is a single broken wire (the smallest wire).
4. If the cables have stretched more than 3.5 % of the ride track length on a looping cable ride. For example on a 180 foot ride- 180 x 0.035 = 6.3 inches.
5. If there is more than 100,000 cycles on a looping cable ride.
6. If there is 80,000 cycles on a 1 cable system
7. If the cables have been on a ride for 1 year.
8. If there are any twists, frays, or kinks.

SECTION 5: General Maintenance Procedures

5.4.1: Cables (cont.)

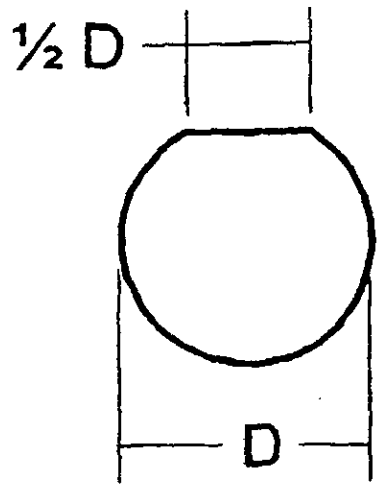


Figure #1 19 X 7

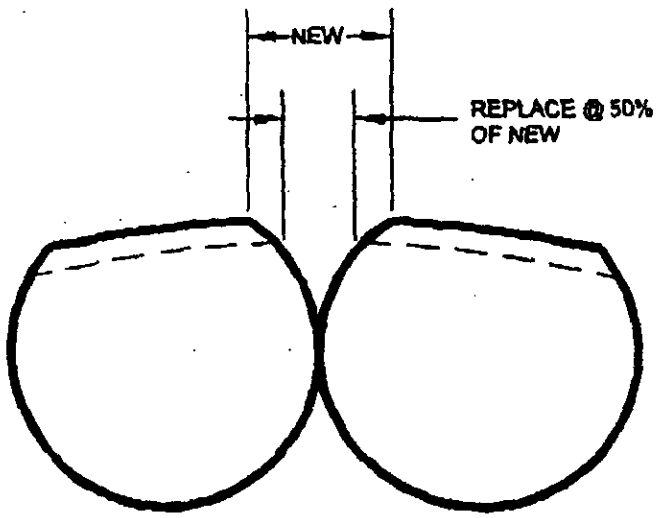


Figure #2 Flex-X 19

Note: Never weld, cut, or grind near the cables without protecting them and always use caution when handling to avoid kinking.

CABLE CHANGE PROCEDURE

Notes: Never change cables in high winds

1) Locate the following items:
   - A- Clean cardboard or tarp.
   - B- A spool jack or saw horses to set cable spools on.
     The work rope, making sure it is in good condition and at least twice as long as the tower is tall. (This is optional when you are just replacing old cables with new ones)
   - C- Two nylon work straps and a carabineer.
   - D- One empty cable spool.
   - E- Three tie down straps
   - F- Crow's foot
   - G- 24 inch adjustable wrench
   - H- Shear pin bearing installation/extraction tools

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SERVICE BULLETIN No. 02.10.30

DATE: October 28, 2002

TO: Owners and Operators of Space Shots, Turbo Drops, Double Shots, Turbo Drop/Space Shot Combinations

ATTN: Maintenance Personnel

FROM: Service & Installation Department

SUBJECT: New Shear pin and Shear pin service life criteria.

In an effort to improve the quality and safety of S & S tower rides we have designed, tested, and approved a new shear pin. The new shear pin will be the only one approved for use on S & S tower rides for the 2003 season forward.

The new shear pin is heat-treated, machined and has an SS mark on the head. This makes it easy to distinguish from a normal bolt and will eliminate any confusion concerning what should be used as a "Shear Pin". The heat treating and machining ensures a precise shearing force needed to shear the pin. Each lot of pins are tested to ensure the shearing force is within engineering specifications.

