The Bear's Rowe Jackpotting, Fs, Bucket Power On, and Crashes

An overview February 16, 2005 2B

By Bruno D Puglia
East Coast Amusements,
Canton, MA

It would be gratifying to write an article that simply tells you how to fix jackpotting, flashing F, or Bucket power on type problems, but this is not as easy as it you might think. Because many of the Rowe bill changers being used and updated today (2005) I felt this supplement information can be used by people who have to deal with Rowe Jackpotting, Fs, Bucket Power On, and Crashes. Much of the information is basic in nature so it can be applied to many service problems.

Be adviced I may use the word jackpotting but many of jackpotting sections generally apply to Buck power on too. You will find more information on the BC-100/3500s in the Bear's note BCxx00_bucketpower_on. It is a must read for BCxx00 users.

You will find this article is more of an overview rather then a bunch of quick fixes. These notes will cover the need for reporting problem details, defining the problem at hand, expending time and money with poor results, working with a given plan of attack when a problem occurs, and it will supply some specific problem fixes. A wide overview is given because problems can effect time, money, credibility and your customer relationships could be damaged without full consideration of all of the aspects of the problems relating to jackpotting, flashing F or Bucket Power ON, A lot of the examples deal with BC-11/25/35 machines and Bucket Power On problems with BC100, 150, 200, 1200, 1400, 2800 and 3500 machines.

I believe one of the biggest problems could be you will not read all these pages about jackpotting and Fs etc. I am sorry to say there is no magic wand fix for these kinds of problems. Your expertise and this information may help to locate and fix these types of problems. Winging it will not work in most cases.

For those who do not know what a jackpot is: Normally the coins are loaded into an escrow bucket. When a bill is accepted, the proper bucket door opens and the coins drop to the coin cup. The door closes and then the motor/s run and reload the bucket for the next vend. When the escrow bucket door opens by itself without a bill/vend the coins drop to the coin cup. The machine has jackpotted. An F or BUCKET POWER ON error code may, or may not, be displayed when the jackpot occurs. Other problems can also occur when a real vend takes place and the computer crashes or errors the machine off line, maybe with an F or bucket error message. These types of problems may be the toughest service problems to find and fix the problem because it may be caused by some many things both in and outside the changer. The information which will be given here is for Rowe bill changers but the information is generic enough so it can be applied to other types of machines because we will be dealing with computer crashes, intermitting connections, AC line problems, bad components, etc.

Many times the required input data required to find a given problem is not supplied. "I had an [F]" is not good enough. Was the "Out of service" indictor lit? What did the Status Display/s read? Was the hopper LED on? Were the other status indicators on or off? Which bucket or buckets jackpotted, $1, $5/50c, 25 cents? Did you count the change left in the escrow buckets? After the reset, now many coins were left in the escrow buckets? What are the payout switches set for? Was the machine giving change at the time or was it just standing there?

Using Test buttons, did motors run or did you get another [F]? Did anything else happen such as; Did anything such as a compressor in a soda machine or vending machine startup? Was someone using anything such as a vacuum cleaner, floor polisher? Did some one turn on a florescence light? What else is plugged on the same AC line? What was/is the AC line voltage? Did you use Max/min hold meter on it for a while problem existed? What action/s have been done up to now to resolve the problem?

Before changing to a second computer board, did you inspect and ohm out the solenoids and diodes? Did you check the vend counters and their diodes? Is any of the solenoid burned?

These questions are nothing more then an attempt to gain as much information as possible. Since the problems may be intermittent and the problem may only occur once a month, week, day, or hour the data is very important. If the machine is in trouble, look at the status display and the other LED displays before doing anything. Write the status down so you can recall what you found.

If you see a [1] [on BC1 to BC-35 control boards] before doing anything, normally the power was turned off while the machine had a real problem. Did the [1] come from someone turning off the AC power or did the computer board see a power shutdown on its own? The questions here and above should give you some insight of the extent of a problem such as an "F", jackpotting or "Bucket Power On" problems. Some machines shutdown or jackpot while just standing there while others act up when the vend occurs. Let's look at one example. While testing a machine, it may breakdown when giving the change. A simple report such as the machine gave a flashing "F" means very little in terms of help to find the problem/s.

Report detail of the problem: A BC25 $1.00 bucket opens and [F] error appeared. The bucket door had opened and dropped 4 quarters. The machines were reset. In four more days, the machine does an "F" but this time none of the buckets opened. In both tests, the machine was just standing there.

How do we really know the bucket doors did open, perhaps there were no coins in the bucket? Maybe there was a jackpot before and someone just reset the machine and did not reload the buckets. Maybe the 25c bucket was never used, hence never loaded.

Swapping parts of the system will not correct the failures if the fault lies in the cable harnesses or bad connectors. You may not be able to wing it with these kinds of serious problems.

A bad transistor on the board or burnt solenoid/s may be the result of another problem. The computer board may have crashed and the automatic voltage shutdown did not work so just replacing the solenoid and bad transistor may only fix the end result and not the problem/s which created the problem in the first place. Jackpotting, burnt solenoids, etc, can be caused by a computer crashing. In turn, almost any voltage or connection problem anywhere in the bill changer might cause the computer to crash. Sometimes the crash is due to a defective computer board, but problems outside the computer can also cause the computer to crash. Under a crash condition, error detection and shutdown of the power may not take place. A "sense" circuit in the hot side of the 40 vdc and it detects current is being drawn. Some computers give an error "Flashing F" displays when the sense sees a current when there should be no current being drawn. The error is only reported if the sense circuits if the computer are operational and the computer running correctly.

