TouchDRO

Presented By Yuriy’s Toys

Congratulations on your decision to explore the use of the TouchDRO. This application is assembled and designed to provide a small tablet capable of blue tooth connectivity to operate as a Digital Read Out for machines. This Manual describes installation and setup of the TouchDRO for Milling Machine or a Lathe

TouchDRO is a front end for a do-it-yourself DRO project that uses an Arduino or MSP430-based wireless controller to read a wide variety of scales. More details about the project and the required hardware can be found at:

http://www.yuriystoys.com/p/android-dro.html.

The app is designed to offer all of the functionality found in a commercial DRO unit based on normal conventions, while taking advantage of Android's touch interface. In addition to the standard functions, the latest version of TouchDRO includes the following.

Features:

- Readout for up to three linear axes, angular axis, and a tachometer
- Configurable user interface with mill and lathe modes
- Support for up to six machines
- Virtually unlimited point memory, organized into workspaces
- Machine-specific tool banks
- Graphical workspace preview

With this Version - 2.5.10 - August 13,2016:

- Revamped graphical layout view
- Arbitrary hole circle
- Per-workspace absolute origin
- Per-axis metric/inch mode selection
- Arbitrary hole circle
- Workspace export to CSV

Other machines that need Imperial or Metric measurements may benefit from this application for simple measurements, but is mainly used on Mills or Lathes.

Recommended Tablets:

- Google Nexus 7 (2013 Model)
- Google Nexus 7 (2012 Model)
- Samsung Galaxy Tab 2 (7-Inch, Wi-Fi)
- Samsung Galaxy Tab 4 (7-Inch, Wi-Fi)

When choosing an inexpensive tabled please ensure that it comes with Android 4.0 OS. Many off-brand tablets advertised as running Android 4.0 use an older version that is heavily “skinned” to look like 4.0. The only sure way to know if the device is running Android 4.x is to check the Kernel version, which should be 3.0.1 or newer. If the Kernel version is older, the application will not install and/or operate properly.

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Normal Conventions:

User Interface is the main screen.

Axis available on the user interface are *X Y Z* and *W*.

Y Z W may be disabled on the user interface.

The *W* axis may be combined with either the *X Y Z* axis.

The *W* may be shown as an angular setting on the user interface.

Reference to buttons are normal interface to functions I.e. inch/mm, zero set etc.

The three vertical dots icon on the upper right hand corner of the user interface, means "more options" technically called Vertical Ellipsis.
Any time the manual calls for “Options” it is referring to touching these.

Short button press means to briefly touch the button for more options or an action.

Long touch means to touch the button for at least 1 second or longer for more options or action.

General Screen Layout for Vertical Mill:

Normal screen Layout for the vertical mill can have the normal *X Y Z* and *W* readouts and tachometer if so desired. Each readout will have its own abs/incr button in line with the readout. On the bottom of the screen you will find a button for;

- inch/mm button
- Zero Set button
- abs/incr (global set) button
- Tool Offset button
- Hole Circle button,
- Arbitrary Hole Circle
- hole pattern button, and a Add point button.

General Screen Layout for The Lathe:

Normal screen Layout for the lathe can have the *X Y Z* and *W* readouts and tachometer if so desired. Each readout will have its own abs/incr button in line with the readout. On the bottom of the screen you will find a button for;

- inch/mm button
- Zero Set button
- abs/incr (global set) button
- Tool Offset Button
- Rad/dia button

Recommended Tablets:

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- Google Nexus 7 (2012 Model)
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- Samsung Galaxy Tab 4 (7-Inch, Wi-Fi)
- Samsung Galaxy Tab 6A (7-Inch, Wi-Fi)

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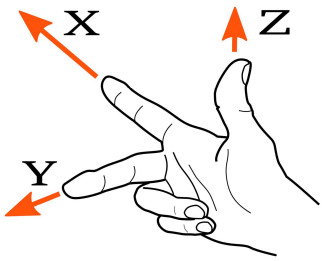
Counts-per-inch for some common scales are as follows:

