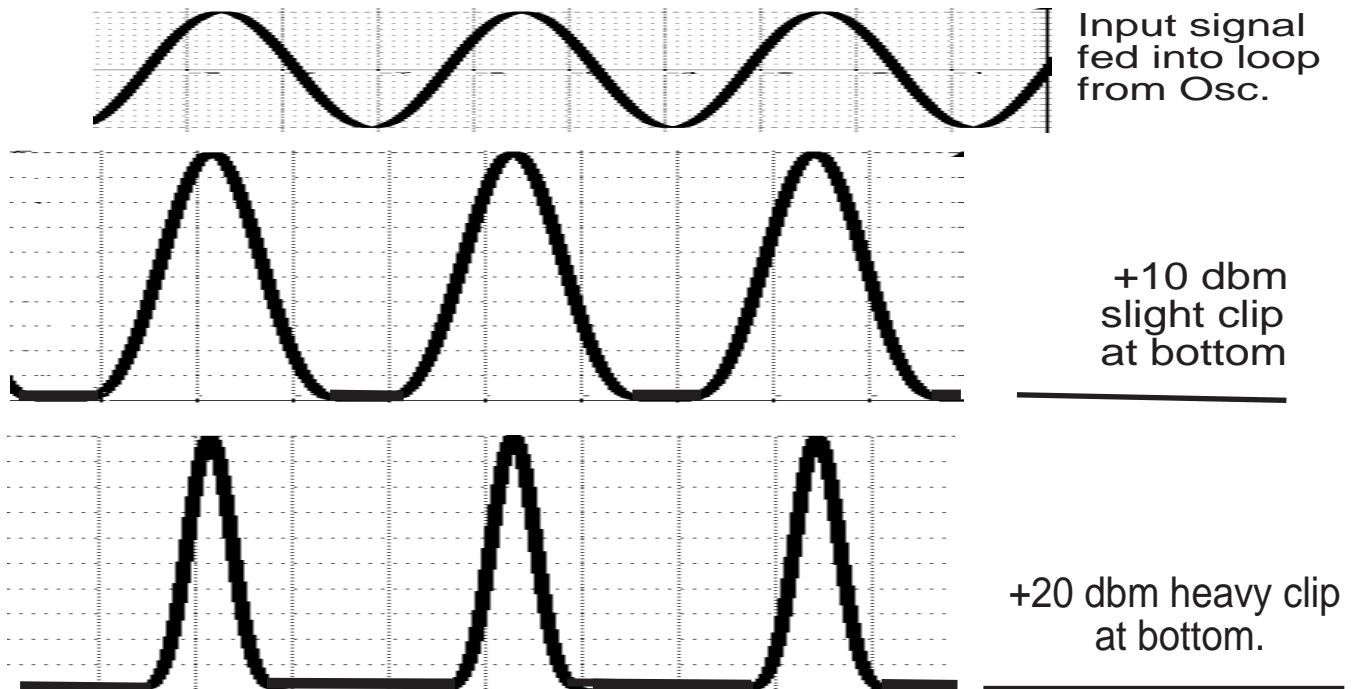


# The Bear's magnetic head and amp Test Loop and other goodies

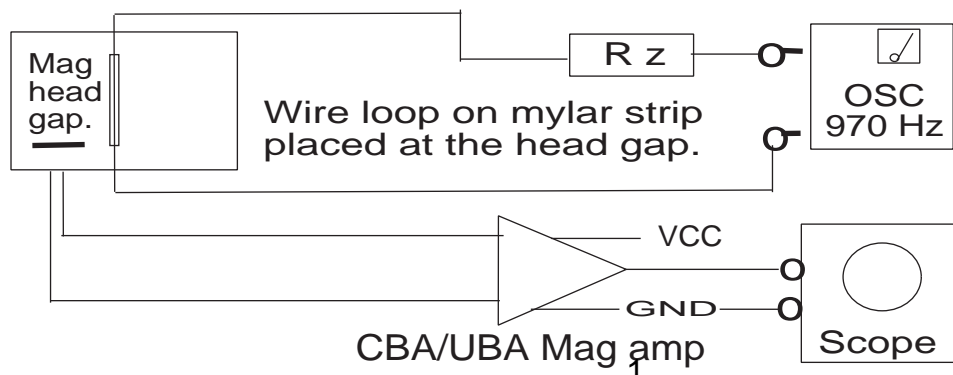


Use the frequency of 970 Hz

The above pictures were made with sin (X) math and plotter program but they are accurate enough to give you an idea of what to look for. As you vary the Osc output between 0 and +20 dbm you will see the signal start to clip at the bottom. This level is a pointer to the condition of the head and mag amp. Compare a new head with some bad heads. Distortion (not clipping) is another sign of a bad head/amp. You can also do audio frequency sweeps to check frequency response.