A test for [F] or Bucket Power On shutdown can be done by putting a 7.5 ohm 5 watt resistor in series and a normally open switch from the cold end of one of the solenoids to ground. Push the resistor test switch and the sense circuit should shut the machine down. Follow safety rules because the arc from the resistor/switch and solenoid could reach thousands of volts. Don't get hurt!

Here are many problems areas which can cause jackpotting. The power supply card could have a bad cap or the cap has a loose lead (poor or cold solder joint). The connections may look good but with a small tug on the wire lead of a cap or diode and the lead breaks loose. Diodes can break down under large voltage spikes or heat and this can cause problems. Cold solder joints, in fact, any intermitting connection may cause jackpotting. The power supply board connector and the socket maybe damaged. They may have heated up the connector and contacts may be loose. The plug and connectors are used to cable the power supply to the rest of the machine use male and female pins can be the source the problem. Any bad cable/wires, connections, power supply wiring and connectors, terminal block connections, which open or short can cause problems.

As a real example, the insulation on a wire hitting the edge of the power transformer broke down because of the heat on the transformer frame and the wire was shorting to the transformer core from time to time.

The power supply card in a BC11 - BC35 might have a small hole on the card's copper connector where it connects to the female connector in the power control unit. An intermitting condition can exist at the point of contact. Remove the two screws holding the connector in the power control unit and you can clean and repair bad female contacts. Fill the hole on the card with a liyle bit of solder. Do not build up a large coating of solder on the connector or use to much heat. Just fill the hole. If you build up the connector with too much solder this can wreck the female connector in the power control unit. You may find machine problems such as losing the 5 vdc are caused by bad board contacts. A proper fix would be to replace the card, rebuild connector strip or fix/replace the socket contact/s.

The 30 volt regulator transistor on the power supply gets the reference from the power supply card. If the 30 volt card reference circuits are flaky, the problem of jackpotting could be back at the power supply card 30 volt reference. An intermitting short at, or breakdown, of the 30 vdc pass transistor on the power supply could cause a problem.

In many changers smaller voltage diodes 1N4001 were used for power supply bridge (4 diodes close together on the power supply card) and they were also used on bucket solenoids and counters. Later versions of bill changers uses 1N5404 diodes on the power supply bridge, counters and on the solenoids. If you find cooked solenoid/s or have a jackpotting problem, consider changing the solenoid/s and the diodes too. Also consider changing money counter diodes in the power control unit. The counter diodes are in a power control which means the power supply will have to be removed to get at these diodes. It pays off in the long run! Use 1N5404s for power supply, solenoid and counter diode replacement.

Check the new diodes before installing them. When testing a diode with a multi-meter the diode may check not bad, but I would be incorrect to say the diode is good. If an ohmmeter-diode meter test shows a diode bad, then the diode is bad. A multi-meter diode test does not mean the diode is GOOD! The diode may open or break down under real load conditions.

It may have wiring connection problem. The bucket solenoid or counter, can produce a quite a large voltage spike which can cause damage, or cause the computer to crash.

In case you are interested, yes, there have been bad counter diodes causing F and crash problems. In one case, after reading my notes, a vendor working on an F machine reported he was looking at the counter diodes and he found one that was not soldered.

When you look at the current drawn by a solenoid, basic ohms law E Voltage says the:

$$I \text{ current} = \frac{E \text{ voltage}}{\text{Resistance}} = \frac{40\text{vdc}}{8 \text{ ohms}} = \sim 5 \text{ amps}$$

This approximate figure (~5amps) is not accurate since the voltage is not a pure DC voltage under load conditions and it turns into a pulsing DC voltage when the solenoid is turned but as you can see there is quite a current draw when the solenoid is operated. The turning on and off this current creates quite a voltage spike.

Any device that has a voltage on it could have intermitting short and cause the jackpotting. Let us look at one device. The coin lock out relay has voltage on it. The coil heats up can cause a short. Another short might just the lead going to the relay is laying close enough to ground to cause a short from time to time.

Some solenoids such as the dual stacker $1 - $5 dollar solenoid or stacker relay could create a spike and/or short. There is a solenoid diode on the dual driver stacker board and a relay diode inside a single stacker.

An internal diode embedded in a coil (such BA3-35 transport pressure roller solenoid) can be the cause of a problem. You may find the solenoid diode may break down or it may be open. The solenoid might be shorting to ground; either within the coil itself, wire shorts exists under a metal cover and/or from a pinched cable/wire.

The voltage on the bucket solenoids is hot on one side of the coil so a short on the cold side of the coil will cause the bucket to open. A short within the coil close to the hot side the coil could cause an "F" problem without the bucket opening up. It depends just where in the solenoid the short occurs. Solenoid breakdown can occur at almost any number of vends. Here are some real numbers: BC-10 $1.00 at 255, BC-1 at 1,500, and one in a BC25 broke down the 2,501st vend of the $5.00 bucket.