- iGaging Digimag and AccuRemote - 2560
- Standard (Sylvac) Chinese Scales - 20480
- Harbor Freight Calipers - 2000
- 5 micron Glass/Magnetic Scales - 5080
- 1 micron Glass/Magnetic Scales – 25400

Section 1 Axis:

Functions in the TouchDRO application are implemented based on the standard axis. If your DRO is set up differently, many of the Functions will be useless. For example, functions such as “Hole Circle”, “Hole Pattern”, “Tool Radius Offset”, etc. assume that the axis Drilling the holes will be Z. Similarly, lathe tool Offset function uses Z and X axis for the table and cross slide movement respectively.

TouchDRO uses the “right hand” Cartesian coordinate system that is commonly used in manual machining and in most, if not all, CAD/CAM packages. There is a mnemonic called the “right hand rule” that might help you remember it better: partially close your right hand so that your thumb, index finger and the middle finger form some resemblance right angles.

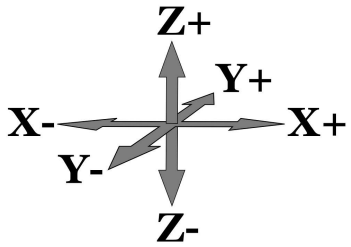


Your index finger will then point in the positive “X” direction, middle finger will show the positive “Y” directions and your thumb will represent the positive “Z” direction. The convention in the trade is to assign the axis parallel to the spindle to be “Z”, with X and Y being used for the other two axis. Additionally, there are two sets of secondary* axis, angular and linear. Angular axis that rotate about X, Y, and Z are commonly designated A, B, and C respectively.

They use the “right hand screw rule”: close your hand and point the thumb in the positive direction of the axis; your fingers will point in the positive direction of rotation. The linear axis U,V and W are often used for things like quill, etc.

Vertical Mill:

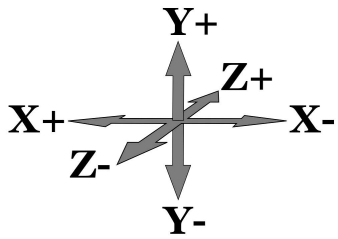
Vertical milling machine is probably the most intuitive when it comes to it’s coordinate system.



The axis parallel to the spindle is Z. On a vertical mill this axis is vertical, therefore table’s longitudinal travel will be “X” and cross travel will be “Y”, with the numbers increasing as it moves to the right and away from you. Moving the knee up will increase the Z value and vice versa. On a tabletop milling machines that don’t have a knee, moving the head and/or the quill down has the same effect as moving the knee up. If your setup includes a DRO on the knee/head and the quill, the application allows Z and W readouts to be combined, giving you a single Z position.

Horizontal Mill or Surface Grinder:

On a horizontal mill or a surface grinder the cross travel of the table becomes Z (because it’s parallel to the spindle’s axis), X then, is the longitudinal travel of the table and Y is vertical.



Lathe:

On The lathe, the bed is parallel to spindle, therefore it becomes the Z axis, pointing away from the headstock. In other words moving the carriage away from the head stock increases the position and vice versa. The cross slide on a lathe is X, with the positive direction pointing away from you (towards the center of rotation). A milling attachment axis then becomes Y.

Special note:

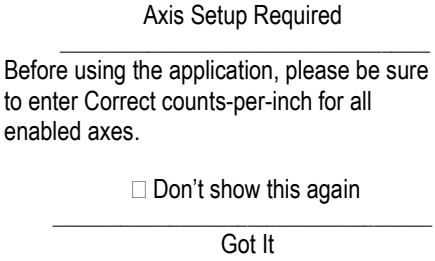
3-in-1 Combination Machines

Combination machines that basically consist of a lathe with a tabletop milling machine attached to it. They have two spindles, so depending on which function you use, the axes change accordingly. For the purposes of the TouchDRO application consider them to be two separate machines, otherwise some functions make no sense. In the version of the app it's easy to switch between machines, so this should not pose much inconvenience.