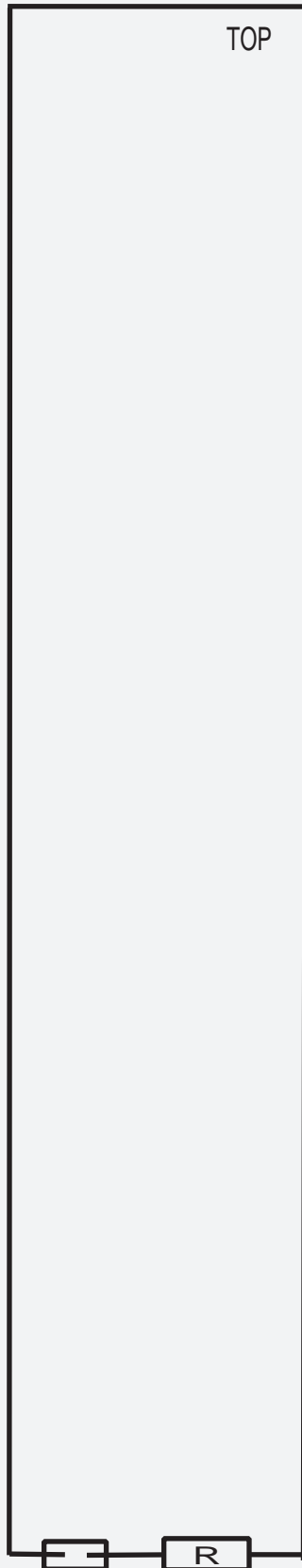
Input levels can be watched with 2 channel scope, ac meter, audio level meter, AC meter (vac), etc. My Audio generator has a calibrated output level meter. You can use low Z function generator. For a 50 ohm generator, use a 50 ohm series R in the loop circuit. The series resistor RZ must match the generator's output Z.

The frequency of 970 Hz was selected because Rowe magnetic head bill changer BC8 in the late 1970's and later on the BC-9 and BC-10 mag amps use a very sharp filter at 970 Hz.



Bruno  
Oct 16, 2004 1B  
MAGLOOP1.PGS

Wire must align with and cover the mag head gap/s.



Connector

## The Bear's Wire Mag head Loop

This Mag loop will induce the generator's signal into the mag head/s OBA, CBAs, UCBA's, BA50's Mag1 and Mag 2 heads, plus others via the gap. When the unit has a built in mag amp you will be checking the amp too. The wire must be wide enough to cover all of the mag head gap.

To make the loop, prick holes in the sheet keeping the long vertical wire runs on the bottom and head gap section on top. Cover the wire with tape to protect it and keep the wire in place and insulate them. You don't want a short from the wire to the head because it can cause ground loops (depending on the generator used) and you do not want it to short the head or gap.

This drawing shows a 2 pin connector. I use a connector to switch from one loop to another loop. Plastic or mylar .012 - .018 thick stock. The last one I built uses Avery insertable dividers #11200 plastic stock. The plastic is has wide has a bill and It has to be long enough to reach from the front of the acceptor to the mag head/s. The reach on a BA-50 is long. I used solid enameled #24 wire I pulled from a solenoid..

"R" = the output Z of  
the generator used:  
600 z = 600 ohms  
50 z = 50 ohms



Bruno  
Oct 11, 2004 1G

## The Bear's magnetic head and amp test loop How to:

My favorite audio generator for the loop is an old 1972 Heathkit 1G-72 audio generator I found in a flea market. The tube rectifier was bad so I pulled it and replaced it with diodes. It has a 10 DB step switch attenuator and a variable attenuator and has a 7+ VAC output. I have used HP generators and HP audio level meters, and various waveform generators including audio sweep generators for frequency response plotting. I have used analog and digital meters and/or a scope to read the amount of signal from the generator. I prefer using my Heathkit generator which has a large built in audio level meter.

Generally you will not be able to see if the loop wire is directly over/under the gap so move the loop strip in and out head watching the scope for the signal to peak. If the motor does not settle down after inserting the loop just disable it.

