Rowe Bill Changer Hoppers Dispensers and More The Rivet Fix - Dry Slick

An overview by Bruno D Puglia
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http://www.eastcoastamusements.com

Some of the time frames in these notes may appear a bit strange. This has occurred because I have been writing and updating these notes for a number of years. It is a file I started on my 1985 Atari computer and when related and/or new information came along I would open the file and add and update the file.

Within the last few years update kits for Rowe bill changers has given new life to the older Rowe bill changers. I have updated BC-9s to BC 35s and they worked out very well because besides installing the update kit. The BC9s [around 1980 I think] is 25 years and still going like a new changer accepting new $5s and even $1 to $20s. One reason for the good performance of these updates is the way I do the hopper refurbishing. I will attach Bear notes and I will tell you how to take care of your hoppers and how to keep them running for decades. More information is in other Bear notes including Dremel and Rowe stuff which you will to read.

The manual is quite clear about how to load a hopper by slowly pouring the coins into the hopper. Dumping the coins into a hopper could bring on coin jams and coin bridging. Never shake the hopper to force the coins down. Why not? Because The Law of Gravity has not been repealed. If your changer goes out of service and there are coins in the hopper maybe it is merely a problem related to the way the coins are put into the hoppers. I often get a dispenser or hopper to check and they are ok. When asked if the user slowly poured the coins into the hopper or dumped them in they say “I dump’em”. If I ask if they shake the hopper to pack the coins down they say “Yes”. They tell my they find coin bridges across the hopper. This is where the coins lock up tight across the hopper and there are no coins below the bridged coins. Do not dump or shake when loading hoppers. Be careful to keep string, in fact all debris from getting into the hopper.

Note: When I write the word clean or chisel I mean with a wooden or plastic chisel scraper and then use the hopper brush. 1. I will explain later. In many of my notes you will see RAD DRY SLICK or just the word RAD. The product is now called Dry/Slick. . : [2003 RAD sold the RAD Dry Slick formula to another company and it now called DRY/SLICK. The last time I talked to Mr. Rad he was retired in Florida.

Here are a few points you should note about the care and feeding of hoppers. Look at the manual and learn how to take the hopper apart correctly. The screw holes in the hopper Baffle plate, chain assembly, tie bracket on the bottom, chain adjustment block and the sprocket wheel under the agitator can easily be stripped when to much force is applied by a power tool or even a hand tool. You can use a power tool to take the hopper apart but never use a

power tool to tighten the screws unless it has an adjustable low torque release.

How often should you clean the hopper? There is no one answer to this question but there are some things you may want to consider. Let me tell the Mr. Car Wash story concerning maintenance of coin hoppers. A BC-11 needed repair because one motor was not braking correctly. Extra coins were dropping into the bucket. The motor had a worn brake pawl. Normally, when the hopper motor has a worn brake pawl, the motor bearings are also worn and the whole motor should be replaced. As a rule replacing just the worn brake only a short term fix! However in this case, check of the bearings the motors showed very little wear. This machine was made in 1983 machine and this was 1991 and just the pawl had to be replaced. On inspection, the agitators looked new. The coin track edges looked as if the hoppers got very little use. The brake pawl was worn but very thing else was ok so I asked the owner if hopper plates or agitators had been replaced. He replied all the hopper parts were the original and nothing had ever been replaced. I presumed the machine got very little use but I asked how much money did the machine change per week? He replied $300-$500 per week! I said, "You must clean these hoppers once a week! He replied "Nope, I clean them twice a week." Here is a machine which paid out a lot of money every week and only needed one small plastic pawl after 8 (now 13) years. I did change the second pawl because it was showing signs of wear. When I tested the machine, the coins dropped one right after another….. Click, click, click, click. More then five years have gone by and as far has I knew, the machine is still clicking away. Brushing the hoppers twice a week may be over kill, yet this story (more to come later) makes a valid point because the lack of cleaning generally means hopper plate replacement. Because of the extra wear and tear on the motors, couplings, gear boxes, and other parts will also need replacement too. A hopper which does not pick up the coins means OUT OF SERVICE, resets and lost income. A number of resets may have to be done to put the machine back on line.

Now I'll tell you more of the Mr. Car Wash story. Mr. Car Wash came in two years later (1993) because he had an acceptor problem. While talking to him, and not knowing he had made brush/chisel before me I showed him my chisel-brush. I was shocked when he told me "Not good enough." He added "the wood or plastic brush was too soft and edges did not last very long! My brother made some special ones made out of very hard wood." He was right! The brush chisel is too soft. The brushes I have do get rounded off quickly. You have to keep shaping the edge. Mr. Car Wash also stated he was still cleaning the hoppers twice and week. You see, I used the word "clean" when I first asked Mr. Car Wash about the hoppers. The word "Clean" to Mr. Car Wash meant "chiseling" and brushing away the dirt on the hopper tracks and not just simple brushing. His machine is over 13 years old [in1993] and still cranking

away; Click Click Click click with replacement of only two motor brake pawls! Mr. Car Wash had not come in for service on the hoppers or dispenser this time. On this day his acceptor was in fairly good shape but a loose motor belt had worn the motor gear down a bit and the anticheat lever had a few very small nicks on it. The rubber rollers were in good shape and a little rubber cleaner were applied to the rubber. I replaced 755 bulbs (with wires) because the leads had gotten a bit short after all the bulb changes. Two belts, bulbs, a motor gear (not the motor) and an anticheat lever were replaced and he was on his way back to the car wash. His cleaning and lubrication of the acceptor has also paid off! While I was working on the acceptor, his car wash bill changer was still clicking away because he had installed his spare acceptor in the machine!

In 1995 I found out Mr. Car Wash had 3 older machines and I had a chance to work on two more hoppers. Coins were jammed in the sliding funnel at the bottom of one of the hoppers and it was jamming and stopping the hopper. As I took the hopper apart I noted the screws were normal and the black screws were mixed up. I noted the part of the sliding funnel which locks to the side of the hoppers was broken and this is where the coins got stuck. I also noted the plate assembly latch was also bent. The agitator was one of the new version types and in very good shape. A so called service person (not him or me) had taken the hopper apart at one point in time to replace the agitator and damaged the funnel and bent the plate assembly latch. I replaced the broken sliding funnel. I took the second hopper apart and it was very good shape. I did replace the agitator not because it had some wear on it but because the hopper had the older straight edged agitator rather then to rounded blade edges you are used to seeing. Remember Mr. Car wash is the guy who chisels his hoppers with his home hardwood chisel stick and brushes them twice a week so when I checked the hoppers they went click, click, etc, just like new hoppers. Mr. Car wash owns a third machine and to date I have never seen those hoppers. Keep in mind his three machines are over 13 years old at the time and to that date had only replaced 1 damaged funnel (people damage), 2 agitators, and two motor brake pawls and his machines do $300-$500 a week and they still go click-click like new hoppers! I hope you can do as well!

Think about this question: How come Mr. Car Wash excels in the care of hoppers, acceptors, having spares, etc, than most vendors? Generally the problem is the hopper is slow, or will not pick up the coins. The hopper is then taken apart and the track cleaned. A cleaning at this point may not put you back on line or may be dropping some coins because excessive damage to the hoppers plate coin tracks. Preventive maintenance schedule will vary depending on the amount of use and the amount of dirt.

How about once a week? I got a phone call from a car wash owner who asked about a repair on his BA50

acceptor and during the call he talked about how wonderful the Rowe hoppers in his eight (8) BC12Rs, now converted to BC1400s, were. He told me he had to put in an agitator once in a while but other than that they were just fine, in fact, great! He added “All I do is brush’em once a week!”

Chisel and brush once a year? Based on what I have seen one year is not a good time frame for cleaning hoppers. I have refurbished many hoppers and some of them have come back within one to two years because the owners have never cleaned them. I found hard clumps of dirt on the guide assembly and the coins were falling off the guides.

How often should you clean’em? That’s really up to you but a reasonable time frame might fall into a one to six month time frame if you want to keep efficiency high, reduce the wear and tear on the guide edges, motors and gear boxes. When it comes to cleaning hoppers more is better! You don’t have to be an expert to listen and hear how long it takes the hopper to pick up the coins. If you waited till the coin loading slowed down you waited to long. In my mind Rowe makes the best coin hoppers ever made. How good they are compared to other hoppers depends solely on the type of preventive maintenance you give them.

One of the biggest problems is the brushing alone will not remove the hardened clumps of dirt from the guide area on either side of the chain. Coins traversing against the edges hit the clumped dirt and the coins fall off damaging the guide’s edges. Once the guide edges round off no amount of cleaning will restore the hopper to normal and replacement of chain assembly and/or guides will be required. Failure to keep the hopper clean means poor efficiency and maybe going out of service plus you end up with extra wear and tear on the hopper, ratchet coupling, hopper motor and its gear box.

I think back on a day I was told 3 hoppers in a machine were not working. The service person told me he had been chiseling and brushing the dirt either side of the chain. I should have known what I was going to find. Upon taking the hoppers apart I found a lot of hard parked dirt on the coin guide tracks. I could tell they had not been chiseled or even brushed properly. The track edges where the coins ride had started get rounded. All I can do is point out to this vendor whatever he is doing was not cleaning the hoppers as indicated by what I saw. The life of these hoppers is greatly diminished. I take no pity for those people who refuse to clean the hoppers with the methods as outlined in these notes. If you have to replace the plate assembly so be it.