Section 2 First Time Setup-General Settings

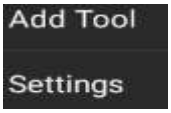
2.1 First Time Setup:

Upon Entering the App for the first time, you might get this message:



If the correct settings have already been entered, check the box and go on. You should not get the message again, if not go the settings page by touching the **THREE** vertical dots in the upper right of the screen.

It will ask for (Add Tool or Settings). Touch **Settings** this will bring you to the general settings page to allow settings for your machine or machines.



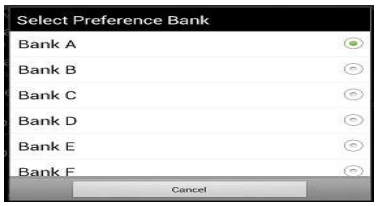
2.2 General Settings:

On initial setup the screen in the upper left hand side will say **General Settings | Mill,** This is the default setting.

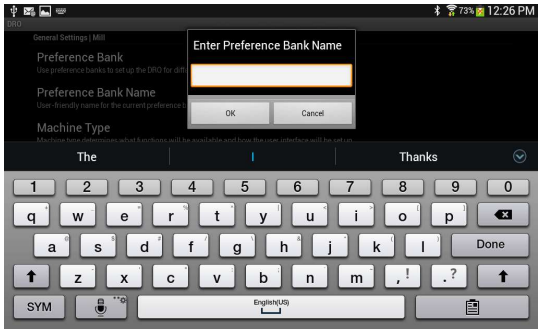
2.3 Preference Bank Letter A-F and Name:

TouchDRO has the ability to use one tablet with multiple machines. This makes this almost seamless by using up to six setting banks. A setting bank is a virtual folder that stores the complete set of application settings and saved workspaces. For example, a shop that has a milling machine and a lathe can use two separate sets of settings and calibration data for each machine. During a milling operation the user would switch to the bank that contains the settings for the mill. Switching to lathe is as simple as disconnecting from the mill controller, switching the appropriate bank and connecting to the lathe.

To set a Preference Bank, **Touch** (Preference Bank) when in the General settings screen.
This will open up a drop down screen as shown.



For the Machine you want to setup and or use the most touch Bank A.
This will select that bank and the drop down screen will go away. Touch (Preference Bank Name) a drop down screen will appear.



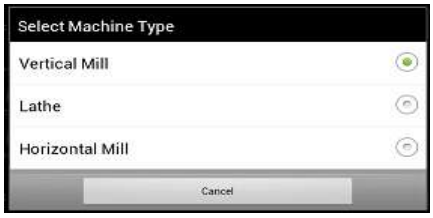
Enter any name you desire (For this exercise enter Mill) and touch Ok, the drop down screen will go away. Touch (Preference Bank) and select bank B. Then touch (Preference Bank Name) but this time type in Lathe, select Ok.

At this point you have set Bank A as **Mill** and Bank B as **Lathe**. To confirm this go back to the (Preference Bank) and touch bank A. In the upper left hand corner it should say **General Settings | Mill**. Go back to (Preference Bank) again and touch Bank B and it will now say **General settings| Lathe.** If for some reason if you in the future forget what bank is what, the General settings page in the upper left hand corner will say Mill or Lathe or what name you have set in the Preference Bank for a quick reference, also when you turn your DRO on It will display on the upper left Connected (MILL) or (LATHE).

2.4 Machine Type:

This will determine what functions will be available and how the interface will be setup, three options are available.

