THE KING MODEL TB4/TB5
ELECTRONIC TABLET COUNTER
CONTROLLER UPGRADE
for 1972 and 1982 style counters
(pre-1972 counter requires extra electronics)

1972 style (before upgrade)

1982 style (before upgrade)

Upgraded 1972 style TB5

Pre-1972 style TB5 (before upgrade)

v1r3 January 2014

The 2014 upgrade

The upgrade consists of three parts:

1. Sensor with micro controller to replace the P/E cell.
2. Adjustable LED light source to replace the incandescent light bulb.
3. Batch counter with PLC & colour touch screen HMI to replace the 1972 or 1982 style batch counter.

Features

1. **Sensor**
   a. Micro controller for accurate and high speed product detection
   b. Self calibrating electronics guarantee consistent sensitivity
   c. Automatic dust compensation (> 20dB)
   d. Communication with PLC without extra wiring
   e. Variable sensitivity (through PLC setting) approx 1mm – 15mm
   f. Very fast sensor recovery times for accurate detection of softgels
   g. Red warning LED to signal operator that sensor needs to be cleaned
   h. Yellow blinking LED indicating PLC communication is active
   i. Green status LED to indicate sensor is ready for counting

2. **LED light source**
   a. Super bright RED leds
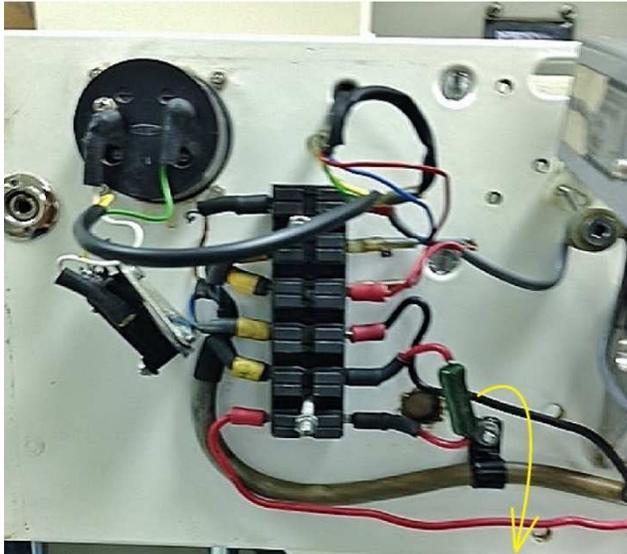   b. Adjustable brightness through potentiometer

3. **2014 Batch counter**
   a. Colour touch screen HMI
   b. High speed PLC system
   c. Sensor paralyses setting to accurately count softgels and other (semi) translucent capsules
   d. Sensor sensitivity setting to ignore small tablet particles
   e. Broken tablet filter to ignore large tablet particles
   f. Broken tablet particle counting register
   g. Flap change-over validation timer to guarantee no undercounted bottles
   h. Counter register on main screen to indicate how many critically separated products have been detected
   i. Bottles per minute indicator on main screen
   j. Test mode to check correct functioning of the flap mechanism
   k. Easy access to all settings by pressing pictograms
   l. Increase production by up to 75% compared to non-upgraded TB4
   m. Wide input voltage range without switch (100 – 240VAC; 50/60Hz)
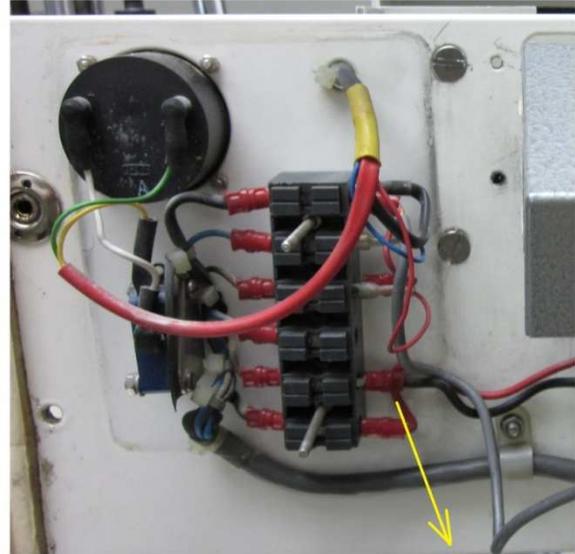   n. Same plugs as old batch counter for compatibility