There is another important item: Someone had been taking the hoppers apart and re-assembling them and must have used a very powerful automatic nut driver or drill. Most of the screws holes were stripped loose and in a few places I found very large sheet metal screws instead of the normal black screws. Over the years I have found a few stripped holes and

simple used a longer screw and a nut but with these three hoppers all the holes in the main chain assembly, I have replaced the lower tie bracket and baffle plates which I found were stripped. If you think you can use a strong auto driver or a drill with a 1/4 nut driver bit I have give you warning. These tools can be used to take the hopper apart but as far as putting it back together; forget it. The metal cannot take any abuse and the result could be stripped out holes. Don't get gross! You are warned about stripping hopper screw holes including those three chain adjustment holes. Snug is all that is required. The lock washers will hold the adjustment block in place.

One way to clean the guide assembly is to take the hopper a part. In removing the chain assembly the key is to slide the chain assembly about 1/8" to free up the assembly's metal tab latch which sticks through the side. Now you can lift the side away from the chain assembly and remove the chain assembly from the hopper. Once you have the hopper apart you can clean it and replace any worn parts. You do not want to damage the guides surfaces with a metal scraper, wire brush, screw driver, et cetera. Make a wooden or plastic chisel shaped scraper. Make it long enough so you can reach all the way down into the hopper and you can chisel clean the dirt from the chain assembly guides even if you do not take the hopper apart. I have a long chisel made from oak flooring and it is the best one. You can grind down or cut the end of a wooded and/or plastic hopper brush. Note that you don't have to take the hopper to do routine cleaning with the long wooden chisel. After chiseling then clean the guides with the hopper brush. It is important to clean the guide areas on both sides the chain where the coins ride up the track.

Now and again you will have jams as the chain goes around the assembly. This could be because the chain adjustment may be too loose plus the chain links are stiff or there is something down inside the assembly. At some point you may have to open up the assembly to replace the guide plates, change the sprocket wheel or just to clean out all the bad stuff that is stopping the free movement of the chain.

Serious jams occur when debris gets between the plates. Over the years I have seen strange stuff between the plates. String, cords, paper clips, screws, nuts, even a star washer was caught on one of the chain pins and locked the chain. You may have to take the plates apart to find and remove the debris. The screws are different lengths and colors so mark them so you can replace them in the correct position. The black screws in the plate are different than the black screws used on the sides and lower bracket. There is a large Phillips head screw and there are small nuts and the small spacers which may slide off when you take the plates apart. Do not loose the small spacers. There is a disk with four screw holes which goes next to the big sprocket. Make sure it gets back into the correct position when you re-assemble the shaft and agitator.

Never mix up or switch large and small coin agitators. The agitator in picture A is the small coin agitator. The black large coin agitator has two small ribs on it. The question of grease may come up because you will see some when you lift the old agitator from the plate. The Rowe repair shop uses Texaco heavy automotive grease (the technician says to use very, very little or no grease at all). In new hoppers, Rowe uses either Molycoat "G" or Rykon 2EP. If in doubt, use no grease. Later on you will read about Ray Dry slick and by pouring Dry/Slick down the hopper you will not need any grease. My customers have been told about Dry/Slick and they use it so I do not use any grease. When tightening the four agitator screws be very careful not to strip the sprocket screw holes. Snug will be good enough.

Check the sliding funnel. The sliding funnel is the one that goes through the sides of the hopper and it locks onto the sides. Often it is stuck to the sides and/or the locking edges are worn. Remove the sliding funnel being careful not to loose the two springs under the sliding funnel. Check the locking edges to make sure they are not worn. If edges are worn replace it. In some cases you refurbish the notches with a hacksaw. If it is ok put the funnel back. Do not forget those two springs. Lock the funnel into the sides. By taking the sliding funnel out of the hopper you loosen it up allowing the ability to slide up and down which is required for proper operation when coin jams occur. Another reason to remove the funnel is coins maybe lodged between the hopper sides and the funnel. The stuck coins maybe effecting the operation of the funnel and they spread the hopper sides apart. Neither of these things is good for the hopper. In late December 2002 a customer called and asked about the sliding funnel in his -06 hoppers. I told him to check the locking edges. By chance I later saw an order from him for 8 sliding funnels.

Before you reassemble hoppers you must read The Rivet Fix section in this article and then do the rivet fix if is required. We have noted that the rivet down near the agitator can be loose or have an edge which can catch a coin between the rivet and the small coin gray agitator. Quarters or similar size coins actually locks the hopper up tight. We have noted quarters nickels can also lock up against the rivet too. The motor stains to a point where the gear box can break down. Normally when this type of lock up occurs the agitator you may find nicks on the round edges. I have taken the bad hopper apart and sometimes I have taken the plate off and tightened (pinned) the rivet with a hammer and punch. Now if the rivet is tight.

The rivet edge may not be smooth enough to allow the coin to pass over the rivet. I have taken a small file and filed down the rivet down smooth so there is no edge to catch a coin. As I started to see more and more bad rivets I started to use a Dremel tool with a small cuter to smooth the edge of the rivet. I use a small round bit to smooth the rivet. For me it works better than a file. Many times the

agitator nicked and worn and needs replacement.

Check the hopper shaft. Sometimes the pin in the shaft may shift off center. Some can be re-centered with a hammer but if the pin is loose replace the shaft. There are two types of shafts. The small coin shaft Part # is 251137-01 and the large coin shaft part # is 2 51137-02

You may find hopper where the shaft has to much end play and the shaft slips or the shaft may be too tight. This can occur because the baffle plate is bent at the bottom area where the shaft goes into the plate.

A defect in the large coin upper nylon agitator cams showed up in March 1997. This is the agitator located on the bottom side of the baffle plate. A vendor reported he had gotten upper nylon agitator cams [I call'em moon] were the nylon cam piece was mounted on the metal ring backwards and this was causing coin jams. We found half of the parts in the parts box were backwards. We also found two hoppers in new bill changers with the backwards cam agitators. We replaced them. The defect may have first shown up in late 1996. As the cam turns the small rounded edge near the metal collar should start cutting into the coins. It is hard to understand what it looks like by just writing about the it so on one of my Bear notes you will find a drawing of the goods and bad agitator,.

On another note, early versions of the moon cam agitator used an Allen locking screw pin but the latest version of the shaft and upper moon agitator cam uses a roll pin. If you order parts they will be the roll pin type.

2 51712-02 Agitator Large coin Upper Moon agitator cam

7 01130-13 Roll pin (for upper Moon agitator cam)

2 51137-02 Shaft - Large coin

While we are talking about large coin hoppers if you use 1 1/8" tokens make sure you order tight tolerance tokens and specify 1 1/8" as the max. Over sized 1 1/8" coins will jam against the hopper side.

Some hopper sides tend to pull away from the chain assembly at the bottom. When you tighten the two bottom black screws which go into the bottom tie bracket of the hopper take a pair of pliers, or vise grip, and pull the hopper sides tightly against the chain assembly as you tighten the screws.

The manual states not to oil the chain and I agree. It is a mess when someone puts oil or WD40 on a chain! I never use WD-40 on any part of a Rowe bill changer. Yes, I know some people swear by the use of WD-40. The choice is yours.

Adjustment of the chain will effect the tension. It does not want too be loose nor too tight. A loose chain will slap and may get caught. A tight chain will cause the motor to work much harder then it should. See the manual for instructions. Uneven tension could be caused by a bent shaft which can vary the pressure between the agitator and the plate. Pressure of the shaft against the bearing on the baffle plate may

also vary. I have not had much luck in attempting to fix a bent shaft so generally I have to replace a shaft which is bent. I never figured out how a shaft gets bent.

Is there something you can put on the chain and guides that really works and will improve the operation of the hopper? The answer is a BIG BIG YES! For over 22 years our customers have been told about and use a product called DRY SLICK [Enequest Chemical Co]. See figure 2. DRY/SLICK is a great cleaner when wet and when it dries it becomes a dry lubrication like no other because it leaves a film that you can not even see plus unlike grease or oil it does not collect dirt. It is also great protection against rust if the environment as a high content of moisture as in a laundromat, car wash, and a location nears a lake or near the sea shore. Once I had to do a right now repair on a hopper. The owner had let the hopper just sit somewhere for years. The chain was rusted so badly not a single chain link would move. I used the DRY SLICK on it but it did not free the links enough. I had to install a new chain. Latter on I got the idea of letting the chain soak for 24 hours in DRY SLICK. This chain is now hanging up in my work area and I could install the chain in a hopper today. Every link moves without any restraint. When using DRY/SLICK on the hoppers just put the chain assembly, or the hopper, in a place where the DRY/SLICK will not cause damage when it leaks out of the hopper. When I have the chain assembly out of the hopper I like to bring it out back where we have an air hose. As I move the chain I pour the Dry Slick on the chain. I let the Dry/Slick soak a while then as I push the chain I use the air hose to blow the dirt away from the chain. Use Dry/Slick before and after hopper brushing. I mentioned chain jams because the chain adjustment may be too loose but part of the problem is that a loose chain adjustment along with stiffness in the links is what causes the jams. Dry/Slick application on the chain is important to free up those stiff chain links. You can use as much as you want to wash away the dirt, cover the hopper chain assembly and Dry/Slick the hopper chain too. While you are using the DRY/SLICK put a little on the sections of the sliding funnel that stick through the sides of the hopper. Why Rowe does not tell every one about Dry Slick is beyond me. The Bear's customers have been told about Dry/Slick for more than 17 years. How many ways can I say your Rowe hoppers need Dry Slick!

