ABACOM Technologies

ezShot Solder Paste and Fluids Dispensing System

The **ezShot** dispensing system provides an innovative, patent pending, dispensing solution for applications that require accurate and controlled deposits of fluids and pastes. ezShot is particularly well suited for solder paste application to printed circuit boards in preparation for SMT component assembly. **ezShot** used the popular **ezPick** vacuum pick and place system is the ultimate small batch and prototyping SMT assembly system .

The dispensing head is a digitally controlled linear actuator driven by the **ezShot** wireless remote controlled, software configurable, stepper motor controller. User's can configure different dispensing profiles in the simple **ezShot** software interface, and then upload their profiles to the ezShot's wireless controller. Each dispensing profile has an associated pushbutton on the handheld RF remote control. ezShot will repeatedly dispense the profiled amount at each key press of the RF remote control.

- **Linear actuator control for precise dispensing shots**
- **Handheld wireless remote controlled solder shots**
- **Accepts standard 10cc syringes**
- **Multi-Axis-Multi-Direction motion control**
- **X and Y axis Gliding hand rest support**
- **Models for left handed or right handed operators**
- **Smooth Ball Bearing slides provide effortless motion**
- **Includes ezShot wireless linear actuator controller and power supply**
- **Includes ezShot dispensing profiles configuration software**
- **Includes 3 empty syringe barrels, tip's and plungers**
- **360 degree rotating PCB platen, ball bearing assisted**
- **Spring assisted rotating Z axis dispensing head for up, down, rotate and centre-rest positions**
- **Companion to the ezPick bench top SMT Pick and Place system**
- **Small 12" x 17" footprint ideal for bench top**
- **Approx. 24" x 17" operating footprint**
- **Dispensing coverage area up to 9" x 9"**
- **Perfect for small batch surface mount PCB assembly and SMT prototyping**
- **Perfect for a wide variety of dispensing and fluid and paste metering applications**
- **Ideal for R&D labs**

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Operation

Once the ezShot software has been installed and ezShot system has been set up , preparing **ezShot** for a dispensing job requires three simple procedures:

1. Configuring dispensing profiles for a particular job in ezShot software
2. Uploading the profiles to the ezShot controller
3. Replaying the uploaded dispensing profile by keying the appropriate transmitter button **(*see note below)**

Initial Setup
Installing ezShot Software

Before connecting ezShot controller to the computer's USB port , ezShot software must first be installed. The software is provided on CD ROM. The USB drivers for ezShot will automatically be installed during the software installation process. Any software updates will be available for download from our website. Once the software has been installed and is running:

- Select the COM port allocated to ezShot
- Power up ezShot controller and connect it to the USB port using the supplied USB cable
- Enable the data link between the ezShot software the ezShot controller by clicking 'Connect to ezShot'
- With the data link established, proceed with configuring your dispensing profiles by entering your parameters into the editable fields
- Upload your profile to ezShot controller by clicking the 'Send Parameters' button. The LED indictor on ezShot controller will blink to verify a successful profile upload
- From the File dropdown menu, name and save your profile for future retrieval
- Click 'Disconnect ezShot' to disconnect the data link with ezShot controller. **(*see note below)**
- Disconnect the USB cable
- ezShot controller is now configured and ready to operate as a standalone wireless controller for ezShot dispensing
- Connect ezShot controller to ezShot via the two polarized plugs. Note: The motor connectors are color coded Red and Green which ensures the correct rotation direction of the motor.

***Note:** ezShot controller is designed to operate as a standalone wireless controlled controller, receiving its commands from the ezShot handheld transmitter. However, ezShot can also be controlled directly via the ezShot software interface. Direct control through ezShot software interface may be useful when experimenting with different dispensing profile parameter settings. Then, once satisfied with the chosen profile settings, standalone wireless controlled operation will be the method used for normal operation of ezShot .

ezShot software allows the user to setup four independent dispensing profiles, where each color coded profile is associated with the ezShot transmitter pushbuttons. **ezShot** is a versatile dispensing tool that may be used for many other dispensing applications besides solder paste application to SMT PCB boards. ezShot software allows you to save profiles associated with a particular application for later retrieval and uploading to ezShot controller. This is feature is a tremendous time saver, even when ezShot is being used for a single application such as solder paste dispensing, considering that you may choose to have several profiles for different solder pasting scenarios. For example, you may have different profiles when using different size dispensing tips.