Sometimes a hopper will hit and pinch the cable going to the electronic count sensor assemblies used to count the coins. The hopper can pinch the cable and short out the 5 volts. The short can reflect back to the power supply and create a jackpot or F condition. The 5 volt regulator on the power supply gets the input voltage from the 14 volt section of the power supply card. If this 5 volts has a problem it could reflect back to the 14 volts and this 14 volts also drives the computer's 5 volt regulator. The 5 volt regulator caps on the Power Supply unit should be replaced with good 100 mfd and 2.2 tantalum caps. The regulator might also be bad and might have to be replaced. In some cases, you may see the bulbs on the transport or dispenser may go dim or bright when there is a problem with the 5 volt regulator. At times, you may not notice the light level changing so the meter is the only way to really tell if the voltage is correct and remains at the correct level. At times, you might see a shift in P1 and P4 adjustment if the adjustments are tight because the lamps on the transport shift brightness level has the voltage increases or decreases. Good service procedures require the voltages are measured. A meter with max/min hold

is a good way to track the voltage.

Computer board problems can create a condition of jackpotting. It is not just one part causing the problem. It would appear the bucket solenoid-switching transistor is the only place to look for the problem. This is not the case. Bad bypass caps, bad connections at the regulator, broken copper, bad leads at the regulator, bad connections at the connector pins or the connector in the machine, bad computer IC, crystal, cold solder, intermitting joints, etc, are just a few of the problem areas. Another trouble spot is the copper lands and connection at the center lead of the 5 volt regulator in the BC11-25 boards.

Any transistor failure or leakage which brings part of the 30 or 40 vdc to the 5 volt logic could be a problem. These could be the bucket transistors and three more examples are the driver transistors used for the power relay, the coin lockout relay driver, and the dual stacker solenoid driver used for upper/lower bill box select.

As you can see, the jackpotting problems could come from almost anywhere. We cannot overlook external problems AC line voltage and grounding problems. External voltage spikes or voltage levels can cause jackpotting. If you're lucky, it may have be a one time shot thing like a truck knocked down power lines or there was a lighting storm. Who is that lucky? Site power problems could exist, a cooling compressor drawing a heavy current, loose AC plug or connections, loose wire at fuse or a breaker is defective or it was not reset correctly, etc, could cause jackpot/s. Running the machine on another good AC line or even another building might be needed to isolate the problem. It is quite common for the AC line voltage to dip or increase. Problems with power coming into the building can cause jackpotting or computer crashing. AC line voltage swings of 50 to 135 voltages have been reported. Heavy voltage loads and/or spikes from compressors, air conditioners, a vacuum cleaners or floor polishers, a florescence light being turn on or off, defective ballasts, electric lighters for gas operated gas devices or hot water heaters are just a few of the items which can cause a problem. A bad neural or bad ground can cause strange AC problems at an outlet plug. In a few cases, a spike or noise problem was fixed by using an external AC line filer between the AC power source and the bill changer. Serious voltage problems like low voltage may have to be fixed by the Power Company or electrician. Remember, a bad or short cycling compressor used for cooling can knock the AC line voltage down or spike the AC line. What can you do with AC power line problems? Not much, unless you know they exist. Checking the voltage over a period of time may be required. One way is a meter such as the Fluke 12 multi-meter which has a Max-Min hold feature. This meter has a "hold" feature of low and hi values read by the meter. You can leave it on MAX/MIN HOLD and go back later and read the LOW and HI readings. Once you have this Max-Min information, action can be taken if the AC line is out of specs. Since mis-wired or faulty grounds at AC outlets may exist, an AC plug tester is a good tool for locating these kinds of problems. AC problems can be found on the bill changer end too. Defective U ground AC plug, loose connections, mis-wired AC wiring, not having or defective AC line filter, defective power switch and breakers have been found and repaired. Play it safe, pull the AC plug when working on a machine! BTW, Turning off the power switch may not mean the HOT side of AC voltage is off.

Here are two real cases AC line problems with BC25 bill changers. One problem was where the changer was on an AC line with 15 games.

Another AC line problem was a bit harder to find. A vendor took over an operation in

February and it was ok for about 3 months. Having many F's the machine was replaced with another changer that had not been having problems. F's still showed up. The AC line was checked and they found there was a water cooler on the other side of the wall which was on the same circuit has the bill changer. They moved the bill changer to another location and the problem went away.

The jackpotting problem has to be taken very seriously from the very beginning and you must have a good plan of attack. It may not be a simple matter of exchanging the board and it will be fixed. In fact, if jackpotting and Fs errors have occurred you must measure the bucket solenoids (7.5 - 8.5 ohms) maybe change the diodes and check the wiring. Visually inspect the coils for damage. It is possible the diodes or shutdown protection was blown away when the problem occurred, and/or damage already exists from a prior problem. Plugging in another board into the machine without checking the parts could blow the second board. You now have two bad boards and you still have to go back and make the checks and repairs other wise you might blow a third board.

Jackpotting at random times makes it difficult to know if the problem is fixed. Time and temperature shifts might affect the jackpotting. The problem could be in a small temperature range of just a few degrees. A little bit hotter or cooler and there is no jackpotting. One way to test a machine and find out which bucket door opens is to load the buckets all escrow buckets with coins. When testing in the shop I use:

$1=Quarter 50/$5=Nickel 25/50 cents=dime...

