

FEK and A MOTOR TEST UNIT! SPEED and MAG ADJUSTMENTS! A Bear Service Aid

Bruno D Puglia
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FEK is another one of those terms I put together many years ago. F is for Familiarity, E Experience and K is for Knowledge so I ended up with up with FEK. OK maybe you don't like the word FEK so try some synonyms like know-how, expertise, practice, awareness, and understanding. If you don't like FEK make up your own word.

By sitting down at the keyboard I hope to pass along some of my FEK hoping you could ponder some of the data and ideas and maybe you can increase your FEK. While the background for this article has a foundation built around Rowe bill acceptors and bill changers I am sure you will find something interesting because much of it will be just simple basics. I use the word **basic** knowing complicated material or unfamiliar material can become very simple to handle once something is explained and you understand it. Then you can apply what you learned to tasks you have to do. May the "**I got it!**" be with you! The motor test unit and it's applications is something you must try yourself in order to get the full substance of what you are about the read. Another thing to ponder is how we start off with one simple little thing and over the years we learn more about it and expand on it and we end up with much more than what we started with.

Acceptor Motor noise is a product of the condition of the motor and the load placed on it by the acceptor. The ability of the motor to pull the bill through the acceptor at a given speed is one key to good acceptance. It so happens that measuring the motor noise is a key to finding out how good an acceptor motor is. A motor is either good or bad but there is a middle ground and measuring motor noise will point to condition of the motor. It also confirms a motor is bad. Since the condition of the rest of the acceptor effects the amount of drag on the motor keep in mind a large amount of drag will increase the amount of current the motor has to draw and the larger the current draw the higher the noise level. It all leads to poor bill acceptance. Can we look at measure the motor noise? I am going to show you how!

One of these FEK things revolves around a Rowe OBA test unit. It all started over 22 years ago [2005] with this OBA test unit which has two very important switches on it. One switch for turning on 12 VDC [from a 7812 regulator] for the OBA motor and the other switch for reversing + and - so you could run the motor in forward or reverse. I quickly found out I wanted to use this voltage as a basic test tool for other 12 VDC motors and I also use it to make many different types of tests. I use it on Rowe OBA, CBA, UCBA, RBA-7 and BA-50 bill acceptors. Kevin, a previous co-worker, worked on many other types of acceptors and he used the test setup too. While clip leads to connect

the voltage to motors could be used I wanted to quickly connect it to other motors besides the OBA I found it was easier to add a PC board and I started adding connectors on the board for testing various drive and stacker motors I wanted to test. Using red and black wires I wired the new connectors to the correct motor pins so the motor would run in the forward direction. When Kevin started working on other acceptors we added more connectors. Leave room for labels so you can mark the connectors for the type of motor that it will be used for in case others use the test setup or just in case you are old like me <grin> and forget things. Another reason for marking the connectors is you may only test a given type of motor once in a while so it would be nice to know which connector to use. Some motors have photocell sensors and a LED so you don't want to connect 12 or 24 vdc directly to the LED or opto. We also added a way to check the stacker micro switches.

Lets start with the a basic power supply motor tester you can build. You will find a drawing of the unit towards the end of this Bear Note. It starts with an isolated 24 VDC power supply. If you do not have a 24 VDC supply you could use a 18 VAC 2 amp transformer connected to a bridge rectifier with a 4,700 mfd 50 VDC capacitor. You should have a fuse and power switch on the 117 VAC side of the transformer. You could even add a power on indicator light. I like isolated because you will be switching + and - so you never will know where the voltage will end up

with reference to ground. You may also connect the voltage to a scope for tests and it may be grounded. You feed the 24 VDC into an isolated 7812 voltage regulator [do not ground it - use an insulator] with a 100 MFD 50 VDC cap on the input and a 2.2 MFD 25 VDC tantalum cap on the output. For those who have to work with 24vdc and/or 12 VDC I added the 12 or 24 VDC switch. You should have a place for two terminal posts where you can connect a meter and/or scope. The 12/24 VDC goes through an ON-OFF-ON switch. The up position being forward motor run and down being reverse motor run. Center position is OFF. With the center off switch you only have one switch to worry about.