I do not know of one my Rowe bill changer customers who has tried Dry Slick and then stopped using it. Over the last 22 years I have not heard one complaint about Dry Slick from our customers but I have heard a lot of them say how much they like the product and many have found other perfect uses for it. I use it on my wife's and my coat zippers, my tools, and my house window slides,

DRY/SLICK has no side effects, and no silicones, oil, graphite to build up to collect dirt. Use it where a metal or plastic need a smooth, slick, dry slide action without the complications

caused by other lubricants. Try it on slug or bad coin ejectors, hoppers, coin slides, delivery chutes, handle locking slides, even zippers. All this and it protects metal from rusting. The Bear says use as much as you want because there will never be excessive build up. Any excess will just roll off. The nice part about using Dry/Slick when it used has a cleaner it is a very good cleaner and the clean will last longer.

Warning: The people who make Dry Slick said it can be used even where there is a very very tight tolerance. I do not use it on the OBA shaft and nylon bearings. The film actually tightens the already very very tight tolerance so the shaft rotation may slow down. I would not use it on a BA50 acceptor because it has similar shafts and bearings like the OBA. I know of no other places that has this very very tight tolerance. I do not use DRY/SLICK to clean LEDs and photo cells or plastic where there are LED light goes through the plastic.

Here is just one example for you: Dry Slick is an ideal cleaner for cleaning and protection for the surface area of a coin mech where the coin slides. People who have tried it always use it on their coin mechs. Dry Slick becomes regular part of their Bear preventive maintenance schedule for coin mechs. Many people hate to do routine maintenance procedures but Dry/Slick cleaning is one procedure most people do because it is such a good cleaning product and so easy to use.

Can you make improvements in your old hopper? Rowe added a small bracket and a strip of nylon to the baffle plate [part 270359-01] in Hi Capacity hoppers to provide better control of the coin flow. History has shown the new baffle plate can be put in normal capacity hoppers, and while Rowe has not said so, I have added the new baffles in smaller hoppers. Customers have reported it did help coin flow and reduced hopper coin jams. When I refurbish any hopper if it does not have the new baffle plate it I install it.

When using quarters in a large coin older - 06 hoppers, the large coin agitator may not move quarters around enough to get the quarters on the chain. Replace the black large coin agitator with a modified gray small coin gray agitator to improve coin movement. Part number 4-50342-05. You have to grind down the edge diameter and re-bevel it other wise jam up against the hopper plate. You can also put in a new small coin upper cam (Part # 350472-01) and move the baffle plate closer to the plate assembly by using the other set of baffle holes normal used for small coins. If you are serious about it, replace the plate assembly with a small coin assembly will get you the normal small coin chain but you will have to get the small coin upper cam if you move the baffle plate where it belongs for small coins. You may want to order the parts so you can make a full conversion to a small coin quarter hopper.

What about lubrication for a Rowe hopper drive shaft? There are three points that need oil lubrication. These are two shaft bearings, one where the shaft goes into the chain assembly and another bearing is on the baffle plate. While we are talking about the baffle plate let me tell you something one of the vendors told me in May 1995. I have nick named him Mr. Arcade. He had just finished cleaning and dry slicking 12 hoppers and called me to pass on some information. He had lubricated the bearing and the cam area at the end of the baffle plate. He noted, with all 12 hoppers, the hoppers turned a lot easier after the lubrication of this area. He used the Radio Shack oilier but you can also use the Magic Wand oilier. Since there is tightness between the cam against the baffle plate this lubrication makes sense and the end result will be a less strain on the hopper motor and its gear box. Observe that Mr. Arcade was getting ready for a summer arcade season and he has started off with a vigorous preventive maintenance schedule. On the same day, I got the phone call Mr. Nice & Clean came in and I told him about this procedure: He told me he had also found out that cam area need lubrication. One day I clamped an Amp probe to a hopper motor and measured the current. Then I lubricated between the upper cam and the baffle plate. Guess what! The current being drawn by the motor went down. See figure # 2.You can lubricate the upper agitator without taking the hopper apart. Angle the hopper and align the oilier and play The Dive Bomber game. Drop the oil drop falls between the agitator and the baffle plate. If you miss the right spot try again and then clean up any spots caused by your misses. If you are a lousy pilot like me, you can use the long The Bear's Honey Dew straw procedure. An alternate could be the Dunkin Donut straw procedure. <grin> The choice is yours. Put a few drops of oil about one [1] inch down into the top end of the straw then turn the oiled end down and place it at the junction of the agitator and the baffle plate. Just hang in there awhile and the oil will fall into the right spot. After you are done you'll be surprised how much better the hopper runs.

Let's look at a hopper motor which may not have the same specs as the original. Bill changers have hopper motors. The new replacement motor may be a little bit longer the original. There is a cover on the rear of the dispenser to cover the motors. Later model covers have holes which allow clearance for the longer motors, but the older covers do not have these holes. If you Install a new motor and replace a cover which does not have the clearance motor holes in the cover the cover will put pressure on the motor shaft. This may keep the motor from running or it adds extra resistance on the motor. The fix is to buy a new cover or drill holes in the old cover so the shaft clears the metal cover. Don't presume the specs for the motor are the same as the original. Some people are place it safers and may ask the parts person, "Is this the correct motor replacement?" The answer will be yes because it is the right replacement motor. It may not be the same, but it is the correct and only replacement.

The older Multi motor had a heavy duty gear box which could be purchased for hopper motors if a gear box failure. I don't know I you can get these replacements anymore. Hoppers can jam at times and gear boxes can failure.

When changing a BC100 gear box, you will need some of the old hardware from the old assembly if you do not get the full BC100 motor assembly.

If you have be looked at hopper motors you may not have noticed the old hopper motors had a hole in the brake arm and the later motor brake arms have a non magnetic rivet in the hole. Do you know why the rivet is needed in the arm? Without the non magnetic rivet over a period of time the residual magnetism causes the brake arm to stay stuck to the motor frame even after the AC power is removed from the motor. The extra motor coasting run time caused by no brake action means the hopper chain is running. If coins are on the chain, extra coins will drop into the active bucket bin. The machine may pay extra coins and the machine may go into an alarm condition if enough coins are dropped. Unless someone installed the rivets in older hopper motors or replaced the hopper motors, you may end up with extra coins dropping into the escrow buckets and out of service alarms. Other items like bad or unhooked brake springs, worn brake pawls, bent brake arms, worn brake arm bearings, etc, can also cause the same problem.

Other brake problems have been noted over the years in both old, and new, motors. Tightness or binding of the brake may be caused by problems within the bearing sleeves. Remove the brake and inspect the bearing sleeves for burrs, scratches, or pieces of metal in or on the bearing.

In some cases, the pawl can hit and stick to the motor winding tape. Rowe starting grinding part of the pawl to increase the space between the pawl and the motor winding but sometimes it will hit and stick to the winding. Generally you can push the tape/winding back down and keep the pawl from sticking to it. You should grind or file down the pawl to get you the space you need between the cam and the motor winding.

In one case, the brake on a new hopper motor would pull in and not release. When doing a manual push on the brake, I could push the brake to the motor frame and it stuck there when I released the pressure. It felt tight and it turned out it was not the bearing bushings, spring, plastic brake, etc. The piece of brake arm that fit into the plastic brake was bent and it went into the slot to far. As the brake arm went into the slot, there was a locking type action when it reached the end of the slot and it just stayed there. Bend the brake so it was free to move in and out without hitting the end of the slot fixed the problem. Be careful because the piece of brake arm that fit into the plastic brake has been know to break.

In 1998 I noted one bill changer where someone had decided not to use a non-magnet rivet but a small brass type screw. The screw head was ground down and two washers and a nut were used to hold the screw in place. Sounds like it should work. Guess what... It did not work. The screw was not pure brass, It was just plated with brass and it became magnetized and the brake would not always release. It was like all those things marked stainless but when you put it near a magnet the item sticks to the magnet. Carry a magnet or use one of those small screw drivers with a small magnetic on the end and check those so called stainless and other plated items. Plated is not the real thing!

A person's point of view relating to a service problem can be misleading when a person does not have a good overview to see the big picture. Sometimes a person has to be willing step back and view the problem from another angle. Here is an example of a simple case of extra coins being dropped into the bucket. One presumes the motor brake is failing and views the brake operations by peeking at the brake from the rear of the dispenser. The metal cover hides some of the brake and motor, but, it can be seen clear enough to see the brake arm does release correctly and you can see the brake arm lock the cam on the motor. The brake action is operating correctly so you have not found the problem. Let's change the point of reference by watching the front of the dispenser. Looking at the black ratchet coupling which drives the hopper, we see the coupling continues to rotate after the power is removed. How can this be when we saw the brake work correctly? The answer is in yet another point of reference. Remove the metal cover in the back of the dispenser and we can now look at the motor armature, brake cam on the armature and the brake arm. As we watch the braking action we see the brake arm hits the brake cam on the armature correctly. The cam stops, but we now see the armature is still rotating. The brake stop cam is normally attached to the armature is stopped and when the brake locks the armature stops but in this case the stop piece as broken free from the armature shaft so armature continues to turn. It's all too easy to say some thing is operating correctly when in fact, it's not! You can check the cam by removing the armature. [Don't lose the front nylon bearing riding on the front part of the armature] and check the cam by holding it and use the other hand to turn the armature. The cam should stay locked to the armature. Do you make this check? Did you really look at the brake action? Before you check something and say it is not the problem, you must know what to look for or check for before you start assuming it is OK.