It not does make any difference what values you use as long as you know was you loaded into the escrow buckets. If the $1 bucket opens, you will find a quarter in the coin cup, etc. If all three buckets open, you will find all 3 coins in the cup. Under normal operation, 4 quarters would mean the $ 1 bucket opened. 20 quarters would be the $5 bucket opened. You may not be using the coin bucket (25/50 cents) so you will have to load this bucket with coin/s so when the bucket that opens coins will drop. If there are no coins in this bucket, you will never know if it opened. In the field, normal 4-20-1 coins might be the normal count for $1 $5 25c dispenses. In some cases, all three buckets can jackpot at once.

Sometimes a problem could only occur once a month or once a week. As always, information is very important to finding the problem. A simple machine power switch on-off, reset, etc, may not be enough to resolve the problem. You could disconnect the stacker for testing and also the coin assembly if you block off the coin inlet when testing the machine. Inspection of the entire machine might be needed. If it still fails swap out various parts such as the control board, dispenser, transport, stacker or coin mech assembly one at a time. You can use the divide by 2 rule to help locate which section might be causing the problem. The rule assumes the problem is a unit part within the system. The divide by two rule: The rule is a divide by 2 to narrow the range down to find a number or in this case a unit.

Here is a story reported by one of our better vendor service people. “Bruno, I had a machine that was giving me trouble with both d's and F's". Having trouble with both a d and Fs, I disconnected the single stacker and both errors codes did not come up for a week. Thinking both the F and d's had something to do with the stacker, I moved it out where I could see and work on it. With no power, I went to check the micro switch and I noted by just touching it the switch would move. I got out my screwdriver and found the screws were loose." Keep in mind, AC line glitches can cause a computer to crash and result in an F error. AC line voltage glitches could be from external sources or

within the machine itself. The stacker and/or it's relay (single stacker), dual stacker solenoid, dispenser with it's hopper motors, power relay, power transformer, or other AC voltage problems such as loose connections, bad solder connections, sockets, connectors, etc, can be a source of voltage or current glitches which crash the computer. In the case just sighted, some of the time the d error pointed to a stacker problem but remember the problem of the F error could be a stacker glitch and the d error may never appear.

Murphy's Law will apply and there is chances the problem will not occur when you are attempting to find the problem. Many times the real cause of the problem, such as an intermittent connection or bad part will not break down when you are testing the unit. Under the conditions were the failure does not happen again when swapping units does not necessarily mean the units removed are bad. The machine could run for weeks with not problem at all. Don't jump to conclusions.

If you have a problem of jackpotting, moving the machine to the shop or another location where is can be watched may make it easier to locate the problem and fix the machine. No one can lay out a plan of attack when dealing with jackpotting for you because it depends several factors starting with replacing the machine with another one. You may have to spend several hours going over the entire machine piece by piece and/or you have to do testing for days/weeks. Loose wires and broken wires on connectors in power control unit, transport, terminal areas (including at dispenser block). As examples: Short to ground of 30 vac or 30vdc which goes to the acceptor. It could be any 5,14,30,40 vdc, 30 vac or 117 voltage short or open. Say it happens at the cable going to the acceptor. It could also be at connections of the lamp assembly shorting located in the bottom of an acceptor, or where the wires go into the acceptor.

Maybe someone did not replace the paper insulator under the bottom plate metal cover of the BA-3/35 acceptor. Let’s presume a screw, nut or coin got into the wrong place and is making a short once in a while.

Can you swap various parts with spares or parts from another machine? Keep in mind the problems may not exist in the unit parts but the problem could be in the machine cables and terminal areas so a plan of attack must be outlined. Since damage to a solenoid or the computer board could occur again and again, take time to make the tests shown in the manual and consider the items covered in this article.

Swapping a bill changer boards such as BC 100, 200, 1200, 1400, 3500 which was not reset when a problem such as BUCKET POWER ON existed, may have a reset problem when swapped to another machine which has the old versions of software. The power may have been removed with an error on the board. Swapping a board and when a problem already existed to another type of changer may have a condition where the board error cannot be reset. There can also be misleading error reports when a second problem exists. The acceptor may be disconnected, dispenser disconnected, etc and the error cannot be reset. Get the new software!

For those who really want to get a feel of how extensive the problem can be, here is a list of just a FEW problems found to cause jackpots and other serious failures. The items shown are located within machine and not due external problems. You might be able to locate the problem by inspection or changing parts such as diodes but working in the field is hard to do when you have to tear the machine down to the level required to inspect or to change parts in the machine.

Solenoids: A test of $1 solenoid showed a short once in 1,500 vends and another one, (BC25), once in 2,501 vends. We have seen many bad solenoids.

Control board socket. Bad connector pins. Some people build up connector on the board with a thick layer of solder. This kills the sockets female pins. This is a no no!

What are some of the problem areas? Bad transistors in the driver and/or switching transistor. Cold solder joints on CPU, Intermitting crystal. Loose connections on 5 volt regulator, or broken leads. Bad bypass caps, leaking relay driver transistor. Coin lock out relay coil shorting. Coin lock out wring shorting at terminal strip in mech housing.

Hopper . Shorting the 5 volts by pinching coin counter sensor cable.
Dispenser - Cable pinched in back of dispenser. Cold solder joints on solenoid diodes, Bad diodes or wrong diodes. Use 1N5404s. Pinched solenoid wire/s, under solenoids, covers, etc. Bad connections on interface board.