Currently the wire ropes are changed every 50,000 cycles or one year which ever comes first. The new shear pins will have the same retirement criteria. A new shear pin and locknut will be shipped with each new upper wire rope ordered and must be installed when the new wire rope is installed. **The locknut must be replaced whenever removed for piston inspections ect... and must not be torqued when installed.**

The head and the thread ends of the shear pin should be safety wired back to the cart in order to retain the pieces in the event that the shear pin is sheared.

If you have spare wire ropes in your inventory or new wire ropes on your rides please contact S & S and order new shear pins. Make sure to order one shear pin for each upper cable.

Turbo Drop, Space Shot, Double Shot

Brake Shock Retrofit

Tools Required:
½" Drive Air or Electrical Impact Wrench
Large Channel Locks
Drill (electric or battery)
Allen Head Sockets (sizes: ¼", 7/32", & 5/16")
1 set of End Wrenches
¼" Drill Bits (supplied by S&S)

Retrofit Procedure:

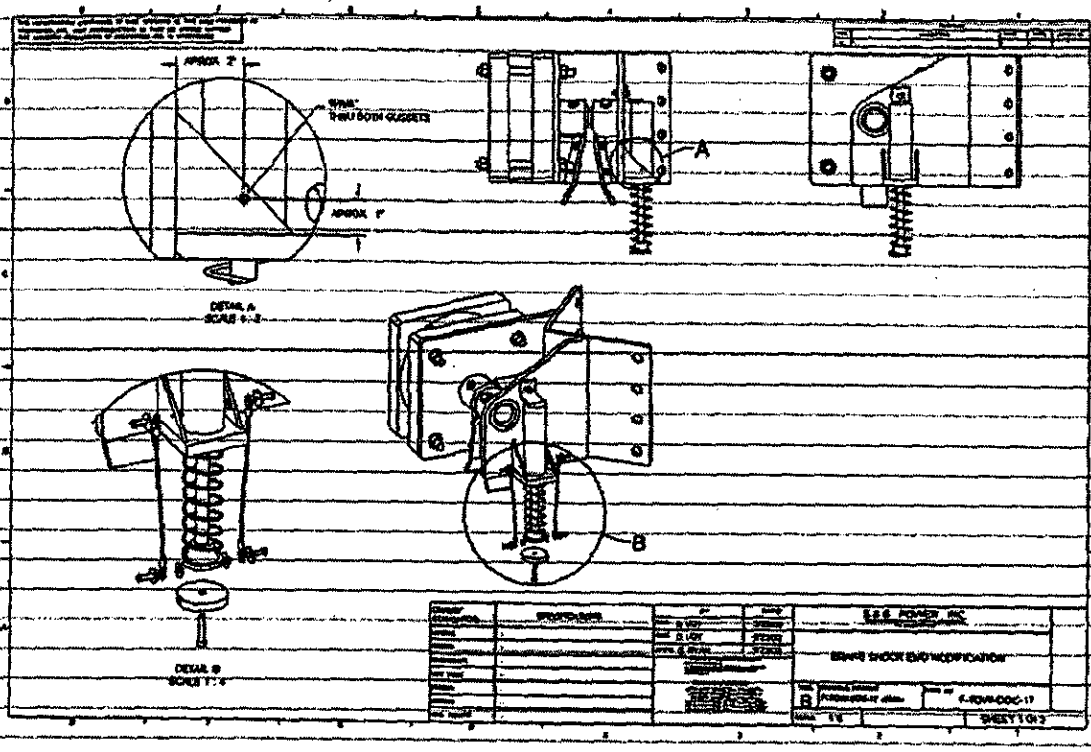
Step 1 – Remove existing cap screw from end of shock. The size of the cap screw will either be 5/16" or 3/8" depending on the model # of your shock. This will require the use of ½" Impact Wrench and Channel Locks. The Channel Locks should be used to grip the shock's cap (very tightly) to keep it from rotating while being impacted. This step could be fairly difficult since thread lock was used during factory assembly. The use of heat may be required.