You can power up an acceptor like a CBA/UCBA-2 which has a built in mag amp and stick the loop into the acceptor and put the scope on the Mag amp output P8 pin 4. CBA-4 use P4 pin 3. RBA-7 has upper and lower mag. RBA-7 Upper use P4 pin 4. RBA-7 Lower - Turn loop over and use P4 pin 4. A fine tip on the scope probe helps.

I showed a CBA/UCBA-2 magnetic amp board in my test setup for a reason. For tests of a magnetic head which does not have a built in amp like OBAs, BA3-35s and other heads such as Ardac MBA heads I use a good magnetic amp board taken from CBA-2 has my basic test amp. I knocked out the head and amp board from the CBA-2 upper track. I removed the worn mag head and with a little hacking I put a two pin connecter on the two mag head connections. I have various two wire cables for various acceptor magnetic heads such as the OBA and BA series. I have a 4 pin connector for the CBA-2 mag head test board for the +/- 5 vdc for power and I have a place to connect the scope to the amp's output. I like having a standard mag amp test board when testing bare magnetic heads. This amp board also supplies the required DC bias for the magnetic head.

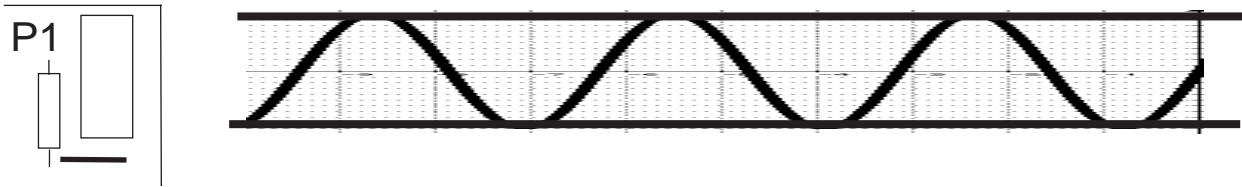
The key to using the test loop is to test good and bad heads and note the levels. In order to see the "clip level point" or distortion you need a scope. You will quickly find the break point for good and bad heads. You will also find bad heads where you will see distortion of the signal.

Remember the magnetic loop was designed to inject a signal across the head and it was used to setup magnetic tape amp playback and record equalizer responses. The loop does not look like a big deal but it is a very powerful test tool. If you want to test a mag amp in a control unit for OBA CCU, BA3 [ BC8, 9 or 10 ], BC11-35, etc just insert the loop in the acceptor and do your testing. Check the levels or do a frequency response curve. If you do the test before and after changing bypass caps you will see the gain increase. It is great tool for finding intermitting connections and conditions.



A Rowe BA50 can be tested in the bill changer or a test bed. I do the test on the test bench where I have the generator and scope. I put + 5 vdc directly to the mag head amp board [Pin 4 +5 vdc and Pin 1 -common] via the 4 pin connector. I pickup Mag outputs #1 [Pin 2] and Mag #2 [Pin 3] outputs on the 4 pin connector.

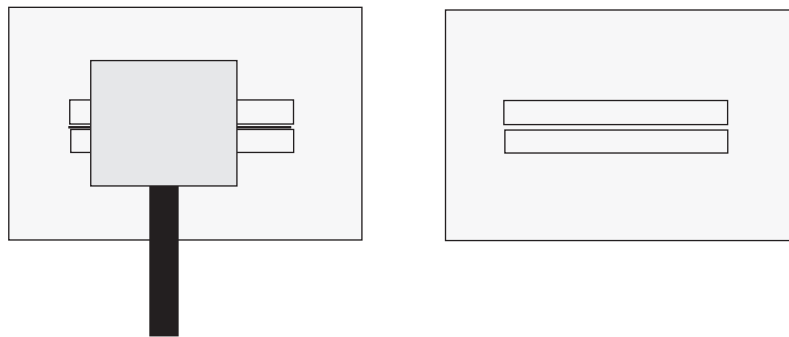
Up to now the clip point [at bottom] has been based on Rowe equipment and the CBA/UCBA amp but the loop test procedure can be used on many acceptors with built in mag amps. Example: MARS VFM3. Remove the two screws holding the main computer board and hook the scope to the .47 uf mono cap next to P1 to pickup the mag amp output. [The P1 cable comes from the upper part of the acceptor which has the mag head and mag amp]. Be careful around the mono cap lead. Some old mono cap leads tend to break away from the cap. Unlike Rowe amps the clip points for this Mars will be balanced at the top and bottom of the signal.