You have to inspect the black ratchet coupling which drives the hopper because it can be worn and slip when driving the hopper shaft. If you are good with a pin punch and hammer, you may be able to get the pin out and replace the black coupling. You might consider getting a new roll pin in case the original pin gets banged up. Better

yet, have a complete hopper motor assembly and/or gear box assembly handy. You may want to do a replacement of the motor assembly and replace the motor assembly in the field and then do the replacement of the coupling and pin back at the shop.

Let me make a comment about the coin counters. The older machines use a 755 bulb/s behind the hopper/s which shines on the coin counter photo cell/s. If any of the bulbs are dead, or intermittent, the machine knows it cannot count coins so it goes into a trouble shut down mode. Even if a hopper is not being used all the counters still have to have light on the counter. With age the bulbs melt together with the rubber grommet. To remove the bulb, break the bulb away from the rubber first. Then you can pull it out and replace it. With age, the filament of the bulb gets brittle and a shock to the bulb, even a small one, can cause the bulb to go dead. Generally, if one bulb goes out, the others may also go out in the near term so I replace bulbs at the same time.

With the onset of newer Rowe BCxx00 bill changers Rowe started using a red LED instead of the 755 bulbs. An OEM now as bullet LED replacement which is a bullet case with a red LED mounted in the case. I like the bullet replacement. You gotta watch the color code because LEDs can only be connected one way.

Many of the control units [BC11-35] have an error display and a "C" error could be a defective bulb, coin counter, control unit or the power supply and/or the 5 vdc regulator. The bulbs and counters need the 5 vdc. The manuals have a section which tells you how to measure the voltages and check the counter/s for proper operation with a meter. You should read the manual and make the measurements on a working machine so when there is a problem you know where and how to make the coin counter checks. The Rowe manuals tell you how to check counter voltages. If you called me because you have C problems on a BC35 it would go something like this:

Coin counter problems.... Are all the 755 bulbs behind the hoppers lit? If they are lit often a 755 bulb can be intermittent. A short fail failure will give you the counter error, Generally if you have to replace one 755 it is best to replace all of them at the same time. Replacing bulbs should be routine maintenance.

wrong change problems. While not very common some of the wrong change problems revolve around the solenoids, bucket door assemblies, and diverters in the bucket assembly. I will high light some of these problems. The solenoids have 40 vdc on the coil. When a vend is to be made the low side of a given solenoid is pulled to ground. There is a sense circuit in the electronic section of the machine which checks to see that current was drawn. Sometimes this check circuit is defective, the 40 vdc is to low, or the transistor switch in the control board does not work correctly so the solenoid is not pulled all the way up. The

escrow door or diverters are not pulled to the correct position. In other cases the diode across the solenoid or the solenoid itself is defective or there are connection/connector problems. We have also seen where the escrow linkage is defective or is too tight and this slows down the pull up time and position. When this occurs, I normally replace it with the plunger – linkage - door kit. There is the small door and a large door kit. When doing the routine oiling of the bucket assembly be careful not to get oil on the plungers. We have seen cases where the bucket door sticks in and open position. The time may vary from very short to long. We have found there should be a very slight about of sideway freedom for the doors on the shaft the door pivots on. 1/32 to 1/16 is enough. When I find no sideways movement I remove one of the nylon spacers between the doors and filed it down a little bit. We have found the door stays open when there is a linkage problem and a replacement was required. It could be a stickation problem with the solenoid and plunger. We have found stickation caused by burrs on the plunger end (tip), burrs where the pin and linkage connects to the plunger, residual magnetism or someone used oil, or WD-40, on the plunger. My feeling is WD-40 in, or on, Rowe bill changers are a NO NO! {I know some people swear by WD-40] Since problems with the diverter doors have not occurred often you may not have seen any of these problems which have occurred. As the plunger is pulled in there are pins on the linkage which pull up the proper diverter yoke/s. The diverter doors are left in the correct position to fill up the correct escrow bucket. Assuming the plunger and linkage came up all the way and pulled the diverter door yoke/s we can take it from there. The diverter door/s may not be in, or stay, where they should be. We have seen a door end up in the incorrect position. We have heard of and seen cases where the yoke pin was missing and another where the pin was loose and while the yoke did move the diverter door correctly but not in at other times. A tightness of the door shaft and yoke or the pin slipping out of the hole could make the problem intermittent. Assuming the diverters moved to the correct position they may not stay there. Again while not common, we have seen or heard about a few reasons why not. The first one is that loose roll pin. The yoke must be pinned to the diverter shaft for the door to stay put. Another item is the spring and steel ball which keeps the diverter door in position. We have seen loose springs and missing steel ball. In 1995 we had the first report of a case where the part of the diverter door yoke which normally faces towards the steel ball was going down instead of up. You may not have watched the operation of the bucket assembly closely, and if not, I suggest you do. These problems do not occur often but they are real and could occur at some point in time.

Bad coin counts or going out of service? Some hoppers pop backwards and away from the motor's ratchet when a jam occurs. Actually the ratchet should pop backwards towards the motor but because there is something wrong with the device that

was designed to hold the hopper in place the hopper jumps away from the ratchet. The devices used to hold the hoppers are latch springs, movable metal latch arms, and the one which you may not have noticed is a rubber pad. Many times I find the rubber pad is missing because it fell off. I see this in machines like the SPC and other machines too. If the machine gets warm inside the rubber stop could fall off. Some hoppers have handles which hit a rubber pad but I find handles are bent or they are missing. Sometimes people swap hoppers and they never notice there is a slight difference on how the hopper is held in place. When a coin jam occurs the hopper may move away from the ratchet and the hopper may not fall back to the normal position. This can cause a shortage of the coin payout and the changer may even go out of service even if there are plenty of coins in the hopper.

Other coin count problems: Take note you might find a large coin chain is in a small coin hopper and visa versa. The coin glide path on the small coin hopper is narrower than the large coin glide path. The chain pin spacing is wider on the large coin chain. I know a lot of people get and use large coin hoppers and use them for quarters or tokens close to the quarter size and this is permitted however the large coin hopper chain pin spacing is wider than the small coin chain. The large coin chain takes a little longer to deliver the coins and it will also add extra wear to the hopper motor/gearbox. When ever possible always use the small coin hopper for quarter size coins.

Other problems of extra coins have been noted and located to two coins in the same chain position. In most cases this occurs when smaller coins put in the large coin hopper or the hopper has the wrong chain. From time to time we have found the wrong chain in a hopper assembly. I do not know it was done by Rowe or a repair person put in the wrong chain. I will attach a chain drawing.

While we are talking about small and large coin you can buy the chain assembly:
4 - 7 0 0 0 6 - 0 1 Chain assy for small coin hopper 25c and smaller
Ag = Gray
4 - 7 0 0 0 6 - 0 2 Chain assy for large coin hopper 25c and up
Ag = Black

You can purchase a complete full chain assembly replacement small Coin to large coin conversion kit for the Hi capacity. These are for the larger size Hi capacity hopper. They have all the shafts, pins, agitators, etc. Part # 270332-02 Full large to small hopper conversion kit. As for other conversions from and to small or large coins for normal [not Hi capacity] and small coin Hi capacity hoppers I will add a page of information but remember there are normal original size hoppers and the HI capacity large size hoppers and parts needed are slightly different.

On new BCxx00 machines you can get CK XX coin counter error message. It is a good procedure to count all the coins in all three buckets when any error report appears. It may not be a

bad counter at all, but error was caused by a motor ran when it should be off and two coins dropped. It could also be motor did not brake correctly, dirty/bad connectors, power supply board or computer center problems. The computer remembers extra coins and alarms on the second coin. A "Reset" will reset the counter back to 0. Generally a bad opto and/or triac in the control unit cause the motor to run.

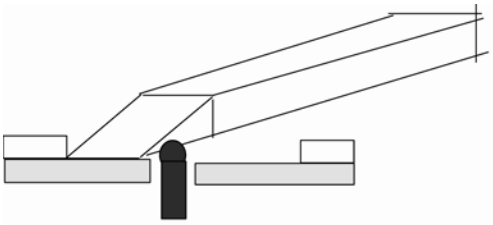
The photocell assembly. Use a meter to check the cell's operation. You need + 4.5 to 5 vdc on the blue wire. You should have => + 3.5 vdc on the orange wire with the light shining on the cell. When the light is blocked with a quarter the voltage should below .8 vdc. You may find there are cold solder connection/s on the small pc board. I check the counter's outputs voltages at the BC35 control board. The meter leads points are small enough to go into the connector while it still is connected to the board. On the CCU board connector [upper right hand corner] P2 left=pin 8 / center= pin 7 / right= pin 9]. The pin numbers are the same for BC12 or BC12R except the center hopper is not used. Often problems occur with connector and connections, loose screws, pinched cables [sometimes pinched by the hopper], etc. Sometimes you may have a computer control board problem. Basically the same type of test procedure is used for new BCxx00 changers and I will attach a BCxx00 Bear note which I use to check coin counters. You will find the details on the BXCOIN1S Bear Note page.