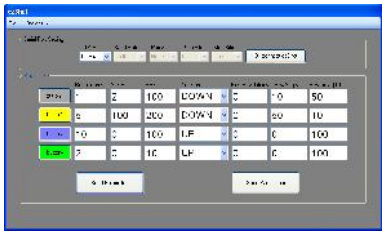
ezShot Software

The software interface is simple and intuitive to use. There are **three** profile parameters windows in the **'Options'** drop down menu:

- Plunger **Revolution_steps** profile window
- Plunger **Linear displacement** profile window
- Paste **Volume** dispensing profile window

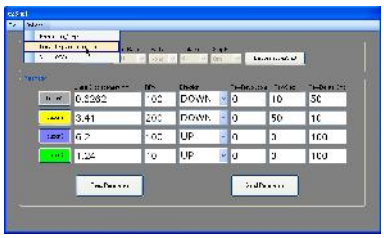
All three profile configuration windows share the same 'RPM' (revolutions per minute) and 'DIRECTION' data fields. For all profile configuration options, it is best to initially experiment with different settings to quickly get a feel for how the settings translate into actual ezShot dispensing. Note that a total of 4 profiles may be entered. Each profile is assigned to a colored control button in the software. The software control buttons and the ezShot remote control push buttons share the same control function

The **'Revolution_Steps'** profile configuration window enables you to enter:



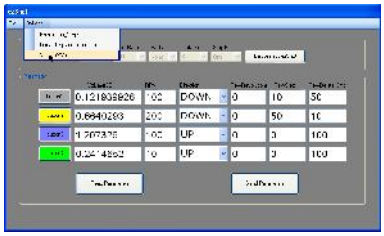
- **Revolutions:** the number of revolutions (255 maximum). For <1 revolution enter 0 for revolutions and then enter a value for the required steps (or degrees of partial revolution) in the Steps field
- **Steps:** partial revolutions in Steps (200 steps=1 revolution) (1.8 degrees rotation per step)
- **RPM:** revolutions per minute, where the maximum RPM is 255. Lower RPM is preferred for increased torque
- **Direction:** selects the direction of plunger travel; either Up or Down
- **Rev-Revolutions:** reverses the plunger for the entered revolutions after a dispense shot to
  relieve pressure so as to minimize drooling at the dispense tip
- **Rev-Steps:** as above, but in step increments
- **Rev-Delay:** delay x10 milliseconds after a dispense shot before the reverse (back-off) occurs

The **Linear Displacement** profile configuration window enables you to enter:



- **Linear Dispalcement:** The distance in millimeters the plunger is to travel. One step or 1.8 degrees of a revolution equates to 0.0031mm of plunger travel. One revolution equates to ezShot plunger traveling a distance 0.62mm (200 steps x 0.0031mm)
- **RPM:** described above
- **Direction:** described above
- **Rev-Revolutions:** described above
- **Rev-Steps:** described above
- **Rev-Delay:** described above

The **Volume** profile configuration window enables you to enter:



- **Volume (CC):** The volumetric amount to be dispensed in CC (maximum is <10CC)
- **RPM:** described
- **Direction:** described above
- **Rev-Revolutions:** described above
- **Rev-Steps:** described above
- **Rev-Delay:** described above

Uploading your custom profile

After entering your dispensing data profiles using your preferred configuration window, the profiles can be uploaded to ezShot controller via the USB link as follows:

- Click **'Send Parameters'** button.
- ezShot controller LED will blink momentarily indicating successful completion of the profile upload

Testing your Profile

With the profile uploaded to ezShot controller, you are able to test the results of your profile in two ways:

- Directly from the software window;
  Clicking on a **profile software button** will cause ezShot to perform according to that particular profile.
- Using the ezShot handheld remote control transmitter;
  Clicking on a profile button on the remote control transmitter will cause ezShot to perform according to that particular profile. (note: for wireless communication to be established, the transmitter must have been paired with ezPick wireless controller. For details please see Receiver Transmitter pairing described later in the manual)

Profile testing assumes that the ezShot system is completely assembled, set up and connected for normal operation.