Restoring a magnetic head's gap !

I do not use this procedure on sensor type pickup heads.

Magnetic heads in bill acceptors take a beating from the bills passing over the head. Cleaning, and where required, lubrication keeps the acceptance rate high and the reject rate low which reduces the magnetic head wear. Over time the magnetic head gap can become shorted when the metal smears across the gap and this will reduce the acceptance rate. One of the Bear's tricks is to re-surface the head and restore the gap opening with Dremel tool. A Dremel # 414 1/2 inch felt polishing wheel with #421 polishing compound is used at slow speed to clean up the head gap. Move the Dremel tool side to side along the head's gap. Don't over do it ! In many cases this will restore to gap opening. This extends the head life and this helps keep the end user's, or your, cost of the repair/rebuild down. I don't know what other repair shops or techs do but I have been doing this procedure for many years. There are other polishing compounds which you may find useful. Formax and others make a series of compounds and some companies offer 4 and 6 bar compound kits.



Dremel # 414 1/2 inch felt polishing wheel with # 421 polishing compound



Location: \_\_\_\_\_

Date: \_\_\_\_ \_\_\_\_, 2004

From Eq: \_\_\_\_\_

Acc Type \_\_\_\_\_

Serial #: \_\_\_\_\_

Error: \_\_\_\_\_

Problem: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

When removing an acceptor for repair please note why it was removed and what unit it came from. Please note any error message, error code, or status blinks.

In the picture below the dark stuff on the head came from the pressure roller. Never leave the mag head pressure wet [after using wet cleaning card]. Never store the acceptor without inserting a piece of white paper between the magnetic head and the pressure roller. High temperature in a hot storage area can increase the transfer of the rubber to the mag head.

Another Bear note from Bruno !



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### THE BEAR STRIP FOR ACCEPTORS:

The data sheet on the left is cut to the width of a dollar bill and stuck into a bill acceptor which has been repaired and stays there while the acceptor is being stored. It is designed to have a place to note data when an acceptor is removed from service but its main purpose is to keep the pressure roller from contaminating or sticking to the magnetic head while the acceptor is being stored. Acceptors are often carried in cars and trucks where the temperature can get quite high. This increases the chance of contamination from the magnetic head's pressure roller or the pressure roller sticking to the magnetic head.

Use very light cardboard or very heavy paper (at least 24lb) for the strip. You don't want the strip to tear when you remove it.

I have been placing the paper in repaired acceptors for many years and I am pleased to see some companies are also sticking a card or paper into acceptors.

I want to remind you to never leave a pressure wet and laying against the magnetic head.



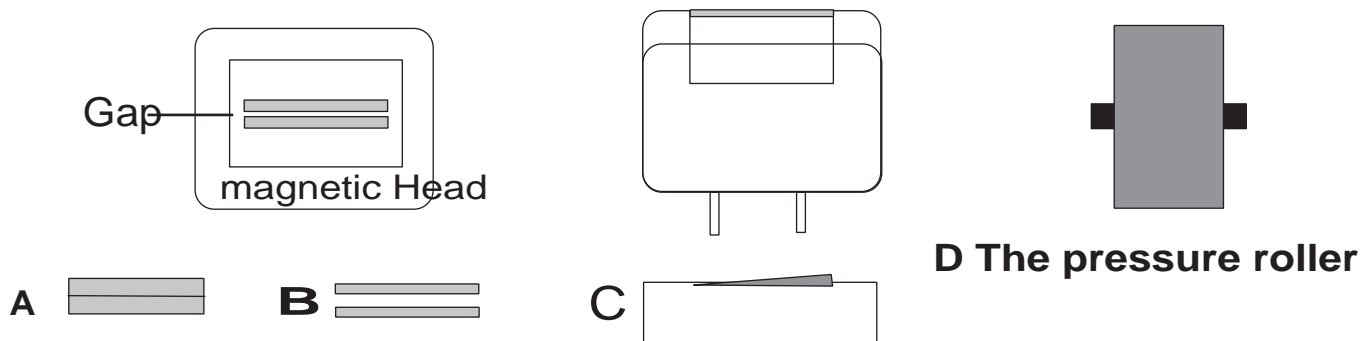
Oct 16, 2004 1B  
MAGLOOP1.PGS

Why do you have to replace a magnetic head assembly ?