In the newer series of bill changers (BCxx00) you might see Check XX Det which is similar to "C" error in the older machines. One never knows where a problem can occur. In one case, a Check xx Det was given when there was not 5 VDC and the LEDs in front of the coin detectors were not lit. Disconnecting the dispenser restored the 5 vdc to normal. An intermitting + 5VDC short to ground were finally located under the cover of one of the coin counters. Normally one find the led has gotten weak and the LED and/or the LED assembly has to be replaced. Sometimes you will a bad connection on the LED and/or counter board.

I would like to thank people like Mr. Arcade, Mr. Car Wash, Mr. Nice others who were kind enough pass along information about hoppers and other items too. These vendors help supply, and/or confirm important information which has found its way into these notes and other notes too. "Thanks" is does not cover how I feel about their help and input. I really hope some of their preventive maintenance mind set rubs off on you.

Has I was re-dong these notes on I noted I have not heard about any hopper problems from Mr. Car Wash [at least Rowe 6 changers] Mr. Nice and Clean [28 Rowe bill changers] and Mr. Arcade [12 hoppers]. If you read all the pages I'll bet you can tell me why I haven't heard from them.

May the Dry Slick and chisel/brush be with you!



Make a long wooden
or plastic chiesl
Figure # 1

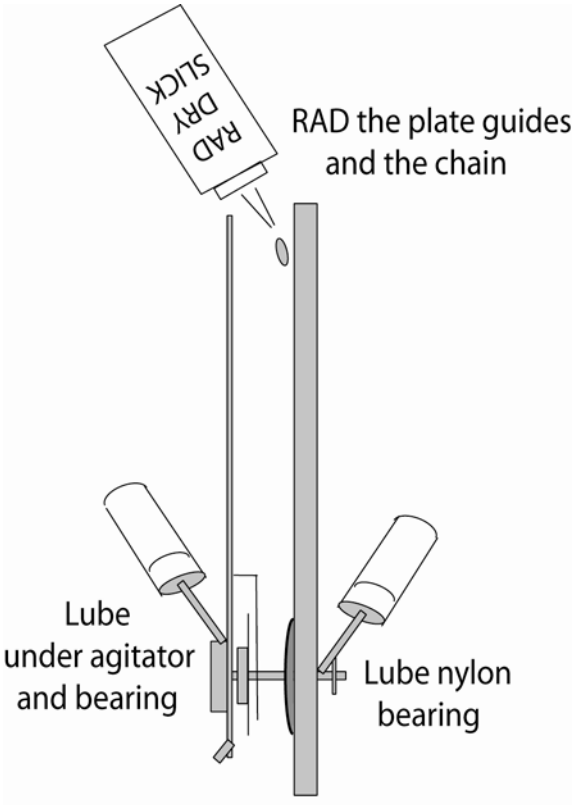


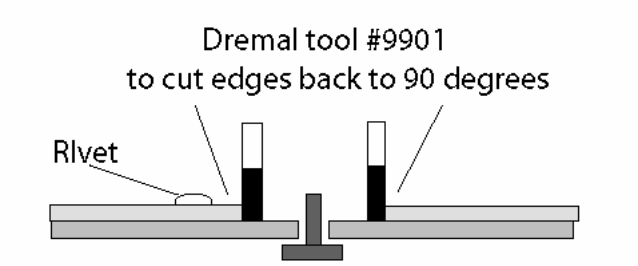
Figure # 2

EXTENDING THE LIFE OF THE CHAIN ASSEMBLY GUIDES

Can you extend the life of your hopper beyond what we have covered so far? The answer is yes. With excessive wear the hopper track guide edges where the coins rides against loses its 90 degree edge. Coins fall off the track when dirt causes the coins to drop off the guide wearing the guide edges. I have re-surfaced the 90 degree edges with a Dremel tool and a cutter # 9901. The idea is to get the guide edge back to 90 degrees. The cutter is flat on the end so it does not cut at the end but I do grind the cutter at the end with a slight angle [2 or 3 degrees] to help keep the end of the tool from cutting into the flat surface of the guide. Other cutters may work but this one works best for me. It's worth the few extra bucks you have to pay for it.

I keep the tool moving and you do not have to cut too much off to get back to 90 degree edges. In some cases the newly surfaced edges will be better than new guides. I have done many hoppers over the years and they all worked much better after using the cutter process.

Warning! The metal chips that come from the cutting process are not a good thing to have around a bench or work area and even worst is the injuries they can do your hands, arms and eyes. I use paper towels on the bench which I can throw away when I am done. I purchased long rubber gloves at Home Depot that go beyond my elbows and use them when cutting. I wear glasses to protect my eyes. Maybe a rubber type apron would be a good idea but I do use an air hose to blow away any filings that are on my clothes when I am done.



I have included so part numbers for some of the hopper parts but you should use the manual when you order parts. I have also included two sections in case you want to convert a normal small coin hopper or a small coin Hi capacity hopper to a large coin hopper for those who want to dispense larger tokens or the $1.00 coin. As an option I recommend installing the 270359-01 Baffle plate update with hanging nylon strip if the hopper does not have the updated baffle plate.

You may find the wrong chains or plates got into in a hopper. There are two types of chains, the standard chain and the large coin dollar chain.

Small coin - 25c and smaller

```
|<-1 1/8->|              |<Pins
o  o  o  o  o  o  o  o  o    Links
1  2  3  4
```

Large coin chain used for 25c and up

```
|<-- 1 1/2--->|                 |  |  |                 |  <Pins
o  o  o  o  o  o  o  o  o  o  o  o  o  o  o  o  o  o
1  2  3  4  5              chain slice
                          3 pins side by side
```

While we are talking about small and large:
4 - 7 0 0 0 6 - 0 1 Chain assy for small coin hopper
25c and smaller Ag = Gray
4 - 7 0 0 0 6 - 0 2 Chain assy for large coin hopper
25c and up Ag = Black

I have included so part numbers for some of the hopper parts but you should use the manual when you order parts. I have also included two sections in case you want to convert a normal small coin hopper or a small coin Hi capacity hopper to a large coin hopper for those who want to dispense larger tokens or the $1.00 coin. As an option, I recommend installing the 270359-01 Baffle plate update with hanging nylon strip if the hopper does not have the updated baffle plate. There is nothing like looking at the manual and its pictures to help you pick the parts you need.

Parts to convert a small coin normal capacity hopper like a -02, -04 et cetera into a -06 large coin hopper:
- 4 70006-02 Chain assy for large coin hopper Ag=Black [=====]
- 2 51137-02 Shaft Large coin. -|----
- 2 51712-02 Agitator Large coin Upper Moon agitator cam G
- 7 01130-13 Roll pin (for upper Moon agitator cam) ==

- 3 50472-02 Agitator Cam large coin (shaft end normal) O
Take from the old Chain assembly: Tie Bracket at bottom ==== 3 50488-01
Optional: 2 70359-01 Baffle plate (update with hanging nylon strip)

Note: When making the conversion to large coins the baffle plate will be moved from to the set of holes nearest to the chain assembly to the nearest set of holes away from the chain assembly..
Parts to convert a small coin Hi Capacity hopper like a -08 into a -09 large coin hopper.
- 4 70006-02 Chain assy for large coin hopper Ag=Black [=====]
- 2 51137-02 Shaft Large coin. -|----
- 2 51712-02 Agitator Large coin Upper Moon agitator cam G
- 7 01130-13 Roll pin (for upper Moon agitator cam) ==
- 3 50891-02 Agitator Cam large coin (shaft end Hi-cap) O
Take from old Chain assembly: Tie Bracket at bottom ==== 3 50488-01
Optional: Note: I always put the hanging nylon baffle in all hoppers.
- 2 70359-01 Baffle plate (update with hanging nylon strip) ===|======

Note: When making the conversion to large coins the baffle plate will be moved from to the set of holes closest to the chain assembly to the furthermost set of holes away from the chain assembly..