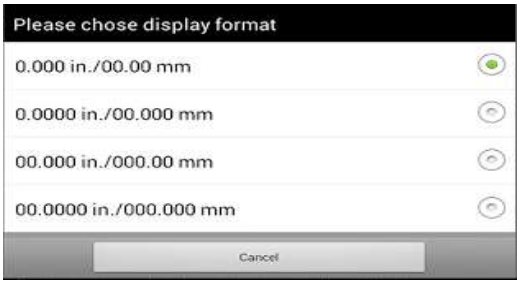
Vertical Mill
Lathe
Horizontal Mill



Go to Preference Bank and select bank A. Now go to Machine Readout, touch machine readout for the drop down. Select Vertical Mill or Horizontal Mill which ever is relevant. Go back to Preference Bank and select Bank B. Go to Machine Type again and select Lathe. Now you have machine user interface functions available Bank A and B.

2.5 Readout Display Format:

There are four formats available for use. By touching readout display format a drop down box will appear.



Select format that suit's the machining desired.

2.6 Read Out Display Font:

There are three available for use.

7-Segment Font

Monospace Font

Default Font

2.7 Metric Mode:

Allows the application to be set in Metric mode. To set touch Metric Mode, it will check the box on the right. With this set it will always start in metric mode.

2.8 Use USB Connection:

This option is for a wired connection instead of BlueTooth. By touching this it will check the box on the right of screen.

Caution:

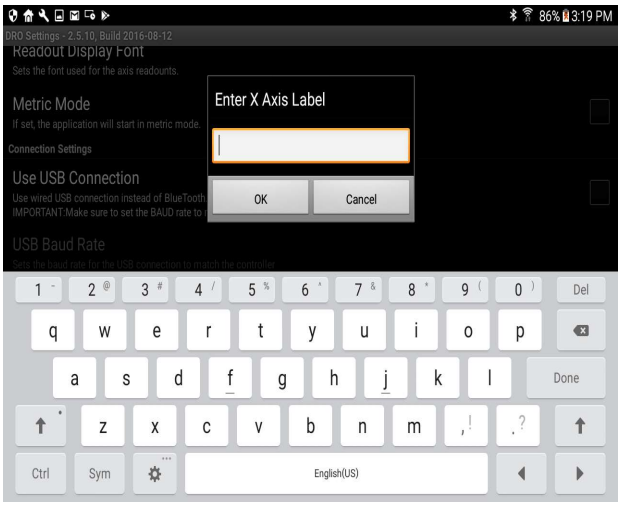
It is very important to make sure the BAUD Rate is set to match the controller.

2.9 USB Baud Rate:

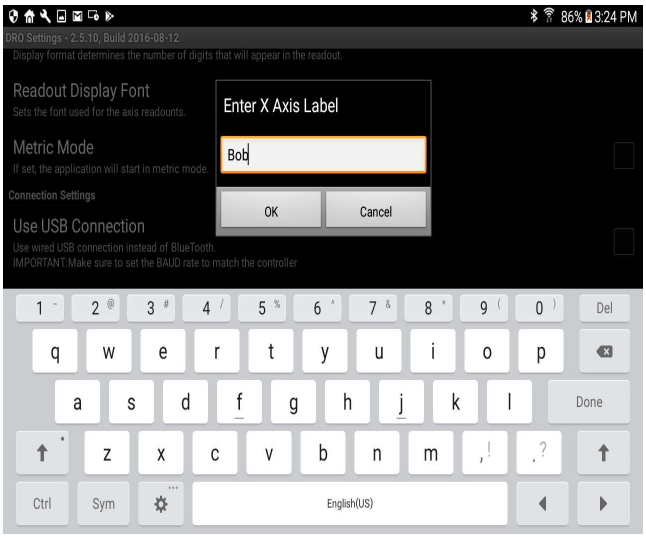
The Baud Rate setting grayed out if the check box is not checked ! Once checked you may by touching the usb baud rate and the drop down screen will appear. Three are 5 speed settings to select from. Select the proper setting for your application by touching that speed.