Power control center - Loose cables, cold solder connections on power control interconnect terminal and boards. Short or bad (break-down) 30 vdc pass transistor. Bad connections in crimp connection and terminals. Bad coin counter and or diode/s. Use 1N5404s. Bad caps on 5 volt regulator, use 100mfd and if other capacitor is a .1 mfd disc, use a 2.2 Tantalum. Power relay or bad connections at relay socket, counter diode, and bad solder connections.

Power supply card - Intermitting and/or cold solder joint/s on board. Bad 1N404 diodes or old 1N4001 diodes. Power supply card. Bad contacts on power supply card and/or its connector. Burned or pitted (holes) on contacts. Component breakdown of parts, alla diodes, resistors filter caps, etc.

Anywhere - Loose wires and broken wires on connectors in power control unit, transport, terminal areas (including at dispenser block). Bad motors. Short to ground of 30 vac or 30vdc which goes to the acceptor as one example. It could be any 5, 14, 30, 40 or 117 voltages short or open. Metal objects such as a screw nut, paperclip, etc fell into the wrong place causing shorting.

Acceptor - Shorting bill pressure solenoid. Bad diode inside bill pressure solenoid, Intermittent or shorting cables/wires, loose connection pins.

Single stacker - Mis-adjusted micro switch or intermittent motor run - relay, connections, motor, etc.

No Error reset BUCKET ON Power off or plugs pulled and error cannot be reset. Another problem/error exists such as not in same type of bill changer (old programming roms) or acceptor not connected, etc.

BCxx00 power supplies- 4.7 mfd caps installed backwards. .Broken or bad connections around large resistors. Re-solder using wire jumpers. Bad connectors, loose pins, etc.

As you can see the problem is not confined to any one area or unit in the machine. Replacing the just the board to fix the problem with the board but may not fix the problem which caused the board to fail. Things may get worst if the basic checks such as checking solenoids, wiring and diodes are not made.

Generally when equipment is repaired or exchanged, the reason for the repair or exchange is seldom noted on the equipment. When the reason is given, a channel for important feedback and communication is opened. Depending on where and who does the repair. Sometimes, replacing a computer board

may not fix the problem and additional damage to the second board may occur. You end up right back where you started. Feedback can be very important: "The $5.00 bucket solenoid or diode may be defective or damaged. You should visually inspect and test/measure them, maybe even replace them." Another reason for listing a problem might be "the problem" is not in the board but somewhere else in the machine. If there is no information supplied when the unit is to be repaired or exchanged and the unit may test ok but without a note feedback to the end user cannot exist. As a manager or owner, you want to know why the expenditure is being made, exercise control and supply positive input when required if you are capable. If you're the person fixing the unit, Feed back can help you locate and fix the problem. Perhaps the time to write a brief note and attach it to a piece of equipment appears to be a waste of time, but there are many advantages in writing a brief note. In the case of repeat problems such as jackpotting, a plan attack and follow through is generally required if the problem is to be located.

When buying used machines, rationalize the machine you are buying may suffer from a serious [F] type problem which has not been located and fixed. You may expend a lot of time and money tracking down and fixing the problem. Some of these machines go back almost 22 years and connections and connectors may be a major problem. There may be more then one problem area causing the jackpotting. Even iof the problem is located in just in one area, you have to find it before you can fix it!

When do you know a problem is fixed once and for all? Only time will tell! I have seen machines cycle vend change for 250 to 2500 vends and then breakdown. Reset it and it works fine until the next time. Machines have operated from a few hours to 6 months before the problem re-occurred. It is important to get good information in the beginning. Do you test the machine while its just standing there, or when it gave change for $1 or $5. Little things mean a lot in terms of saving time and money. Are you going to pay me, or your service person, (X $ per hour) to put 2,500 $1.00 bills and another $2,500 $5.00 bills through your machine to test it when the problem occurred while it is just staying there? It would be better to spending some time getting as much information before attempting to fix the machine. A key factor is when the problem occurs. Perhaps it happens once in a while when the changer is turned on? You, and I, need valid input! Use the Johnny 5 approach: :"Need input".

You may want to consider shot gun approach. If a solenoid can breakdown once in 1500-2500 vends, does it make sense just to replace the solenoid and the diode early in the game? Only you can answer the question. If you see a solenoid which is burned does not mean the primary problem is the solenoid. What would I do? Replace it because I have no way of knowing what damage has already occurred but I also keep an open mind and look for other problems which might have caused the problem and cooked the solenoid.

One small item has shown up with early BC100, BC150, BC200 1200, 1400, and 3500 series. If a error message "BUCKET POWER ON" occurs and you turn off the power or plug the plugs and move the control to another type of machine you may, or may NOT, be able to clear the error message even if the problem no longer exists. An example would be a error occurred in a model 100 machine and you swap the board into a model 1200. One would presume you can clear the error by hitting the reset. This may not be the case and you cannot clear the error. To play it safe, swap the board into the same type of machine, model 100 into a 100 etc. The above is reset is another reason to make sure you have the latest

programming roms in the control center because later versions of software fixed this problem. Other error messages might be hidden behind Bucket error. This might the acceptor is not connected or it has a problem. Keep it in mind if a problem does occur. The new programming updates correct many problems that might and increases LED and cell life and this reset problem. Do the update now!