- ezShot must be connected to the controller observing correct motor polarity
- ezShot controller must either be connected to the PC for testing using the software interface or
- ezShot can be in standalone mode for profile testing with the wireless remote control
- The remote transmitter has been paired with the receiver controller
- The solder paste syringe or test media syringe must be fixed in place on the dispensing head
- The linear plunger is under load (ie in contact with the internal syringe plunger plug)
- Dispensing test substrate is in position on the turntable

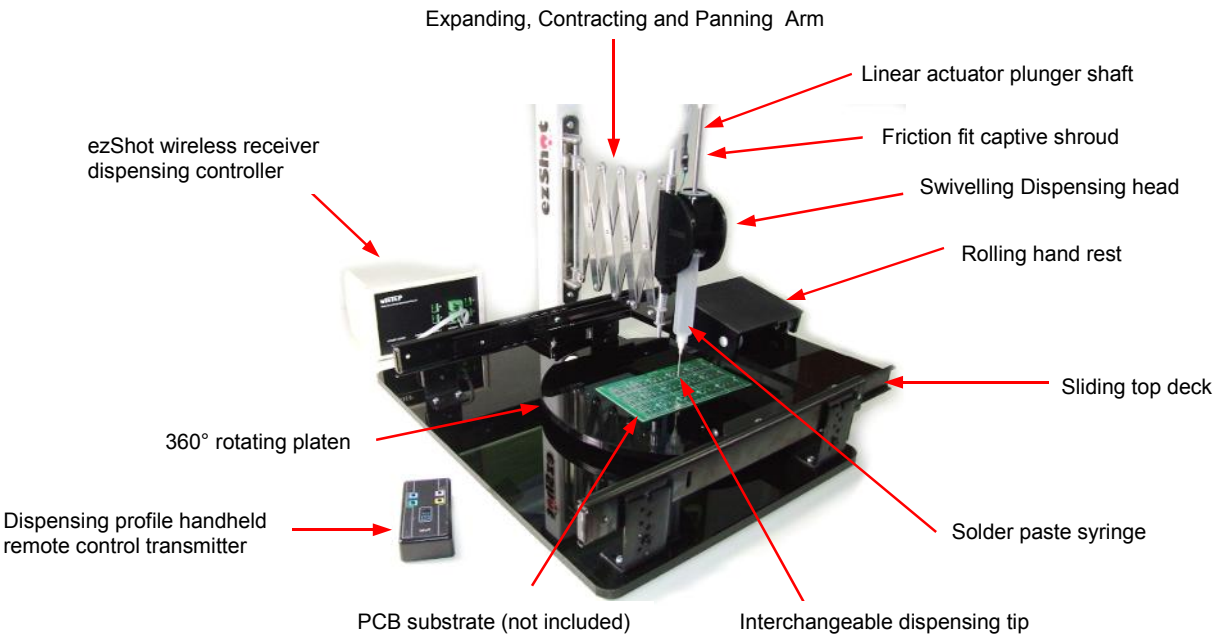
Saving your profile

After an initial profile test, it is likely that some tweaking of your profile parameters may be required before optimal dispensing parameters are determined. Once the profile tests reveal optimal dispensing performance, it is recommended to **name** and **save** the profile file under the File menu of the software for future retrieval and future uploading if required.

Reading your stored profile from the controller

Your uploaded profiles residing in the ezShot controller memory can also be read back into ezShot software.
This is performed by clicking the **'Read Parameters'** button in ezShot software interface. The ezShot controller LED will blink momentarily in response. Ensure that 'Connect to ezPick' button in the software interface has been clicked.

ezShot Anatomy



Referring to the labeling above from the top label and following in a clockwise direction each key component part of ezShot is described as follows:

- **Expanding, Contracting and Panning Arm:** facilitates the forward, backward and panning of the dispensing head, as well as the up and down movement of the dispensing head.

- **Linear actuator plunger shaft** is a freewheeling non captive shaft which rotates freely when triggered by a profile command if there is no load applied to the plunger shaft. However, as soon as the shaft is under load, it travels UPWARD or DOWNWARD according to the profile direction parameter. The shaft will automatically be under load as soon as it comes into contact with the opposing force of the dispensing syringe piston (when receiving a DOWNWARD direction profile command.)
  ***** Please see ezShot revisions and updates at the end of this manual for additional info.***

  Under initial set up conditions, the plunger shaft will be at its uppermost position to allow for installation of the syringe barrel into the dispensing head. At this position there will be no load present and therefore the plunger will freewheel when activated. To allow the plunger to travel DOWNWARD until it reaches the syringe load it is necessary to provide a load manually, by hand. When your hand stops the shaft's freewheeling rotation, the shaft will start to travel and continue to travel according to the particular profile it is responding to. Under idle conditions, the shaft may also be raised or lowered manually through manual rotation by hand. The captive screw at the top end of the shaft facilitates manual loading of the shaft to allow for upward or downward travel when running a profile, or facilitates manual upward or downward travel through manual rotation under idle state.