Installation

Your TB4 door will either be 1972 style (with 1972 style batch counter) or 1982 style (with 1982 style batch counter). The 1972 style door has an extra resistor mounted on the main terminal block (see picture). This resistor needs to be removed to convert the 1972 style door to a 1982 style door. After removing the resistor, plug the red coil wire into the position where the resistor came from. The two doors are now the same.
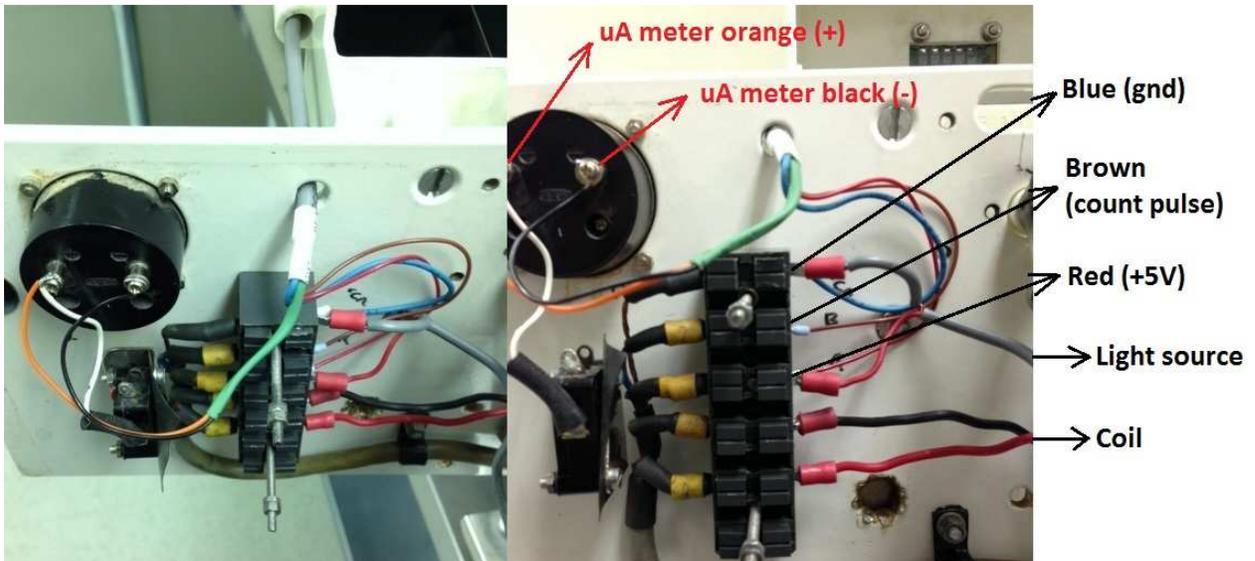

1972 style door — Extra resistor

1982 style door — No resistor

New connections

uA meter orange (+)
uA meter black (-)
Blue (gnd)
Brown (count pulse)
Red (+5V)
Light source
Coil

Light source:

- Undo the two wires from the main terminal block (push-in or screw contact)
- Take the old light source out of the machine.
- Take the top cover off the light source (remove screw on side)
- Remove the wires from the light bulb socket
- Take the light bulb socket away by removing the two top screws
- Take the lens and frame off by releasing the bottom screws
- Install new LED fixture and tighten the two bottom screws
- Attach the wires to the orange terminal block (mind + and – signs)
- Install into machine WITHOUT cover
- Connect the 2 wires to the main terminal block
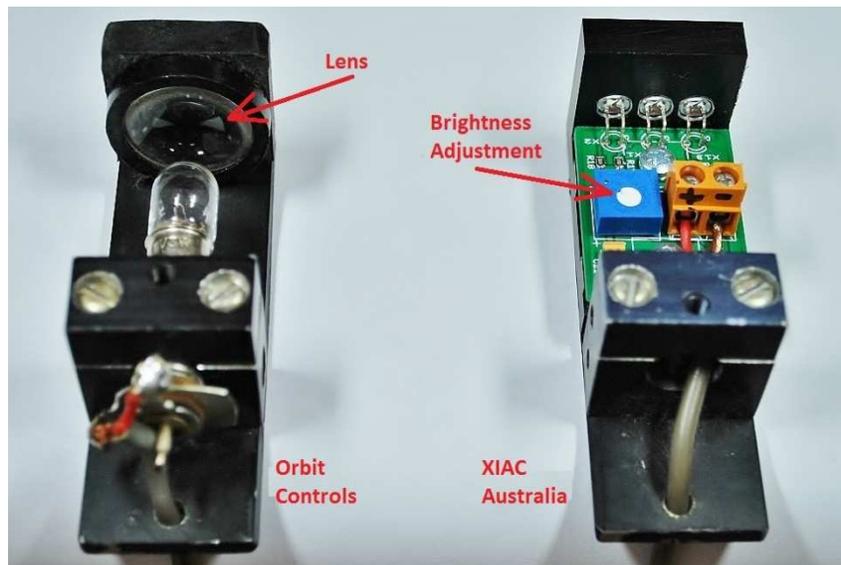
Sensor:

- Undo the two wires from the main terminal block (push-in or screw contact)
- Undo the wires from uA meter and push button (push button is no longer required)
- Undo the two nuts and take out the old sensor
- Install new sensor, feed cable through hole
- Attach the wires as in below picture
- Note that the orange and black wire can be hooked up directly to the terminals of the uA meter, leaving the push button obsolete.
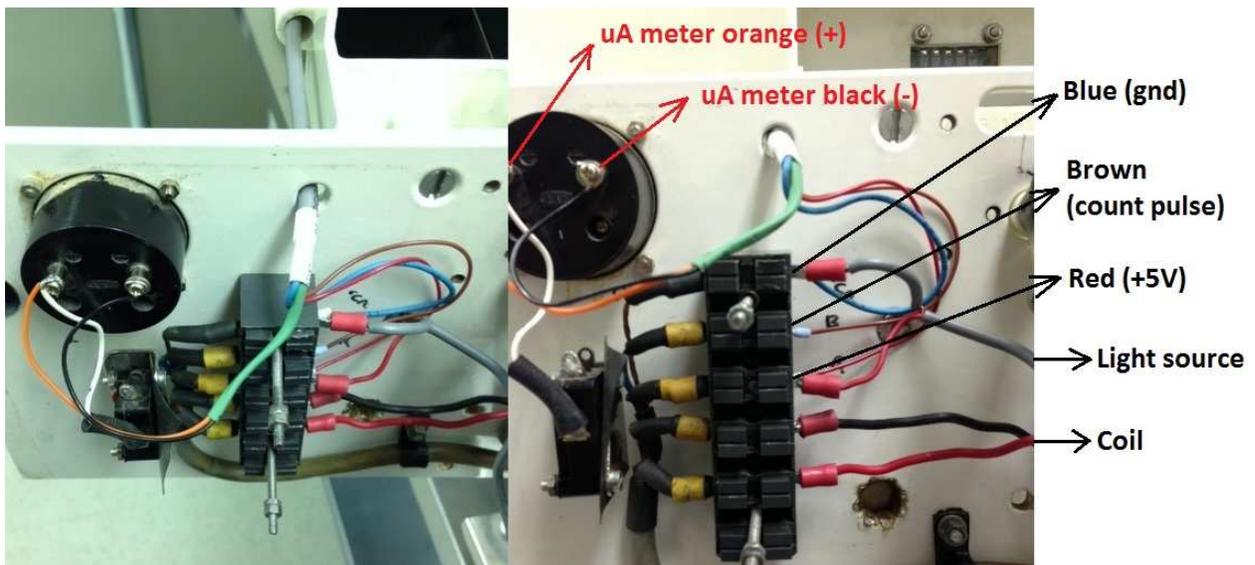
Batch counter:

Remove the old batch counter and install the new controller. The new 2014 controller is slightly larger than the 1982 style batch counter. For this reason, the plateau that the controller stands on top of needs to be modified to accommodate the larger controller. The plateau of the 1972 style batch counter is large enough and does not need to be changed.

Commissioning

Switch on the new controller. The yellow LED on the sensor should start flashing; pressing the reset button on the terminal should change-over the flap. If this does not work, check the wiring. If you can hear the flap mechanism but it doesn't completely change over this means your flap is too slow and you need to service the change-over mechanism until it works properly.