In the BCxx00 series connector and connection problems can exist. Problems may exist on the power supply cards. Check large resistors and you may have to re-solder them and/or use wire jumpers to repair the board. Generally just pushing on a resistor will break or weaken the pad. Once the board is out, take the time to fix it so these problems never occur. add wire jumper where needed. Also check the + - on the 4.7 mfd caps to assure they are installed correctly. It is better to get the updated board if it is a -01 board.

New BCxx00 Power supplies: In Jan 1997 Rowe introduced two new power supplies for BCxx00 series. They produce less heat and are designed to handle heat. I really feel that older power supply card must be updated to the new version. Check with Rowe for latest part numbers and you may want to consider switching to the newer Fast Payout option.

One day I got 3 machines from one vendor. A BC25 MC and 2 BC25 machines. I was told to check them out and nothing else was said. All of the data below did not fit together until I had finished all 3 machines. I had to do one as a right now so I started with one machine. I took out the dispenser and did my thing; inspect, 755,s oil, rivets on motor brakes, etc. I did the acceptor, power supply card and then I stuck the board into my test bed and the 25c solenoid had pulled open and, after a delay, I got a "F" on the display. I pulled another board from one of the other machines did some work on it. It checked out ok and I put it into the machine I had started with. The right now machine checked off as done and out the door it went. I then started to work on the second machine and I found the 25c solenoid was cooked. I replaced it and did the rest of the stuff to that machine. I then worked on the board with the F and found the TIP transistor for 25c was badly burned (shorted). I replaced it and I also found the $5 TIP had been over heated at some point in time. I replaced that one too.

While the protection shut-down circuit did shut-down with an "F" but It was too slow and burnt resistors had to be replaced. The point of this little story was that the 25c solenoid and bad board must have been in the same machine at one point in time. After someone got done swapping things around we had 3 bad machines and no corrective action had been taken to check or fix the machines. At some point, sticking a good board into the machine with a burn solenoid could, eventually kill a good board. The bad board could also burn out another solenoid since the protection shutdown circuit was not operating correctly. I presume this vendor did not see fit to go beyond the swapping stage and since the machines were only were using during the summer season. He must have decided to let the problem go till the beginning of the next season and let me fix the machines rather then doing it himself. Three main points exist here. The first being nothing was reported about the type of problems that existing in the machines. There was no trouble report history. The second is to point out that swapping boards around can cause additional damage to a solenoid and/or a board. The third item is when I turned on the third machine I did not have any 14 or 5 vdc. The power supply card had those smaller diodes (1N4001) in the 14 vdc section and they were bad. I replaced them with the larger 1N5404 diodes. Perhaps the break down of these diode/s were the start of the F problems and then operator swapping of

equipment parts produced the end result of 3 machines which were now in trouble.

Machine 1
Bad board
25c 25c/$5 25c/$5 transistors
slow F shut-down
Cooked resistors

Machine 2

25c solenoid Bad
Bad diodes
old 1N4001s

Machine 3

Bad power supply card
No 14/5 VDC

Perhaps now you can see what I meant when I say the F problem may start, or end up, in any section of a machine, and/or can spread if you swap equipment. The problem may end up affecting other parts of the machine. Which came first; the chicken or the egg? I was lucky the 3 problems showed up right away. Any one of them could have been intermittently bad for a long time and not so easy to find. I cannot really say what happened or when it happened, but you can speculate like I just did. You can see what I am talking about when it comes to F and jackpot related type problems and the importance of trouble report tracking. Could one or more of these machines end up back in the shop? From what I have seen the answer is yes. Will there be a tracking history of the problem/s and my guess is no based on the fact I did not get any information when the 3 machines came into the shop.

Perhaps the next case will give you more insight about F type problems. I got another BC25 to look at and the trouble reports showed every little as to what happened except the F was present. Be advised I use test equipment that you which you don't have. It is a acceptor test simulator. I have adapted it so it gives repeated simulated bills to the machine. I also got out my coin counter simulator which plugs into the dispenser and simulates the coins dropping past the coin counters. I found after at about 100 $1.00 simulations I got an F. I disconnected the stacker and coin acceptor assembly by un-plugging them. I looked at the dispenser and noted the $5 diode had been replaced but not the 25c or $1 diodes so I replaced all three diodes. Since it appeared the F might have something with $1.00 vend and I got a new solenoid and did not replace in in the bucket assembly but I plugged it in place of the dispenser’s $1 machine’s bucket solenoid. I pulled the big power supply and looked for any problems. While it was opened I replaced the 3 counter diodes with 1N5404 diodes. I noted the .1 disc cap on the bottom of the 5 volt regulator and replaced it with a 2.2 mfd tantalum cap. I removed the power supply card connector and cleaned the connector pins. While they appeared to be OK but I did tighten a few of them. The power supply card looked ok and the voltages where within specs but it have one of old long 4700 mfd caps and these long caps end up near the heat which comes from the 4 bridge diodes. I installed 4 new diodes and a shorter 4700 mfd cap. I used the alternate hole to keep the 4,700 mfd cap away from the heat of the 4 diodes. I cleaned the contacts on the card. I opened the control board and found the .39 ohm 2 watt resistor measured ok but it looked cooked so I replaced it. I also replaced the $1 solenoid transistor and touched up some solder connections. With the acceptor, stacker, and coin assembly not connected plus with the work I had done I hoped the machine would not give me any more F's. Using the simulators I ran the $1 and $5 tests in excess 300 times for each type of bill. I re-connected the stacker and coin assembly cables and restored the machine's $1