Section 3 Setting up X-Y-Z and W Axis functions:

The X-Y-Z and W Axis all basically setup the same, the only exception is the Y Z and W axis. The Y Z and W axis have to be enabled before they can be set (See 3.4). Only the X Axis will be explained here as it is the same for all axis. In the setup screen scroll down to the X Axis. Touch the Axis label, the drop down box will appear and you can type in a letter or name.



Normally you would have the letter X in this drop down, but for this exercise enter the name (Bob).



Touch Ok then touch the return arrow to go back to the main screen. You will See the X axis named Bob. Go back and reset to what name you prefer.

3.1 Axis CPI:

In order to calibrate the scales the TouchDRO application needs to be installed and talking to the scale interface controller. Moreover, the scales need to be mounted to the machine in their "**permanent**" positions.

I.e. when you remove/reinstall the scales the calibration will need to be repeated.

Second, the application settings need to be altered a bit to make the calibration easier:

Set display format to show four digits after the decimal period (in inch mode).

Set CPI for the axes you intend to calibrate to **10000**. If W axis is used, make sure it's value is *displayed separately*, not summed up with another axis.

Finally, the application needs to be switched to inches. Axis CPI determines the counts per inch. On initial start up the value is not set, default CPI of 10,000.00 will be used.

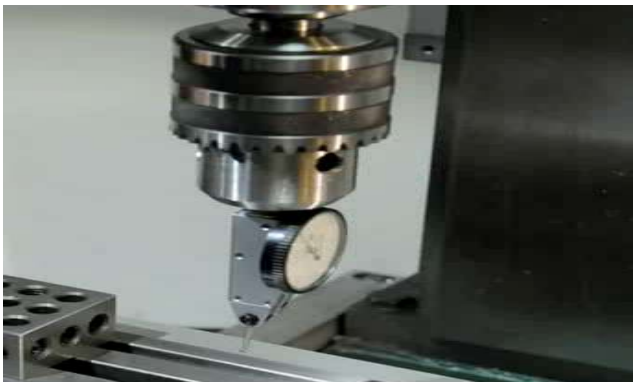
To determine what this count should be:

The Plan__

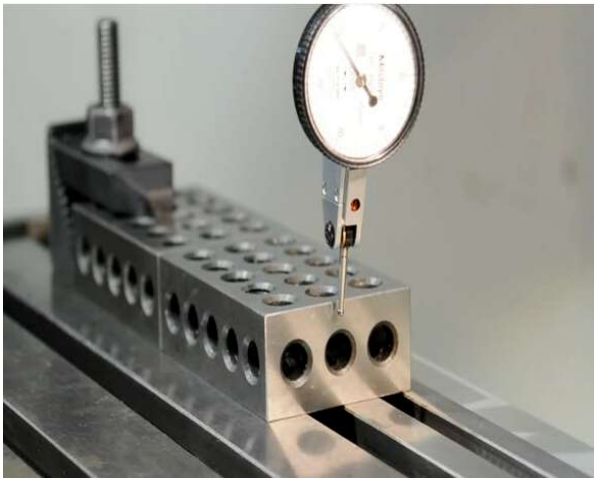
To calibrate the X Axis using two 1-2-3 block's and a dial test indicator. Repeat for the Y and Z axis.

Step 1 Attach one of the 1-2-3-block's square to the table with the 3 inch way in line with the X axes.

Step 2 Mount the test indicator in the spindle.



Step 3 Place the other 1-2-3 block against the first one.

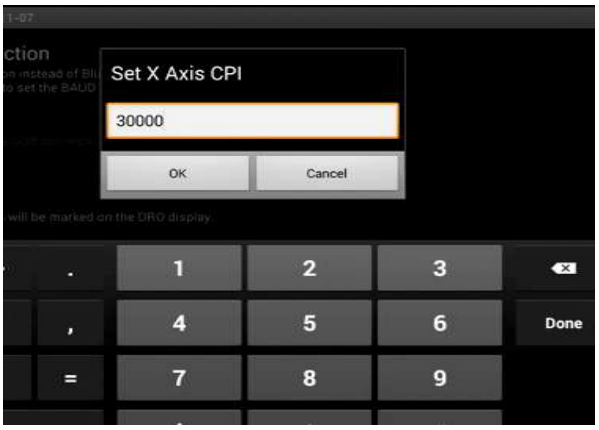


Step 4 Indicate the 1-2-3 block's.