Here is a little Bear theory for You !



The bill must pass over the head "gap" at a given speed. With a DC voltage on the head the metal content of the ink produces a signal pattern at the output which matches the printing on the bill. The process is similar to reading a magnetic tape. The computer logic and the programming determine if the bill matches known parameters from the head and photo cells, alla \$1, \$5, \$10, etc. If the head does not produce a valid signal pattern match, the bill is rejected.



In figure A we see the gap no longer exists. The metal from one metal pole actually touches the other side. The gap between the pole is reduced or missing. The magnetic field that would be there with a good head is short circuited. Another common problem occurs when the head pole pieces wear downwards and the gap widens [B].

In figure C I attempted to show the poles are worn unevenly. The wear can be such that the poles are sunken downward, are uneven, or have both problems. This type wear varies a great deal and wear will effect the reading of the bill.

Figure D is a normal magnetic head pressure roller used to push the bill against the mag head. It can be bad for many reasons. It may be stuck to the head, uneven, roundness has turned into egg shaped or be contaminated with ink, metal, or other material which effects the magnetic field. Often we find the spring has weakened and no longer putting enough pressure on the bill. Sometimes the pin holding the assembly is to tight or rusty and the pressure assembly is not free to move

I cannot tell by visual inspection alone just how good or bad a head is. This is why I built and use my special Bruno mag head test to tell me how good or bad a mag head is electrically.

For me, and you, the test of the head one of the major factors for deciding dollar wise to replace the mag head. If may be ok under bill test but a head near failure will, in the short term, give you poor acceptance. Without the Bruno test you are at risk for additional down time and expenses unless you shot gun it by replacing the head up front.



Mag head 2 1E  
Oct 11, 2004

# When do you have to replace a magnetic head assembly ?

particularly

Perhaps you will not understand all of this information about magnetic heads but let me say it is very important to you in terms of down time, repairs and your bottom line. A history of CBA-2s and UCBA-2s in the last part of 1993 showed magnetic head replacement ran at 24 %. In the first part of 1994 it ran at 30 %. Most of the serial numbers were in the range of 400,000 to 600,000 but this does not mean a low serial number unit must get a new head. Many older serial numbered units may have gotten lot of use, and/or even worst, rejected a lot of bills. Extra reject bill passes back and forth over the head means a shorter head life and it adds extra wear and tear on all acceptor parts. Many units end up with a bad or sub-standard mag heads. Vendors who run the acceptors into the ground end up with a higher head replacement percentages and have higher repair expenses. In 2004 a mag head's condition may be very bad to very good [particularly after Dremeling the gap and deguassing the head] so can a repair shop really tell if a mag head needs replacement or not ? I can !

Before the vending field I worked in radio and TV broadcasting where I had the chance to work with the man who made the first magnetic test tape standard for the National Bureau of Standards. With the magnetic wire loop theory background behind me in 1992 I was able to design and implement a magnetic head and amplifier test for bill acceptors which puts a figure of merit on the mag head and whole head assembly. It actively tests several parameters of the magnetic head and it's amplifier. Electronic wear, and/or it's life, cannot be gauged by just accepting bills or by just doing a visual inspection. Accepting 5, or even a 100 bills, does not mean the head will be ok a few months down the road. Once a mag head starts rejecting bills, the bill reject rate will increase rapidly so this test is very important.

If a mag head fails the test, or the test shows the assembly is in a degraded (weak) state, the head assembly is replaced. This test is not concerned with any other factors of bad acceptance such as motor, speed, belts, belt tension, tracks, path, pressure roller and springs, anticheckers, cells, LEDs, cables, logic module, etc. The test results is not a guess, or assumption, and the test is not subject to misleading results due to anything else in the acceptor. The test is not concerned with the condition of bills used for testing. The test assures good heads will not be needlessly replaced. The test finds those heads which will have to be replaced in the near term. If you do not replace a sub-standard head up front you will soon find less money in the bill box and you will be putting extra wear and tear on your acceptor. When the acceptance rate falls off, or it stops accepting bills, you will have to get another repair made to replace the mag head assembly. The mag test was designed to reduce the odds of having to get a second repair in the near term. The test tells us if the head still has life on it and does NOT have to be replaced. Another feature of the test is it tells me the mag head assembly is ok so if there is an acceptance problem, it will be found some where else in the acceptor. As an example a bad motor and/or excessive motor brush electrical noise.