solenoid and ran the tests again. It ran ok. In one series of tests I used a short period before the next bill and I used long counts of 15. This causes the hopper motors to heat up a little bit and it appears they were not breaking down. In other test, I used a short dispense cycle (1 count) so the solenoids heat up a bit and the solenoids were OK during the test. Remember have had solenoids breakdown once in 2500 vends. What we have done here is just some of the shot-gun basics in hopes of curing the F problem. I have stated earlier you never know if the cause of the F problem/s has been established and repaired. Only time will tell since at this point in time we have only addressed a few of the items concerning F problems. With more testing, the F re-appeared. It could be anything but I decided to disconnect the coin assembly and addressed the stacker because it could be a problem. The stacker was removed from the machine. The relay was hanging partly out of its socket. I opened up the relay and pulled the relay apart. The contacts were in new condition. It appears it was a new relay. If the contacts were bad I would replace it. I opened up the stacker assembly and found the circuit board inside was not completely plugged into the board's socket. I replaced the diode used to suppress the stacker relay's inductive spike. I checked the stacker micro switch adjustment and it was on the money. I replaced the stacker and hooked it up again. I ran more tests. I ran about 200 $1.00 and 200 $ 5.00 tests and the machine ran ok. I addressed what could be a coin assembly problem by replacing the relay transistor driver in the main computer control board. Remember we talked about leakage and breakdown of this driver transistor much earlier in these notes. In the coin assembly I replaced the diode in the coin assembly used to suppress the inductive spike of the coin lockout relay. I plugged the coin assembly back into the system and ran more tests. I ran about 900 $1.00 and over 900 $5.00 tests using the bill simulator and no F's appeared.

That still leaves testing the machine using the acceptor rather then the simulator. At this point one could ask which one of the repaired item/s fixed the F problem. History has shown it could have been any one, or more, of these items and note there could still be an F problem. Only time will tell. This machine story will give you an idea of just some of things you may have to do to locate and fix on going F problems.

Another BC25 bill changer had a jackpot problem. With my tester on $1.00 test I got F's after 25-50 vends. I went to change the board's $1.00 transistor and also saw the $5.00 had cooked at some point so I changed both of them. I then put the tester and board in my BC11 test bed setup. I ran ok for 300 tests of both $1.00 and $5.00 vends. I put the board back into the machine and pulled off the stacker and coin mech cables. It ran for a while so I pulled cable back into the stacker. If a short while I got an F. I was testing $1.00 and this time it was the $5.00 that jackpotted. I took the stacker out and opened the relay and noted some slight pitting so I cleaned it. The driver card was slightly out of the socket. I don't think it was causing the problem but I did clean the contacts and put it back into the socket. The micro switch screws were a bit loose but the alignment was ok. The stacker motor brake did not have a rivet in it so I put one into the brake arm. I took out the dispenser and replaced all three diodes and the coil checked and looked ok. Back to testing and after $100 vends it jackpotted again. With the stacker plugged in, jackpotting occurred in a shorter time then if it was left un-connected. I then pulled out the power supply card and noted the contacts was bad. I had to add thin strips to build up the copper. With fixed power supply card, coin mech and stacker plugged in I re-ran some tests. While testing $1.00s I got the

$5 bucket opening and an F shutdown. How do I know it was the $5.00 bucket? I look at the diverter doors in the bucket escrow assembly and the doors are in the $5 position. What next? Reflecting back the power supply card contacts and noted the they were in poor shape. While I did not see anything with the connector in the power supply you cannot really see the contacts unless you take the power supply out of the machine and then remove the connector. I took out the supply and removed the connector. I tightened each contact with a small pointed tool. While the supply was opened I replaced all three counter diodes with the larger 1N5404 diodes. I put everything back except the acceptor and started testing again. I ran 3,000 + $1 vends and 500 + $5 vends and I did not get an F error. I do these machines in the manor above in an attempt to get data but you do not have a tester so you are forced to use whatever you can do to find and fix the problem. This may be swapping out various parts of the system and shot gun the machine too. You may have to bite the bullet and attack the entire machine section by section. Notice we saw and worked on various problems with the power supply, power supply card, stacker, dispenser and computer control unit. We still have to try it with the acceptor and wait for "time will tell" answer if this machine is fixed.

While I was testing the machine we just talked about I was working on a vendor's power control unit for a BC11. This is a unit where the power supply housing also holds the BC11/20 board into it. The vendor claims he has located the F problem to this unit. My preliminary tests did not give me an F. I was using my own dispenser, acceptor, coin mech and a board which I use on the test bench. At one point I used the BC25 board from the BC25 machine we just talked about and the tester I ran 300 $1 and 300 $5 vend without getting an F. Not seeing the problem I shot gun the power supply card, power supply connector, counter diodes (replaced with 1N5404s) and computer connector. The tester was put on the unit with my dispenser, board, coin mech, etc and it has run for 1,000s of vends and I did not see an F. This does not mean I found and have fixed the reported F problem. That is the frustration of an F problem!