Step 5 Carefully remove the indicated 1-2-3 block.

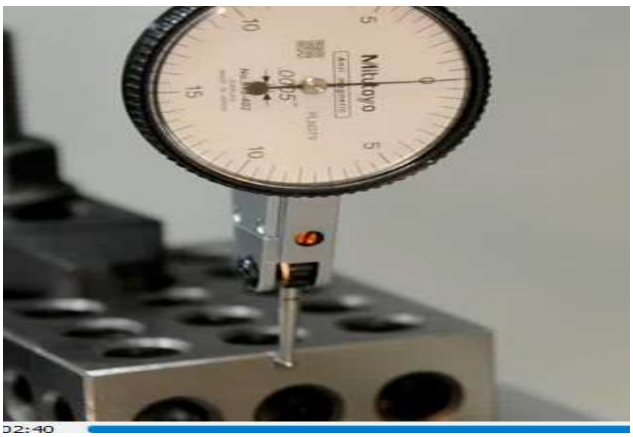
Step 6 Change the display format to show 4 decimal places.

Step 7 Change the axis CPI to 30,000 (10,000x3 inches)

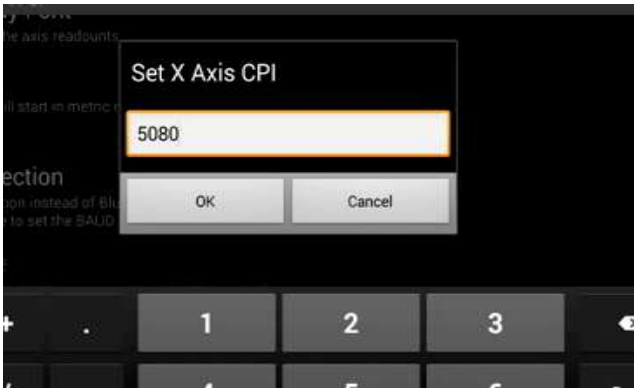


Step 8 Zero out the axis by long-pressing the abs/inc button.

Step 9 Indicate the static 1-2-3 block.



Step 10 Enter the readout after the decimal point as the axis CPI.



Step 11 Go to the main screen and confirm the axis reads exactly 3.0000. If not do the calibration again.

For a Video of this procedure go to:

https://www.youtube.com/watch?v=ngX0G0Z-02s

3.2 Inverting the readout:

If the readout from the scales is “backwards”, i.e. the number decrease when they are supposed to grow, etc. the readout can be inverted by checking the “Invert Readout” option. To invert the readout, in settings page touch the Invert readout. It will check the box on the right of screen. Now the read out will read the opposite of what it did before setting.

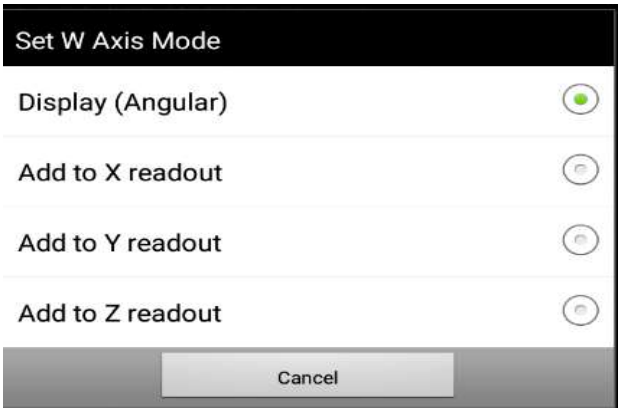
3.3 Digital Filter:

Digital filter when checked will average up to 5 readings to reduce flicker. Input averaging is disabled by default, but can be enabled in the settings. When the filter is disabled, the DRO will be more responsive but the last decimal digit might flicker with some scales

3.4 Enabling Y Z and W Axis:

In the setup screen scroll down to the Y axis and select. This will insert a check in box on right of screen. Scroll down to the Z and W axis, they be can enabled the same way. After enabling the W axis you now can enter the W Axis Mode.