A few of the common Rowe Hopper parts list
- 4 70006-01 Chain assy for small coin hopper Ag=Gray [=====]
- 4 70006-02 Chain assy for large coin hopper Ag=Black [=====]
- 2 51137-01 Shaft Small coin -|----
- 2 51137-02 Shaft Large coin. -|----
- 7 01209-03 Washer for shaft o
- 2 70359-01 Baffle plate (update with hanging nylon strip) ===n========
- 3 50488-01 Tie Bracket at bottom ====
- 3 50472-01 Agitator Cam small coin (shaft end normal) O
- 3 50472-02 Agitator Cam large coin (shaft end normal) O
- 3 50581-01 Agitator Cam small coin (shaft end Hi-cap) O
- 3 50891-02 Agitator Cam large coin (shaft end Hi-cap) O
- 4 50342-05 Agitator Small coin gray o
- 4 50342-04 Agitator Large coin black o
- 2 51712-02 Agitator Large coin Upper Moon agitator cam G
- 7 01130-13 Roll pin (for upper Moon agitator cam) ==
- 6 50279-01 Funnel Fixed U
- 6 50279-02 Funnel Intermediate Hi Cap hop U
- 6 50282-02 Funnel Sliding U
- 2 52245-01 Nylon strip and bracket assy for updated Baffle plate.
- 2 70239-02 Hopper brush ============|||||
- Dry Slick Cleaner & lubricant for hoppers | |==

A few of the more common Rowe Hopper parts list

- 4 70006-01 Chain assy for small coin hopper Ag=Gray [=====]
- 4 70006-02 Chain assy for large coin hopper Ag=Black [=====]

- 2 51137-01 Shaft Small coin -|----
- 2 51137-02 Shaft Large coin. -|----
- 7 01209-03 Washer for shaft o

- 2 70359-01 Baffle plate (update with hanging nylon strip) ===|======
- 3 50488-01 Tie Bracket at bottom ====

- 3 50472-01 Agitator Cam small coin (shaft end normal) o
- 3 50472-02 Agitator Cam large coin (shaft end normal) o
- 3 50581-01 Agitator Cam small coin (shaft end Hi-cap) O
- 3 50891-02 Agitator Cam large coin (shaft end Hi-cap) O

- 4 50342-05 Agitator Small coin gray o
- 4 50342-04 Agitator Large coin black o

- 2 51712-02 Agitator Large coin Upper Moon agitator cam G
- 7 01130-13 Roll pin (for upper Moon agitator cam) ==

- 6 50279-01 Funnel Fixed U
- 6 50279-02 Funnel Intermediate Hi Cap hop U
- 6 50282-02 Funnel Sliding U

- 2 52245-01 Nylon strip and bracket assy for updated Baffle plate.

- 2 70239-02 Hopper brush =====b

- Dry/Slick Cleaner & lubricant for hoppers |Dry/SLick|=

When ordering parts, always get the hopper part number off the front of the hopper and then use the manual to choose the correct part number.

4 - 7 0 0 0 6 - 0 1 Chain assy for small coin hopper
25c and smaller Ag = Gray
4 - 7 0 0 0 6 - 0 2 Chain assy for large coin hopper
25c and up Ag = Black
2 - 7 0 3 5 9 - 0 1 Baffle plate update
2 - 5 1 7 3 7 - 0 1 Small coin shaft
2 - 5 1 7 3 7 - 0 2 Large coin shaft

3 - 5 0 4 7 2 - 0 1 Agitator upper Cam small coin
^ older hopper upper cam
3 - 5 0 4 7 2 - 0 2 Agitator upper Cam large coin
^ older hopper upper cam
^ for -02, 04, 12 etc Hoppers

3 - 5 0 5 8 1 - 0 1 Agitator upper for Hi Cap Hopper
^ Small coins
3 - 5 0 5 8 1 - 0 2 Agitator upper for Hi Cap Hopper
^ Large coins
^ for 08, 09 etc Hoppers

2 - 5 1 7 1 2 - 0 2 Large coin nylon cam assembly
7 - 0 1 1 3 0 - 13 Pin for large coin agitator

4 - 5 0 3 4 2 - 0 5 Agitator Small coin gray
4 - 5 0 3 4 2 - 0 4 Agitator Large coin black

4 - 5 0 3 4 0 - 0 1 Black ratchet motor to hopper coupling
7 - 0 1 1 0 1 - 2 6 Pin for black ratchet coupling

3 - 5 0 4 9 1 - 0 2 Motor assembly, All except BC100
3 - 5 0 4 9 1 - 0 5 Motor assembly for BC100
3 - 7 0 0 4 6 - 0 1 Gearbox (heavy duty) for all but...
With the BC-100, use old hardware from the old assembly
2 - 7 0 2 3 9 - 0 2 Hopper brush
Dry Slick Cleaner/lube for hoppers

The 4-70006-01 Plate assembly is for 5c, 10c, 25c and smaller tokens.
The 4-70006-02 Plate assembly is for 25c and large coins/tokens.

When you replace the entire plate chain assembly you will have to use some of parts from the old hopper. These are the small metal bracket on the bottom of the old assembly plus the shaft, metal washer, screws, cams, etc.

Conversion from a small coin to a large coin hopper.

U = Hi Cap - large coin upper cam = use 350581-02
U = smaller hoppers like -02,04, etc = use 350472-02

-----U---------- Baffle plate - See note:
--=-- Cam 251712-02 + pin701130-13
|
====|================ plate assembly ^ shaft 251137-02

Note: The new baffle plate with the nylon strip is
part # 270359-01 and I recommend using it all hoppers.
\---------- Baffle plate
----------=| bracket with nylon strip

~~~~~~

You can purchase a complete full chain assembly replacement Small Coin to Large Coin conversion kit for the Hi capacity. These are for the Hi Capacity hoppers. They have all required Chain assembly, shaft, pins, agitators, etc.
Part # 270332-02 Small coin to Large coin hopper Hi Capacity conversion kit.
~~~~~~

The Hopper Rivet Fix - A Serious Problem with a simple fix –

By Bruno D Puglia
February 16, 2005
http://www.eastcoastamusements.com

A very serious rivet problem may be found in small coin [–02,-04,-08, etc] hoppers which causes serious coin jams. These are the hoppers with the 4 ribbed gray agitators. The rivet closest to the agitator can be loose or the smooth edge facing the agitator can wear. The rivet wear and/or looseness can cause a quarter or a nickel to lock between the gray agitator and the rivet. This problem will drive you crazy because you chances are you will never see it actually happen. In the picture [A] below you can see the quarter jammed between the agitator and the rivet. It is important to look at the rivet for a lack of smoothness and/or if it is loose. If you see the problem fix the rivet it because the jamming can cause damage to agitator, hopper motor, gearbox, and/or the black hopper racket which drives the hopper shaft. In picture [A] also note the agitator edges are chewed up and nicked which is beyond normal wear. This is a sure sign the coin rivet to agitator jamming is occurring. When I use the word "file" I actually mean I use my Dremel tool with a very small round cutting tool. If the rivet is tight but the edge facing the agitator is worn you have to file just the edge of the rivet facing the agitator smooth so the coin smoothly rides over the rivet. If the rivet is loose it can rise, and/or if it rotates you can take the chain assembly apart and hammer the rivet tight. Then you can file the edge of the rivet facing the agitator smooth or you can do the screw fix in picture B.

Picture A

Picture B

If the rivet is missing or damaged I have used a small brass flat head 4/40 ¼ "screw in the hole. See picture [B]. If the rivet is there I drill it out. I enlarge the original rivet hole in the chain assembly using a # 35 drill. With a #9 drill I make a countersink hole deep enough so the flat head screw lays even with the surface of the chain assembly. I put the screw in the hole and hammer the backside

thread end of the screw flat. This holds the screw in place. This procedure is good for a missing rivet or if you have troubles filing the original rivet smooth so the coin slides over the rivet. With this flat head screw fix you will **never** have to worry about a hopper jam caused by a rivet problem.

"**May the Dry/Slick be with you!"**

Cleaning Mag Head Pressure Rollers

Rowe has designed a card using paper and thin double sided tape to clean ink, dirt, and other containants off the magentic head pressure rollers. The one sticky side is attached to the paper and when you are ready to use the card remove the protctive aper to expose the sticky tape. Then stick the card into the acceptor. While the cards were made for the BA50 acceptor they can be used on all Rowe acceptors (except the RBA-7) and other acceptors. Some aceptorts do not pull the paper into the acceptor so you will have to hand crack the acceptor. People who have seen me work know I always use tape to clean the roller/s under the magnetic head/s.

Rowe Part # 252548-01

Rowe now has a card for the RBA-7. Use 252548-03

Bruno

Clean51T.pgs Mar 05, 2005 1T

To join the MAGIC WAND CLUB buy one of NECo's Trinity Oilers or a similar type.

Your dues are:

1 Buy an oiler, Trinity, Radio Shack's Lubricator # 64-2301A or Rowe's silicone lubricant 270628-01

2 Use it for preventive maintenance.

- Warning -
3 Over lubrication and/or getting oil on the belts voids your membership. More is not always better !

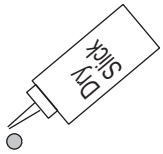
When the oiler is empty you will be a full member in the :

The MAGIC Wand CLUB !
Bruno

Cleaning Rowe Hoppers and Dry Slick !

What can you use to clean and lubricate Rowe Hoppers and clean coin mechs ? Brushing alone is not good enough. Make a wooden or plastic chisel to clean off the hard dirt on either side of the chain. You can grind or file the end of the hopper brush to make a chisel. The product called Dry/Slick is a very good cleaner when wet and when it dries it leaves a surface film which does not collect dirt. It also lubricates the hopper chain. I do not recommend Dry/Slick use where a build up will cause a serious tightening (such as tight shaft and nylon bearing). There is no problem when used on a Rowe hopper or on the coin mech area where the coin slides.