  Tip: when aligning the shaft to the syringe load, in preparation for dispensing, using combination of shaft hand loading and no load freewheeling, when traveling Downward toward the syringe load, allows good manual control to prevent over traveling of the shaft. Over traveling of the shaft that may cause a sudden impact with the syringe load and should be avoided. The final few rotations towards aligning the plunger shaft to the syringe load is best performed by hand rotation. When the plunger shaft settles in intimate contact with the syringe load, fully automatic profile dispensing can then commence.

- **Swiveling dispensing head** swivels in a 270° arc and is spring loaded for up and down movement. The head contains a snap-in grip and guides that secures the standard size 10CC syringe barrel in place for dispensing. It includes a built-in mechanism that allows for easy removal of the syringe barrel. To remove the syringe, simply rotate the syringe 1/4 turn to the left or to the right. This rotation causes the syringe to pop out from the grip.

- **Rolling hand rest** glides forwards and backwards on the top deck. The 'knife edge' of the operators hand rests on the rolling hand rest whilst gripping the dispensing head between the thumb and index finger (as one would hold a pen). This provides extreme comfort and agility during and aids in the accurate dispensing operation.

- **Sliding top deck** is ball bearing assisted to provide a smooth left and right gliding travel of the top deck. In combination with the rolling hand rest above this provides the operator hand with smooth freedom of movement in the forward, backward, left and right directions.

- **Solder paste syringe** is commonly packaged in a 10CC size syringe and available from many vendors. The syringe snaps firmly into the dispensing head and is easily removed by rotating the syringe 1/4 turn either clockwise or counter clockwise. When loading the syringe into the dispensing head, the top 'wings' of the must be oriented to slide into the guide rails of the dispensing head. Slight force applied ensures the barrel snaps into place. Ensure that any label material and adhesive residue on the syringe barrel is removed before attempting to install the syringe. **Failure to do so will require excessive force to load the syringe and can damage the dispensing head.**

  Two empty syringes are supplied with ezShot for you to use for training, testing and calibrating your dispensing profiles. The syringes may be filled with a similar viscosity paste or fluid to that that will be used in the real dispensing application. One syringe filled with toothpaste is included for use as a tester. Additional syringe barrels and pistons may be ordered separately from our website.

- **Interchangeable dispensing tips** twist on and off the end of the syringe. Solder paste syringes are usually supplied with a tip included, but ezShot comes supplied with 3 assorted tips for your use or for experimentation or practice purposes. Additional syringe tips may be ordered separately from our website.

- **PCB substrate** is for illustration and is not included with ezShot

- **Handheld wireless remote transmitter** features four colored and numbered push buttons. The colors and numbers correspond to those in the ezShot profile configuration software. Right handed operators will typically use their left hand to control the transmitter whilst their right hand is handling the solder pasting operation. Each key press on the transmitter will cause ezShot to perform the profile associated with that particular button. Continuous keying will result in multiple performances of the associated profile.

  The transmitter is supplied already paired with the ezShot controller and therefore ready to communicate with the controller. Applications using **multiple ezShot dispensers** will require that each ezShot system operates independently without false triggering from another ezShot system's transmitter. In these applications the address code of the transmitter is easily changed via the 8 position DIP switch inside the transmitter. The 8 position DIP switch provides the capacity for up to 256 unique address combinations which means that up to 256 independent ezShot systems may be operated within the same environment. If the default system address configuration is changed to accommodate additional ezShot systems or for any other reason, then the transmitter will need to be paired with controller.