Touching will bring the drop down box.



TouchDRO W axis can be displayed in "Angular" mode. The readout will be in degrees and will wrap around after each full circle. It can also be selected to be added to either the X Y or Z readout.

Please note, that the CPI and direction for the axes that are summed together don't need to be the same. For instance, you can use glass scales on the knee and a standard "caliper" on the quill. The app will figure out the proper conversion ratio internally to get the scales in sync.

Section 4 Tachometer Settings / Enable Tachometer:

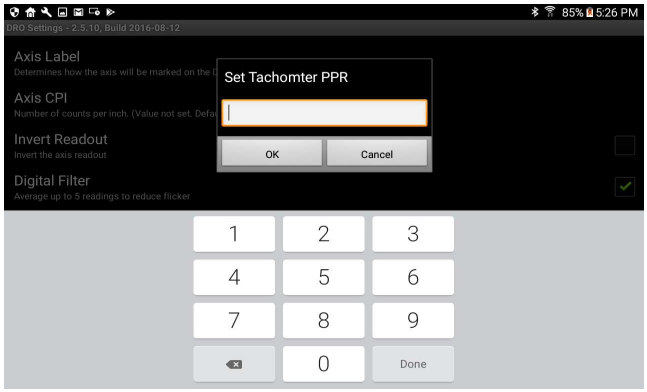
To enable the tachometer touch screen and it will check the box on right of screen.

4.1 Tachometer Label:

This setting operates the same as the Axis label settings on page 4. Touch tachometer label and in the drop down box use what ever name you want.

4.2 Tachometer PPR:

This will set the number of Pulses need to operate the tachometer. To set touch Tachometer PPR and in the drop down bock enter your pulses per revolution.



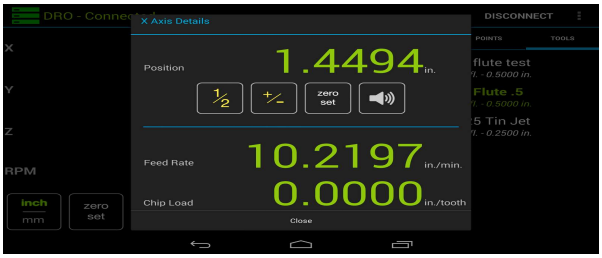
4.3 Invert Output Tachometer:

Invert the output by touching the invert output on setup screen, this will check the box on fight of screen. This will invert the direction of the output for directional tachometer setup's.

4.4 Set RPM Function:

The tachometer value can be preset manually. If your mill or lathe uses a set of step pulleys to change the spindle speed. If you know what the rev's are per stepped set, you will be able to preset the RPM to the current speed so it can be used by the "Chip Load" function. To access the dialog, short press the RPM read out. At the set RPM dialog, enter the RPM in the place labeled dimension.

Section 5 Axis Details Dialog:



5.1 Dialog window:

To access the this dialog short touch a axis readout *X Y* or *Z*. This will open the settings window. X axis and mm mode is represented here.

5.2 Feed Rate Display:

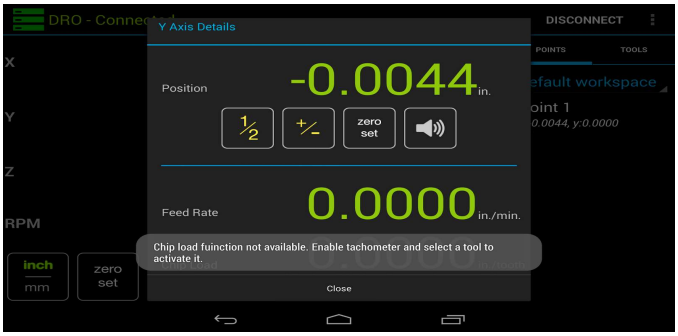
The feed rate is the linear speed at which the work piece is moving past the cutter. Based on the currently selected units this readout will display the feed rate either in inches per minute or millimeters per minute. The value is refreshed roughly twice per second.