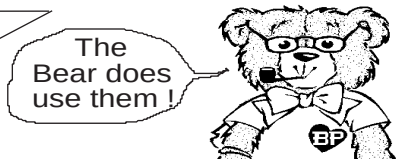
If you can't get hoppers to work right remember "Bruno" can refurbisher your hopper and fix the rivet problem too. . Generally the cost per hopper is $80-$100 if it has normal wear and tear.



Using those Cleaning Cards on Rowe Acceptors ?

Rowe original recommended using **denatured alcohol** (paint or hardware store) to clean Rowe bill acceptors so how can you use these cleaning cards? First, let the cards dry and then apply denatured alcohol on the paper to clean the aceptor. After cleaning with a wet card **ALWAYS run a dry card into the acceptor**.

Over kill should be avoided so **do not** use the cards every week, or month, but just when the belts start to get dirty. You can judge time between card use after the first time use by inspecting the amount of dirt picked up on the card.

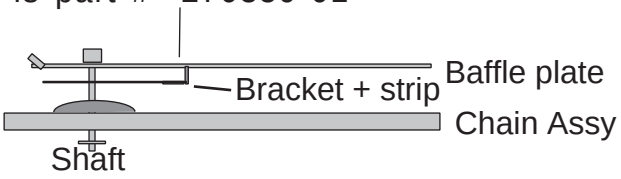


Rubber and belt cleaning should be done when cleaning and lubricating the acceptor. It should be at least once a year and more often in a diry location. Do not over use the rubber cleaner ! Apply evenly with a soft cloth until clean. Wipe off all excess including the edges. Re-Grip is a cleaner and revitalizer.

Rowe Baffle Plate update

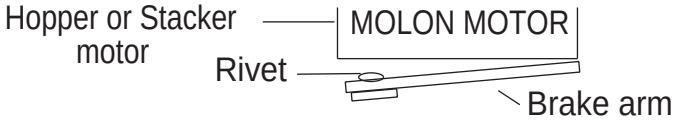
Rowe has added a small bracket and a strip of nylon to the baffle plate in newer Hi Capacity hoppers to allow better control of the coin flow. History has shown the the new baffle plate can be put in older hoppers and, while Rowe has not said so, customers have reported it did help coin flow and reduced coin jams. I like to add the new baffle plate when I refurbish hoppers.

New baffle plate update with bracket +strip. is part # 270359-01



Hopper or Stacker Molon motor coasting ! Dropping extra Coins.

Hopper and stacker motors can have brake failures which cause the motor to coast. Many older motors had a hole in the brake arm but no non-magnet rivet was not installed. This rivet prevents residual magetism the brake arm from sticking to the motor frame after the power has been removed. This holding of the brake arm can cause extra coins to be dispensed or a stacker to coast by the stop micro switch. The rivet is a very small headed rivet You can order a new brake arm which has the rivet installed (270299-02) or add a small non-magnet rivet in the old brake.

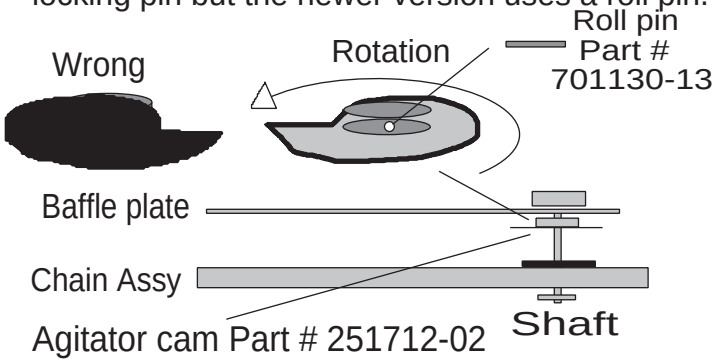


A hopper's life cycle depends the type of cleaning and maintenance you give them. Do not presume they only need work when they are in a failure mode. Basics such as slowly pouring the coins into the hopper, brushing and chiseling the tracks routinely, using Rad Dry slick and lubrication of the shaft and upper agitator will add years to the life cycle of your hoppers.

Hopper Upper Agitator Defect !

In March 1997 a vendor reported he had gotten upper agitator cams which were defective. The nylon cam was mounted on the metal ring backwards. We found half of the units in our parts box were backwards. We also found two hoppers in our machines with the backwards agitators. We replaced them. The defect may have first shown up in 1996 ! As the cam turns the small edge should start cutting into the coins.

On another note, early versions used an allen locking pin but the newer version uses a roll pin.



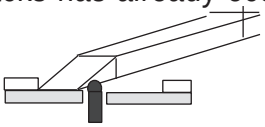
Hopper Latches - Coin Count

Some hoppers pop backwards and away from the motor's ratchet when a jam occurs. Actually the ratchet should pop backwards towards the motor but because there is something wrong with the device that is designed to hold the hopper in place the hopper jumps backwards. The devices used are latch springs, movable metal latch arms, and the one which may be missed by you, a large rubber pad. Many times I find the rubber pad is missing because it fell off. I see this in machines like the SPC-2 and other machines too. If the machine is get hot inside the glue weakens and the rubber falls off. Some hoppers have handles which hit the rubber pad but some handle plates are bent or even missing. Now when a jam occurs the hopper may move forward and away from the ratchet and the hopper may, or may not, fall back to the normal resting position. This can cause a shortage of coin payout and the changer may go out of service even if there are plenty of coins in the hopper.

WARNING: Some of the hoppers I have seen lately have stripped holes. The metal used in the plate assembly, baffle plate, and even worst, the material used for the chain ajustment block can not take abuse. Automatic nutdrivers or drills can, and have, caused stripping of the holes. Extreme care must be used when tighting screws. The three chain adjustment screws need snug tension and the lock washers will hold the block in place. Fast is not better. Gross is not better !

CLEANING ROWE HOPPERS !

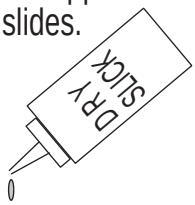
Just brushing a Rowe hopper is not good enough to get rid of dirt build up on either side of the chain. A person should not scrap the plate with a sharp object like a screwdriver, wire brush, or use something like steel wool. Would you use these items to scrap a teflon coated pan ? Of course not ! You can make a wooden chisel out of hard wood or file/grind the back end of the hopper brush into a chisel. How often should you clean hoppers ? What ever you do don't wait till the hopper stops picking up coins. If you do the damage to the tracks has already occured.



Chain

Dry Slick !

What can you use to clean Rowe hoppers and your coin mechs ? A product called Dry Slick is a ery good cleaner when et and when it dries, it leaves slick surface filmwhich does not collect dirt. I do not recommend its use where a build up will cause a serious tightening. (such as tight shaft and nylon bearing). There is no problem when used on a Rowe hopper or on a coin mech area where the coin slides.

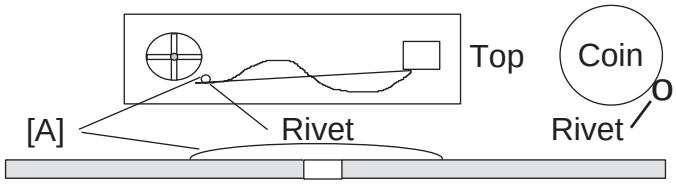


Consider having me REFURBISH your hoppers. I'll take care of the rivet problem, fix the track edges better than new and replace worn parts. If you don't have the baffle plate with the nylon strip on it I'll put it in. The cost will normally run $80 to $100 per hopper but the cost will be a good return on your investment. You have better running hoppers, extend the life of the hopper and other parts like motors and the gear boxes. I do more than just do a cleaning and replace an agitator. . Get those hoppers refurbished now, don't wait !

Hopper jams or coins bridges can be caused by dumping the coins into the hopper and/or shaking the coins down. Slowly pour the coins into the hopper. Failure to do it right leads to coin bridges and/or coin jams. The coin jams can cause hopper motor or gear box failures. Re-read the manual for instructions. Make sure items like paper clips, string, paper, etc, does not get into the hoppers.

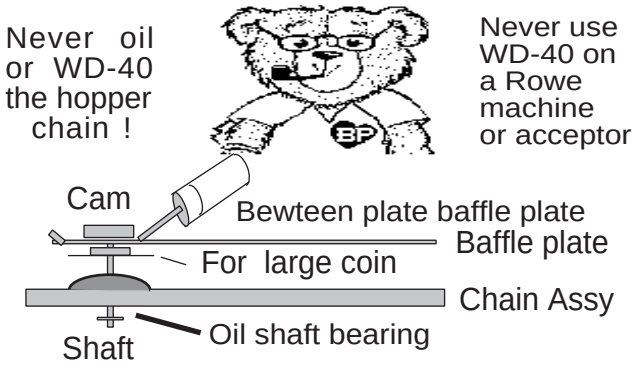
Hopper Rivet Jams

We have seen two rivet problems with the small rivet near the gray agitator. We have noted gray agitators with nicks in the rounded blade edge surfaces. These nicks are caused when quarters or quarter sized coins get stuck between the rivet and the gray agitator (point A). This occurs when the rivet is loose rivet or the rivet no longer has a smooth edge. If you take the main plates apart you can hammer/punch a loose rivet tight. If the edge of the rivet is no longer smooth you can file the edge smooth so the coin slides over the rivet.



HOPPER PLACES TO OIL !