  Transmitter pairing with the ezShot controller is a very simple process thanks to the AUTOLEARN feature of the wireless receiver controller and is performed as follows:

  - Simply press and hold the LEARN pushbutton on the controller
  - The LED will be blinking, confirming LEARN mode is active
  - press any key on the transmitter
  - The LED will stop blinking, confirming a successful transmitter/controller pairing

- **360° Rotating Platen** is a ball bearing assisted platform onto which your printed circuit board or other substrate will be placed for the dispensing process. The rotational ability of the platen provides further agility to the ezShot system and further simplifies accurate dispensing shots. The platen is not fastened and simply sits on top of the ezShot base.

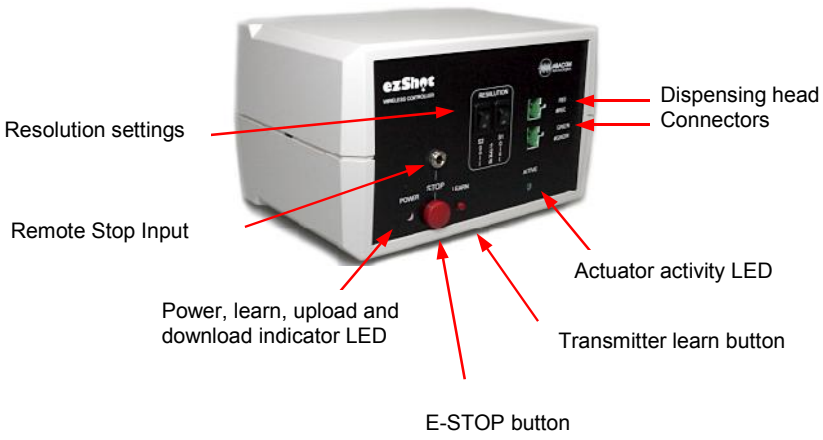
  The **best position** for the platen is in the centre of the base but **offset to the right** (on right handed machines) so that it overhangs the right hand edge of ezShot base. As a guide, have two of the four rubber feet of the platen base aligne with the right edge of the ezShot base.

- **ezShot wireless receiver dispensing controller** features a USB port (type B socket) for connection to the computer running ezShot configuration software. The USB port provides bidirectional data communication between the ezShot software and the ezShot controller. This allows for uploading (sending) the dispensing profile parameter settings to the controller from ezShot software interface as well as downloading (reading) profile parameter settings from the controller back to the ezShot software interface.
  When connected to the computer, the controller may be operated directly from the 4 profile software pushbuttons (typically during profile testing and calibration) or may be controlled by the handheld remote (typically during normal operation).

  Connection to the ezShot linear actuator dispensing head is via two polarized color coed connectors. It is important not to reverse these connections. Reversal will cause a reversal of the UPWARD and DOWNWARD directions in the dispensing profile. ***!! **NEVER** connect the dispensing head to the controller with power ON. **ONLY** make this connection under power **OFF** condition.!!***

  The ezShot controller is powered by the included 12Vdc, 300mA wall adaptor. The Power/LEARN LED will illuminate when power is applied to the controller. Besides indicating whether the controller is ON or OFF, the LED also blinks:
  - To indicate LEARN mode is active when transmitter pairing is performed
  - To indicate successful dispensing profile upload
  - To indicate successful dispensing profile download

ezShot controller –Front



ezShot Controller –Back

ezShot and ezPick

EzShot solder paste application and **ezPick** SMT pick and place systems offer the ultimate and extremely cost effective desktop SMT assembly solutions to overcome the difficulties in small batch assembly and prototyping SMT circuits. As seen below, the two system fit comfortably side-by-side on a regular desktop

Package Checklist

- **Base assembly**
- **Rotating platen**
- **Dispensing head assembly**
- **3x 10cc Syringe barrels and magnetic coupling pistons**
- **Polyurethane tube end coupler**
- **Hand rest truck**
- **ezShot wireless USB dispensing controller**
- **ezShot software CD**
- **12VDC, 0.5A power supply (North American type only. Excluded in International shipments)**
- **ezShot RF remote controller**
- **Remote control battery (Type CR2450)**
- **Expanding Arm Assembly**
- **4x Cap head screws for mounting the vertical post**
- **Tapered tip pack**
- **User Manual**

ezShot Revisions and Updates:

Rev. 2.1:

ezShot configuration software is enhanced to include a reverse direction function to minimize drooling at the dispense tip after a dispensing shot. This function allows the user to configure the reverse rotations and/or fractional (steps) rotations so that after a dispense shot is performed, the linear actuator shaft momentarily backs-off to equalize the pressure in the syringe.