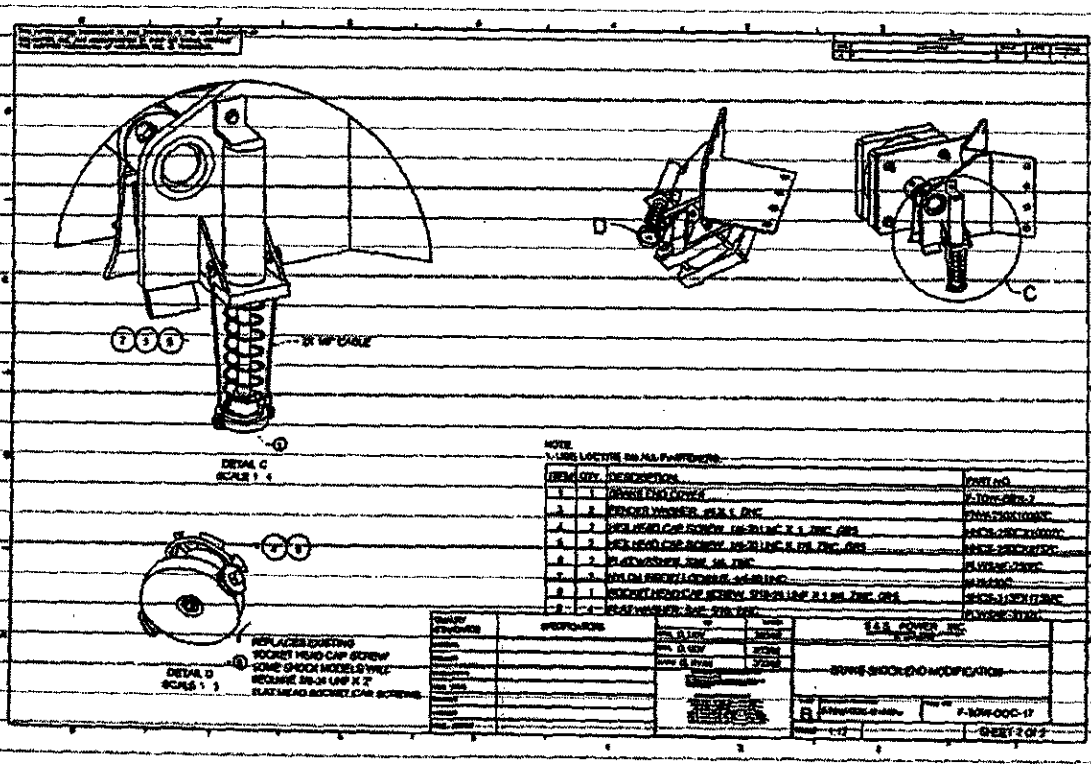
Step 2 - Place the Brake End Cover Assembly (pre-assembled at S&S) on end of shock (see Detail B). Depending on the model # of your shock, insert the new length of 5/16" or 3/8" Cap Screw (supplied by S&S) thru the assembly and into shocks existing cap. Before tightening, apply Loctite to the threads.

Step 3 - Drill ¼" hole thru both sides of the Shock Mount gussets (see Detail A). The dimensions listed are approximate and should be determined in the field. The exact location of the holes will be determined by the length of the 1/8" cables (supplied by S&S). Allow at least ½" of cable slack so the full stroke of the shock will not be impeded. Install the ¼" hardware that has been supplied (see detail C).

Step 4 – Contact S&S Power, Inc. with verification that the retrofit has been completed.

Should you have any questions, please phone S&S Power, Inc. Service Department at (435) 752-1987.


APPROX 2"
APPROX 1"
DETAIL A
SCALE 1 : 2
A
B
DETAIL B
SCALE 1 : 4


C
DETAIL C
SCALE 1 : 4
DETAIL D
SCALE 1 : 1