Light source:

Adjust the angle of the light source until the maximum amount of light is received by the sensor (check the uA meter), then adjust the brightness by gently turning the brightness potentiometer with a screw driver until the uA meter points to approximately 400uA (+/- 5%). Then place the cover onto the light source and tighten the bracket bolt while keeping the light source at the optimum angle.
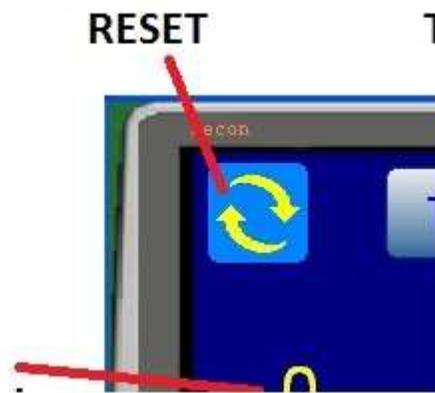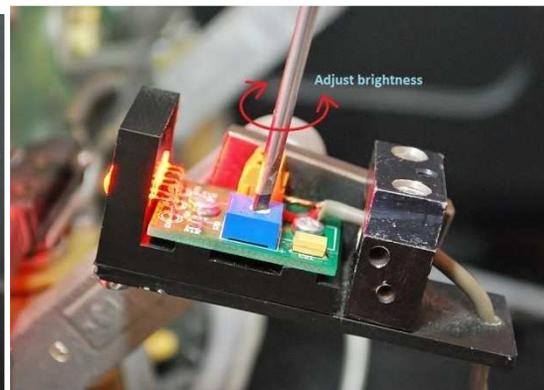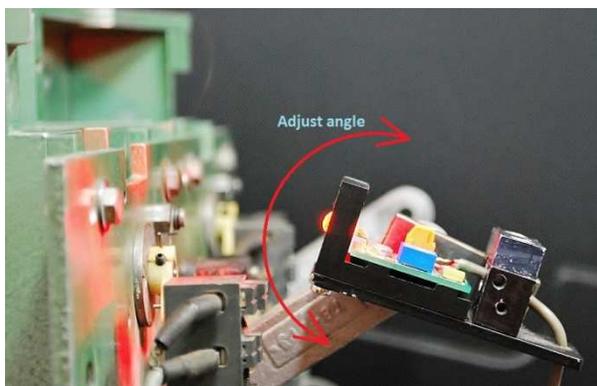
The green LED on the sensor should now be on and the RED led off. Block the sensor momentarily with an object (like a finger). Check that the green LED turns off while the light is blocked out. Please note the uA meter reading will also drop when the light was blocked out. The red LED will come on if the light is blocked out for an extended amount of time (about 10 - 15 seconds).