The reverse rotation function is automatically disabled for all UPWARD direction configured profiles.

Furthermore, this enhancement allows the operator to set the time delay {in milliseconds (x10)} before the back-off function occurs.
A rev-delay setting of 50 for example will result in a delay of 50 x 10ms = 500ms. This means that after a dispensing shot, there will be a 0.5 second delay before the ezShot linear actuator will reverse direction for the number of steps specified in the rev- profile. After the linear actuator reverses direction for the specified number of steps, it will automatically revert back downward and stop; ready for the next dispensing shot.

This enhancement also required an ezShot controller firmware update.

Rev. 2.2:

ezShot dispensing head gets the addition of a captive screw guide. With the addition of the captive screw guide, the linear actuator rod is now always under load and therefore no longer freewheels when no load is present. This eliminates the need for the user to provide the manual finger grip load in order to get the linear actuator rod to travel upwards or downwards. However, freewheeling linear actuator rod is still possible should it be required, by simply loosening the captive screw.

The captive screw guide 'friction fits' to the top of the linear actuator motor and is easily installed or removed.

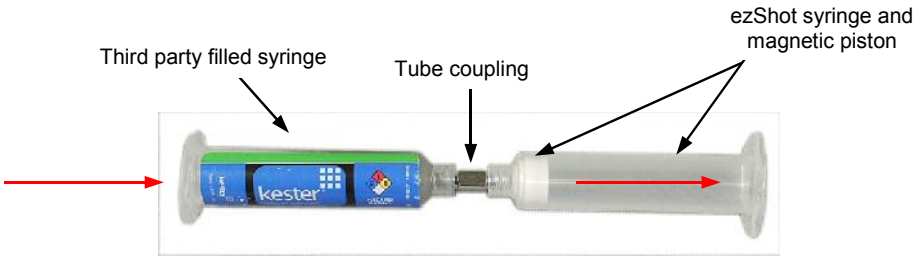
Rev. 2.3:

Linear actuator rod (syringe end) gets non ferrous metal lamination and syringe pistons get magnetic insert. This enhancement establishes a magnetic coupling of the syringe piston to the linear actor rod. The result of this enhancement ensures that when the syringe piston is retracted upwards either for syringe replacement or for the pressure equalization back-off function, the piston travels together with the reversing of the linear actuator rod.

NOTE: It is important to use the ezShot **magnetic pistons** and **not** the standard syringe pistons that are present in third party solder paste syringes. Rather than simply replacing the third party syringe piston with the ezShot magnetic piston, it is best to transfer the solder paste from the third party syringe into the ezShot syringe and magnetic piston. Doing this, rather than swapping pistons, ensures that no air entrapment occurs, as would likely result if the pistons were simply exchanged.

Transferring the solder paste from the original third party syringe is a quick and easy process and is performed as follows:

- **Using the supplied polyurethane tube sections, couple the third party filled syringe end to the empty ezShot syringe barrel end.**
- **Ensure the ezShot magnetic piston is bottomed in the empty ezShot syringe**
- **Plunge the third party filled syringe to transfer the paste entirely into the ezShot syringe**
- **Decouple the syringes**



Rev.2.4

Extension STOP switch is added to the dispensing head. The switch is hard-wired to a 3.5mm plug which plugs into the STOP jack on the controller front panel. This STOP switch operates in parallel with the STOP switch on the controller. Pressing either the new dispensing head STOP switch or the Controller STOP switch will interrupt the current dispensing (DOWN) or retract (UP) activity.

The dispensing head STOP switch provides improved manual control. For example, when the syringe piston has bottomed in the syringe barrel and is to be retracted all the way up in order free the syringe for replacement. In this case you can simply enter a retract profile of an arbitrary large number of UP revolutions to retract the piston all the way up, in a single trigger, and then simply manually stop the retraction once the piston is free from the syringe.

Rev.2.5

Increased resolution modes of x2, x4 and x8 are added to the controller, which are selected via 2 rocker switches added to the controller front panel. The original x1 resolution provided 200 steps per revolution of the linear actuator motor.
With the added resolution scales of x2, x4 and x8 ezShot resolution may be increased to 400, 800 and 1600 steps per revolution respectively. This allows for up to 8x smaller dispense shots compared to the original x1 resolution ezShot version.