To provide the lowest overall cost to the vendor we must know if the head is good or not before doing any repair work. Without the test, all the other work and lubrication would have to be done before we could put a bill in the acceptor to see if the head is ok or not. Without the test, even if it did accept bills, we are not able to say how long it will last. There are paradox situations which are totally avoided by using the mag head test first. This is a Magic Wand type device I built so we can save you \$\$\$.

If you have read any of my other notes you already know I freely pass along information about cleaning and lubrication. I recommend you do preventive maintenance rather than waiting till the acceptor is in a stickation, stuckation, or a failure mode. With the high cost of exchange and/or repair I ask you vendors to take another look at regular cleaning and lubrication of equipment. Also look at better trouble shooting procedures which look at error codes, messages and blinking status indicators and to report them when equipment is turned in.

**Mag Heads 1P**  
**Oct 11, 2004**

## SPEED ADJUST ON OBA 4-50575-xx UNITS

Speed adjust is a must ! There is only a 3 % acceptance range. The speed must be adjusted BEFORE using my mag adjust procedure, With a good lubricated acceptor, good control unit with good cable and clean connectors start with the FAULT indicator OFF. Turn switch #6 ON as marked on the cover and press the TEST switch. Slowly adjust the speed until the FAULT indicator stays OFF. If you can not keep it off, keep it off as much as possible. Blinking on and off may mean you need another acceptor or you have a problem in the system. You can leave #6 on if you are going to use the [ Bruno ] Mag adjust system

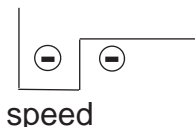
Where they exist, Speed and/or Mag adjustments is a must. Many acceptors do not have a speed and/or mag adjustment.

## SPEED ADJUSTMENTS OTHER THAN 4-50575-xx Units

Before doing a Mag adjust, you must make the speed adjustment first. No amount of speed and/or Mag adjusting will fix an acceptor which has stickation problem and it needs lubrication. After you adjust the speed, it may accept bills for a short period but if the acceptor has stickation, and you take no action, you will be back.

Most control units use a status or fault indicator for adjusting the speed. Press the TEST button or the reset button. Adjust the speed until the status ( or fault ) indicator stays on all the time. If it blinks perhaps there is an acceptor or a control unit problem.

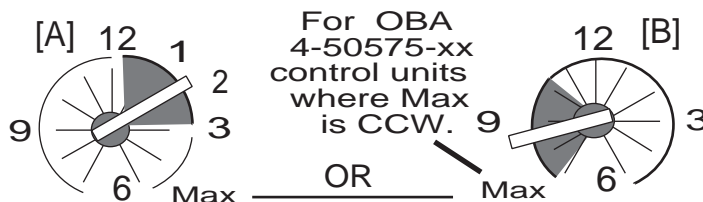
Older CBA/UCBA-2s have a speed adjustment pot. New upside down modules do not. Make sure you adjust the "speed " pot and not one of the other pots.



Spd\_mag1M March 03, 2003 1M

## Adjusting Rowe Mag Gains

There are many reasons to adjust the mag gain as listed below. If a speed adjust exists, adjust the speed FIRST. With an average bill, start at one end and insert the bill. Move one clock position and reinsert the bill and repeat the process until it is accepted. Note this position, say 12 noon. Go to the other end of the pot and repeat the process again going back one clock position till the bill is accepted. Say 3 pm. Set the mag gain between the 2 accept points (shaded area) at 1:30 or 2. See [A]. With OBA 4-50575-xx [B] units Max is CCW. You may find the range is between 7:30 and 10 so you would set the gain at 9 or 8:30. If it does not work when tested, repeat the process with another bill. In checking, you may find you get some rejections and the adjustment wants to be closer to the Max position or Min position. If the unit gives an error code when the bill is rejected. Use them and the manual as an aid. With the new \$5 conversion follow the procedure given in the installation note. Then you may have to try this system.



## Bruno's "STICKATION"

STICKATION describes is a condition which occurs when an acceptor can not come up acceptance speed. Generally this occurs because the acceptor needs lubrication. If it has been at rest for a while, it can not make speed. With repeated inserts of the bill or adjusting the speed, the acceptor works but after a period of idle time, it slows down AGAIN.. Preventive lubrication is required and this will also cut down on wear and tear which leads to expensive repairs and exchanges costs. This is what Magic Wandings s all about.

The Magic Wand Club !



Every \$30,000 or once a year which ever comes first !



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.

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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

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