Controller:
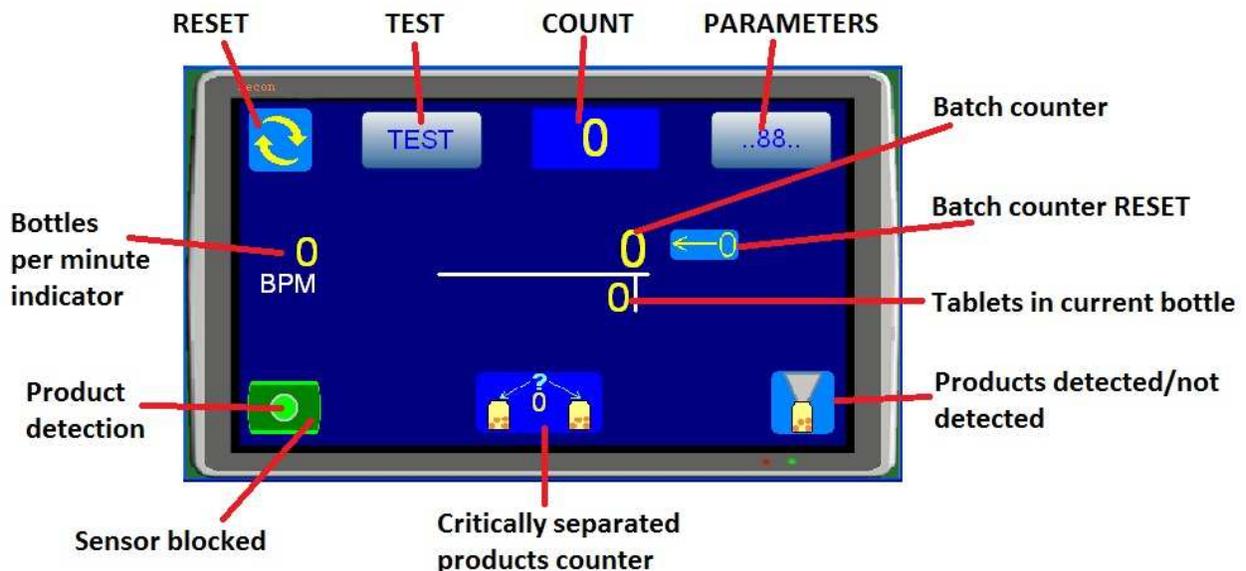
Sensor status indicator

In the left hand bottom corner of the terminal is the sensor status indicator. In its center is the green product detection indicator which will turn red when a product has been detected. Around it is the green sensor blocked indicator which will flash red when the sensor has been blocked for more than 1 second. When sensor blocked is flashing, it can be reset by removing the blockage and then pressing the reset button on the terminal.

Machine status indicator

In the right hand bottom corner of the terminal is the machine status indicator. When no products are detected the icon shows as in previous page. When products are detected, the icon will change showing a funnel and bottle full with tablets.

TEST button

Pressing the TEST button will setup all the parameters for a test mode and then simulate product input at a rate of 50 products per second. Since the count is automatically set to 50 pieces, the flap will change over every 1 second. Press reset to quit the test mode.

NOTE: Test mode will not work if the sensor blocked indicator flashes. First resolve the blockage, then reset, then test mode.

COUNT

Press COUNT to change the quantity of products to be counted per bottle.

Parameters

Press this button to change PLC parameters (see later in this manual).

Batch counter reset

Resets the batch counter (amount of completed bottles).

Tablets in current bottle

The amount of tablets currently counted into the bottle.

Critically separated product counter

When the flap changes direction and a new product enters the channel too quickly, this product is not guaranteed to be directed into the correct bottle. To prevent an undercounted bottle, this product is not counted but instead the "critically separated product counter" is incremented. If too many of these appear, it means the machine runs too fast. This is not a problem but may result in some bottles having an extra product.

Bottles per minute indicator

Indicator for the running speed in bottles per minute.

Parameter settings

- **Sensor paralyses time (ms):** [default = 5] To prevent undercounts, the paralyses time commands the PLC not to count more than 1 product within the set time. This is required for softgels and other transparent capsules. As a rule of thumb, the paralyses time can be set to the product length but should not be set to a value that is larger than 1.5 times the product length. For example, you're counting capsules that have an overall length of 22mm, the paralyses can then be set to any value between 22 and 33. A too low paralyses causes undercounts when counting softgels, but it causes overcounts and/or separation errors when set too high. So, keep it as low as possible while maintaining accurate counts. You will probably get the best results when set to 1.2 to 1.3 times the product length (26 – 29). **Remember to set the Paralyses back to "5" when counting normal (not transparent) products.**
- **Product particle timer (ms):** [default = 2] If the PLC has detected a product that triggered the sensor for less than the particle timer, this product will be ignored. The normal counting register will remain unchanged but the "Counted particle" register (see below) will be incremented.
- **Sensor sensitivity (%):** [default = 90] The sensitivity of the sensor. Normally can be left at 90%. When counting large tablets that have many broken particles mixed between them, the sensitivity can be reduced to prevent the broken particles being counted as tablets.
- **Flap delay (ms):** [default = 0] The change-over flap changes direction at the trailing edge of the last product that completes the count. Normally, there is no delay required but a delay may be set for large products or when counting empty capsules to prevent the flap from hitting the product too soon.
- **Flap pulse (ms):** [default = 80] A short voltage pulse is applied to the flap solenoid to properly change-over the flap's direction. A smooth running flap should still change-over when set to approximately 40ms.
- **Separation time (ms):** [default = 25] The minimum time (gap) required to have between two subsequent products to ensure the flap separates them properly when it changes-over.
- **Not separated count [0, 1]:** [default = 0] When the flap changes over and a new product (for next bottle) arrives too soon, this product is not guaranteed to be directed into the correct bottle. To prevent an undercount, it is advised not to count this product (set to "0"). When this setting is set to "1" it will count all products, even if they were not properly separated.
- **Counted particles:** This is not a setting but a register that can be checked to see how many product particles have been detected. The register will reset to 0 every time the Reset button was pressed.