We have found it pays to oil both nylon bearings used for the hopper shaft. Oiling the area where the cam/s hit the baffle plate with Magic Wand, Radio Shack or 3 in 1 Oil will reduce the amount of friction and make the hopper easier to turn. This will reduce wear and tear on the hopper Motor. Do not use other stuff like WD-40 on the hopper. RAD Dry slick should be used on the chain.



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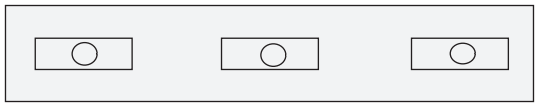
The Latest Rowe Hopper Motor

The latest Rowe hopper motor [part #450491-02] is made by Merkle-Korff Ind. While this motor is only 1/8" longer the Multi Products motor the back end is quite different. Originally Rowe's motors were a lot smaller so the metal cover was OK. Then came the longer Multi Products so holes were drilled into the cover. The Merkle-Korff motor is different so you have to cut new holes in the metal cover. If you decide to leave the cover off remember it also pro- tected anything that might conflict with the free movement of the motor's brake. If you leave the cover off make sure you remove anything in the bill changer which could conflict with the brake's opera- tion. When working in the bill changer keep your fingers away from the motor/s.



Fixing Mutli Products Stacker and Hopper Motors

IBrake problems are sometimes fixed with a brake Pawl 270233-02. A brake metal arm replacement part number is 270299-02. Keep old assemblies noting if motor or gear box is good or bad. At some point you may be able to put a good motor on a good gear box or visa-versa. You may even be able to take a bearing bracket, armature, etc, and repair a bad motor.

I have noted in some cases (chatering) a new motor is purchased because the manual in dicates the motor is may be at fault. It might be a brake problem but generally it is not the motor but the control board. Before buying a motor swap/move it with anotherr motor's. It is easier for me to use an AC power cord (fuse or breaker protected) with clip leads to check hopper stacker motors. Always measure the motor coil with an ohm meter before connecting the power.

A hopper or stacker gear box/motor failure may indicate there is a primary fault in the hopper or stacker and a replacement of the motor assem- bly does not address the real problem. See my other notes on hoppers, etc.

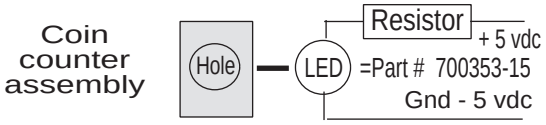
Generally when a hopper or stacker motor shorts you will find a connector pin and/or the copper on one of the boards has also burned open. You may find burnt copper on the stacker driver card. In the new bill changers you may an open the small connector board in back of the dispenser, or on the power supply card.

If you do have blow a motor you should look for the reason it blew. It maybe worn rollers or shaft on a dual stacker, or bad triacs in the control unit causing motor to chatter and burn, etc, etc.

If the black ratchet which drive the hopper is worn you may have a rivet problem in a hopper or some other hopper problem and it maybe time to have the hopper refurbished.

Coin Counter Red LED

The new series of bill changers (SBC-2/4s) and BC-xx00s) use a red LED light source for the coin counters. History has shown three types of problems. [1] The supply voltage (5vdc) must reach the LED board and counter assemblies. [2] There have been cases of bad connections on the LED and counter assemblies plus cable connectors. [3] The mis-alignment of the LED's narrow light beam can miss photo cell on the counter. These problems are generally field repairable if you know what to look for and have a soldering iron. Bad connections may be hard to see. You can use a meter to locate the problem. The LED may be bad or you can not find the problem so the worst case would be you have to replace the LED assembly and align it so the beam hits the counter's cell.



Counter assemblies:
Old BC9-35 changers and updated BCxx00 kits with short wire leads and spade lugs: 251757-01
You must follow the color code. Blue = +5vdc
BCxx00 changers with 2 pin connector use 251757-02 assembly

Checking coin counters and escrow bucket s in Rowe bill changers "CHECK XXX DET COIN COUNTER"

There are error messages which say check a left, right. or center coin counter. This error can be caused by a hopper motor running when it should be off or maybe the motor has a slow or bad braking action. When a second extra coin dropped you get an error message to check the coin counter. After reseting the error message dump (test) all the escrow buckets and count the coins looking for any which contain extra coins. Extra coins could be a counter problem or it may be a motor running, chattering or has braking prob lems. We have seen cases where the control computer caused the hopper motor to run, or chatter, when it should be off. This causes extra coin/s to be dropped and get a "CHECK XXX DET" error message.

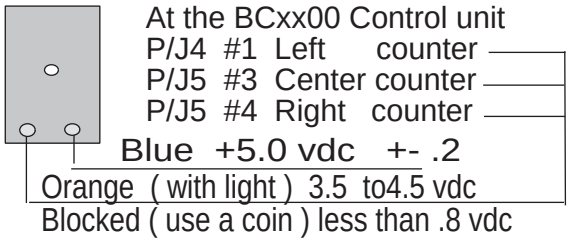
CHECK XXX DET
Always count the coins in the escrow buckets !

BXCOUNT.PS Feb 16, 2005 1S

Checking Coin Counters used in the new series of bill changers

Another part of the coin count system system is the photo cell assembly. Use a meter to check the cell's operation. You need + 5 vdc on the blue wire. You should have => + 3.5 vdc on the orange wire with the LED shining on the cell. When the light is blocked the voltage should below .6 vdc. Refer to the manual for details You may have to push function reset button to clear a coin detector error after doing any testing.

I use the meter on the orange wire to find the peek in voltage has I align the LED assembly. This is better than eye balling the alignment.



Bad coin counts

Over the years we have seen the wrong coin counts end up in the escrow buckets. We have seen a motor run when it should be off and extra coins fall into an escrow bucket. Generally there is a CK xx Detector error. There are items which effect the escrow diverter doors. We have seen a loose or missing roll pin in the diverter door. One case of the diverter door drive yoke was reversed and the tip which normally rides on the steel ball was found in the down, not up position. While not noted in the newer machines we have seen cases of the steel ball missing or the spring was too weak to hold the diverter door in the correct position. We have seen a bucket doors hang open because of burrs on the plunger which catch on the linkage. Sometimes the doors are too tight. The doors should have a little bit (1/32-1/16") side play. You can remove a door nylon spacer and file it down a bit. We have seen worn bucket doors and linkages hang the bucket door open for a while. In this case extra coin/s dropped the vend and the next vend is short. Since the total count for the 2 vends (say 1 more and then next less) is correct so no error message is given. People who convert older machines to the new version, may in the near term, have to replace worn bucket door assemble/s. You may not have seen any these problems but from time to time they will show up !

A temporary field fix for BC1200,1400,BC3500 with "Check XX Detector problems." Pulling P5 from the control unit makes it a BC100 $1 and $5 changer. If the left detector is working re-program the changer for $1 & $5. If the left counter is not working swap LEDs and /or counters from the center and/or right till left counter is \working. Once the left is working you will have a working BC100 $1 and $5 bill changer till you get the parts to fix the bill changer..In September 2000 I learned Rowe changed wiring so this may not work on some changers. Try it, you got nothing to lose.

TAKE NOTE : Keep red LEDs assemblies on hand. There are two types. Original Bxx00 Changers with 18' of wire and connector plug assembly are part # 450761-01 and the updated BC12,12R,35 to BC-1200,1400,3500 changers use 450761-02 which has short 4" wire leads with lugs. Follow the color code !

At some point in time you may want to check out my other Bear notebook articles because they contain a great deal of related material. You will find them on Bruno's Page in http://www.eastcoastamusements.com/ then: left click on: **Visit his page for service notes and tips.** **OR:** http://www.eastcoastamusements.com/services.htm and then click on the BEAR with the flower!!

Note: These files were checked with Acrobat Reader 7.0. Earlier versions **may not** view/print correctly. I know version 5.0 will not work correctly.

If you click on that tile name and if your computer is loaded with the Adobe reader the file this will open up an Adobe window. If you want to save the Bear Notes .pdf file/s from the Bruno page you can right click on the article title and a window will appear on the screen. One of the selections will be Save Target As. Left click on it and a Save As box will appear and you can select where you want to save the .pdf file. You can save the file on your own computer.

You will want to check the East Coast Amusements site for revised or new articles. I do have more titles in the works. Here are some the posted articles.

ROWE 4900 ACCEPTOR ISSUES
ROWE BC-1 BILL CHANGER
THE MAGIC WAND (Dick's - my favorite)!
CONNECTORS - FIXING AND TESTING (another good one)
ROWE BILL CHANGER HOPPER REPAIR
MEASURING VOLTAGES
BUCKET POWER ON ERRORS
ROWE STACKERS
MAG HEAD LOOP SECRETS
DREMEL & ROWE STUFF
FEK MOTOR TEST UNIT
OBA ACCEPTORS
JACKPOTTING, FS, BUCKET POWER ON & CRASHES
BC-8 to BC-35 Bill Changers
CBA_UCBA
Basics_101
BCxx00_bill_changers

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Adobe Acrobat printing of some drawn picture pages correctly may require using Acrobat printer setup and setting Print to image on.

Please take note that East Coast Amusements is supplying the Bear Note pages on their web site for you and for me at their expense. I just write and East Coast Amusements does all the rest.

To East Coast Amusements
> THANKS ! Bruno 1F