One of the first things I found out about using the tester was I could accurately make belt tension adjustments. As I made the adjustment I could hear just where the motor started to drag. I can keep belts tight enough to keep them on pulleys but loose enough not to drag down the motor. There is no reason why you should have to wing a belt adjustment. With the various kinds of belts and materials being used today **I do not know of any other way of making the belt adjustments correctly.**

I listen to the way the acceptor runs without the speed control being applied to the acceptor motor. The motor speed control done by a control board hides some of the problems. When I get an acceptor I can plug it in and see just how bad it is in terms of

speed and operation. Many times a worn or non-lubed acceptor will not run at all. It is in what I call the stuckation mode. As a matter of fact I can hear the speed increase as I lubricate an acceptor. Hearing and seeing the speed pickup as I lubricate an acceptor is what lays down one of the major factors which guides me to write about the importance of lubrication of Rowe bill acceptors and the real need for preventive maintenance. No matter how many Bear notes a customer has read when they watch me use the speed-lube process and hear the acceptor's speed pick up they always get the message about how importance lubrication is in just a few minutes. Generally they are astounded. This is what I meant when I said to get the importance of the voltage test unit you got try it to understand.

You can use the tester to hear and see wow and flutter as the belts runs. It will help you find various wow and flutter problems like clumps of dirt in a pulley, cracked or bad pulley or a bad spot on a gear. You can also put a bill into the acceptor and without the speed control from a control unit you will see just where the bill gets stopped or slows down. I call the varying speed problems wow and flutter because I came from a background in Radio and TV broadcasting and it as related to audio and video tape machines. You can call it whatever.

If you are a scope person looking at an oscilloscope [both on AC and/or DC] is a very good way to see the

amount and type of noise the motor produces. Try the scope on DC and use a very slow sweep rate and watch the trace. Turn on the motor in the forward mode and put a bill into the acceptor. If you have a dual channel scope you can set one channel to AC mode and the other one to DC mode. Don't have a scope? Than use an analog meter in VDC and/or VAC modes to see what the motor and acceptor is doing. I use the meter on AC and DC for recording measurement data on a motor.

Of course it is a basic tool to just to find out if a motor is basically good or bad. A problem could bad or no voltage from the control unit and not the motor. I just plug the motor into a connector and test the motor. From this test I know which way I have to go to fix a given problem.

The test unit is very useful when you have to clean the acceptor's belts and rubber rollers. Just turn it on and away you go.

While it can be used to check stacker motors and it can also be used to set the stacker to home position. There is one **BIG Warning**: A stacker with a micro switch with a metal actuation arm can be damaged if you run the motor in a reverse mode. Normally stacker motors only run in one direction so if you are trying to set it to the home position only the motor the forward direction. If you have space on the interface board you can add a resistor and a LED and wire them in series to the micro switch pins. As for me I don't thrust LEDs so a 24 VDC

bulb is a better choice for me. If you build a 12 vdc only test unit you use a 12 vdc bulb. In either case you can watch the LED, or bulb, go on and off as the motor goes round and round. You could also use an ohm meter but those digital meters going up and down drive me crazy on a test like this. Do you still have one of those analog meters in the shop? Sometimes **old is better!**

When I wrote "The Bear Necessities for Voltages and What about Ripple? What are False Positives?" I mentioned measuring a DC motor's brush **electrical noise** of motors used in bill acceptors. This noise measurement says a lot about the condition of the motor brushes. You put the meter leads on a 12 VDC supply leads feeding the motor and put your meter on the **VAC scale**. You are now reading the AC motor power supply ripple plus the motor brush noise. Granted there will be a little data keeping because motors may, or may not, have noise filters or the filters may be on an interface board. The noise will vary with the amount of drag on the motor. Watch this value as the motor starts to drag. If you are a scope person looking at an oscilloscope [both on AC and DC] is a very good way to see the amount and type of noise the motor produces. You should measure and record data on good and bad motors to build your own data base on motor noise checks. In the case of OBA motors you will find a lower price motors, may in fact, have less internal noise filtering and a higher noise figure.

A few more things before I finish the subject of motor noise. Sometimes the failure of a system to accept bills may be related to excessive motor noise so I first have to pass along some FEK on magnetic adjustments. Some adjustment procedures were written and motor noise range becomes a factor when making the adjustment. I have never gone along with Rowe making a magnetic adjustment without actually having to put a bill into the acceptor. Years ago I decided I had to find a better way to adjust the magnetic gain which actually used a bill. Along with this article included is an original short form type of Bear note that our customers have gotten for many years. It covers the Bear procedure for speed and mag adjustments. Spd_mag.ps dated Mar 08, 2003 number 1M is attached and this date is when I added the new \$5 bill update information to the Bear note. I started with 1A many years ago so the sheet has been around for many years. The magnetic gain adjustment range may be narrow so a careful adjustment of magnetic gain will be required. With too little or too much magnetic gain you will end up with no or poor acceptance.