Early in the game Rowe made major mods to the BC11 to 25 MC boards. 21 changes were made to the boards. A simple way to check the mods is the solenoid transistors were changed to TIP102s. When I started with Rowe many years ago I was told these boards should go back to the factory for the major update and I have been doing that. I now am seeing boards, some which have been converted to BC25 and BC25mc were purchased (or exchanged) from other companies who do not update or send them back to Rowe for the update. I do not mind you looking for "deals" but I have to tell you when you get one of these not up-dated boards you are on your own. You may get a deal on the old boards but you do not want them in you bill changers. I still see non-converted boards. Your best bet is to make sure you are not given one of the obsolete computer boards if you buy or exchange BC11 to BC25 boards. The breaking of the label could void the warranty from these companies so you may not be able to look inside. You will have to take care the problem up front.

Feed back from the field to us is very important. One example was a report which said a flashing F problem was located to a diode breaking down on on one of the money counters in the power control unit. This verifies what I had found; a counter diode on a machine could cause an "F" problem. Others reported; "I found a pinched wire under a solenoid in the solenoid bank in the bucket assembly," and another vendor reported the stacker caused the F error. Other reports talked about putting wire jumpers on the power supply card of the new BC-

100, 150, 200, 1200, 1400 and 3500 machines. Please pass on all pertinent information about jackpotting, F errors and bucket power on errors. Many of the items reported in these notes I saw and fixed myself. Many items in these notes such as the coin lockout relay, stacker, and others, have been found and/or confirmed by people in the field. To those vendors who have supplied information to me; “Thanks! "

When I get an [F] machine I never know what I am going to find, in fact I don't know if I can find and fix the problem. As pointed out before, the problem might be the location AC power where there are 15 games, a watercolor, or whatever on the same AC line. I'll never find the problem in the shop.

Over the years I have seen a few problems with wire tap connectors where a connector taps into a wire. The connector may be used to add a wire or it is a connector lug. The lug is then connected to some part in the bill changer. I have found these connectors with flaky or not making a connection at all (open). Many of these tap connectors are used on the AC power wiring on both the hot (normally the black wires) and the neutral return (normally the white wires). Another place where you may find these problems is in the BC-1 power supply. I have found some not making connection and others that were intermittent. Intermittent connections can occur at any connector so keep in mind what appears to be good, or measures good on an ohm meter, may in fact not be ok when used when normal current is being drawn through the connector. Rather than get a new tap type connector I prefer to solder the wires or use a standard push on connector where both wires are crimped into the connector.

While talking about the BC-1 you may find very early BC-1s did not have the 1N5404 diode on the terminal strip on the dispenser. You may find a bad solenoid, solenoid diode (1N5404), bad counter diode and, of course loose, bad connections. As noted before, a solenoid can fail at any time. On One BC-1 I found the bad connection as noted earlier, a bad solenoid, that break down after x number of vends, and a bad solenoid diode and still had the computer go into a lockup condition. It drove me nuts because I had to test it out to at least 1000 vends to see if I was actually fixing it. I was getting failures anyway from 3 to 600 vends. The lockout results would vary, normally holding the solenoid open (which would start to cook the solenoid and the TIP102 and .39 ohm in the dispenser control) and at times the hopper motor would continue to run. If the stacker was connected at times it would just keep cycling. Since the computer has crashed (locked up) the normal shout down does not occur. The damage to the BC-1 with this type of dispensor control lockup can be quite expense to repair. Anyway after all the other work was done I got down to the stacker testing. I had already noted the burned relay contacts so I put in a new stacker relay. I measured the cap on the relay board and it read .1 mfd so it seemed ok and the resistor was ok at 100 ohms. I started testing again and after 32 vends the lockup occurred again. Like a diode or a capacitor which tests ok may not be good under real load conditions the same can be said about a capacitor too so replacement was the best way to handle the problem. The resistor was one of those newer types so I replaced it with an old fashion carbon 100 ohm 1/2 watt. Yes, resistors can break down too. I re-soldered every connection on the relay board. I pulled the connector pins from the connector going to the relay and tightened them by bending them in shape. I tested the BC-1 out to 1500 vends. It is finally fixed? Like all Fs, lockups, etc you never know till the unit gets out into field and then only time will tell. For those who have BC-1 problems and think just getting

the dispenser board fixed and maybe replacing a burned solenoid is all it will take be warned that this may only be the simplest part of the final fix. It took me days of testing this BC-1 to find for these various problems. If you have one of the problem F or lockup problems with a BC-1 it may be best to take it out of service and bring it to the shop. At least these note you can do a shot-gun a repair. Also note I had tightened up all connector pins with a small metal probe and cleaned all connectors, etc.

Most machines come in with little or no history so I don't even know how to test the machine. Do I just leave it on or vend $1 or $5 or 25c? Does it happen once a day, week, or month? The owner presumes I should be able to find the problem with little or no information, well guess what; it may not work out that way. Even if it does, there might be a large number of hours put into finding and repairing the machine. We may think we got it fixed but we never know if it is fixed. We only know fixed after there are no more Fs.

>> May the Manual be with you and paper clip be with you! <<

Bruno D Puglia

Check out
http://www.eastcoastamusements.com/
Bruno's page: for more Bear notes like:
CONNECTORS - FIXING AND TESTING

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

If you have trouble printing some Acrobat drawing pdf pages:
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