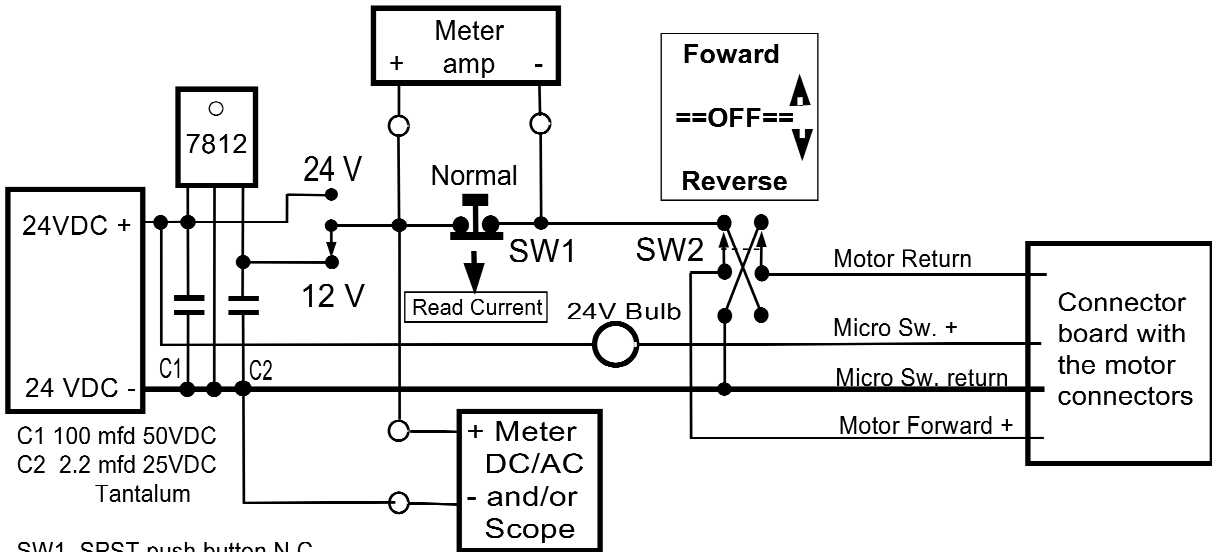
Please take into account that the Bear Speed and Mag gain adjustment procedure is not the end all for bill acceptance because it may not work because there are many other factors when it comes to bill acceptance. A few examples: stickation [lack of lubrication], bad belts or rollers, bad shafts, belt tension adjustment, bad

magnetic head, mag head alignment, bad or contaminated pressure roller/s, bad or no pressure roller spring, stuck pressure roller or pressure roller pivot, magnetic head amp, control unit problems, power supply, cable and connectors, and so on which all influence the bill acceptance. One of these factors could be the motor noise may be just too high because of bad brushes, bad brush springs, bad armature commutator segments, worn bearing/s or bad gear box, short-circuited windings, bad filtering components, etc.

May the FEK be with you !

May the NOISE not be with you!

The BEAR MOTOR TEST UNIT



SW1 SPST push button N.C.
 SW2 DPDT 3 Pos. ON-OFF-ON

AC ~ fuse on switch Tin || Tout 18vac <-> bridge 4700 mfd 50vdc cap

Bruno 1B

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

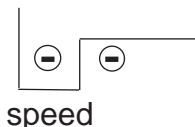
Where they exist, Speed and/or Mag adjustments is a must. Many acceptors do not have a speed and/or mag adjustment.

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.

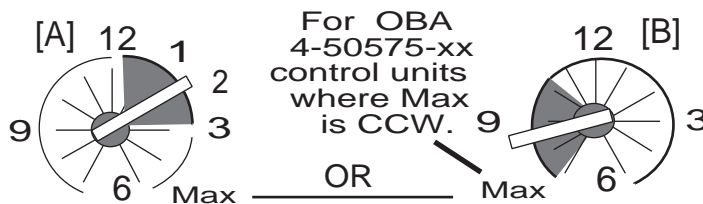
Older CBA/UCBA-2s have a speed adjustment pot. New upside down modules do not. Make sure you adjust the "speed " pot and not one of the other pots.



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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