5.3 Chip Load:

Chip load is the rate at which the metal is being removed. It can be thought of as the thickness of the chip being removed by each flute. Correct chip load is critical to tool life and surface finish

The formula for chip load is Chip Load = Feed Rate / (RPM * Number of Cutting Teeth). This means that, in addition to the feed rate, the DRO needs to know the tooth count of the selected tool and current RPM. Tooth count is set by selecting a tool from the tools list. When you click a tool, "Set Offset" dialog will pop-up. If no offset is desired, "X Offset" and "Y Offset" can be left as "None". RPM is provided by the tachometer.

Chip Load display in enabled state (axis not moving) Displays the chip load when the axis in moving and a tool is selected. The value is calculated by dividing the freed rate by the product of RPM* and tooth count. When no tool is selected and/or the tachometer is disabled, the display will be disabled and a toast will briefly appear informing the user that one of the above requirements is not met.



Setups that don't include a tachometer can still take advantage of this function by entering the RPM directly using the "Set RPM" function as in* ***Section 4**.*

5.4 "½" Function (AKA "Centerline"):

Sets the incremental zero to the position exactly 1/2 way between the current incremental zero and the currently displayed dimension. The most common application of this function is to find center of a hole or another feature.

For example, you would start by indicating one side of the hole, set axis to zero, indicate the other side and click "½" to find the center.

5.5 "+/-" Function:

Inverts the current dimension. I.e. multiplies it by -1, so positive dimensions become negative and vice versa. This function can be used to move to a position that is at the same distance on the other side of the zero point. In other words, to machine symmetrical features.

5.6 Zero Set:

Identical to the similar function on the main DRO screen, but acts only upon the selected axis.
Short pressing the button sets incremental origin for the selected axis to the current position.
Long pressing the button sets the workpiece origin for the selected axis to the current point.

5.7 Audible Alert:

Toggles audible "near zero" alert for the current axis on and off.

When on, the DRO will emit series of beeps starting at 0.250", or (10mm when in metric mode). At 0.100", or 5mm, 0.010", or 2.5mm and 0.005", or 0.1mm and the *frequency of beeps increases*. When the axis moves to within 0.001", or 0.05mm of 0.000, the application will emit *one 2-second long beep and stop.*

5.8 Preset Dimension:

Long-pressing axis readout brings up the "Set Dimension". dialog.

Although this is not a part of the Axis Details dialog, this function is closely related to it. It can be activated by either long-pressing axis readout in the main screen or touching the position readout in the "Axis Details" screen.

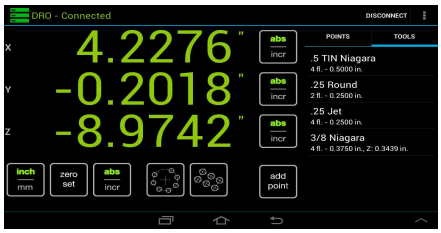
You have the option to preset absolute dimension. This is useful in a situations where a drawing's dimensions reference a point that can't be indicated on the mill. In such case you can locate a feature whose coordinate is given in relation to the drawing's reference point and preset the axis to that dimension.

From that point on all other dimensions will be in relation to the drawing's origin. The dimension can be entered as a decimal number or as a fraction.

Section 6 Tool Library Function:

6.1 Adding Tools to the Library:

Tools are accessible right from the main DRO screen



To enter tools in the library touch three dots (options), select Add Tool.

The *tool offset* option box will appear.

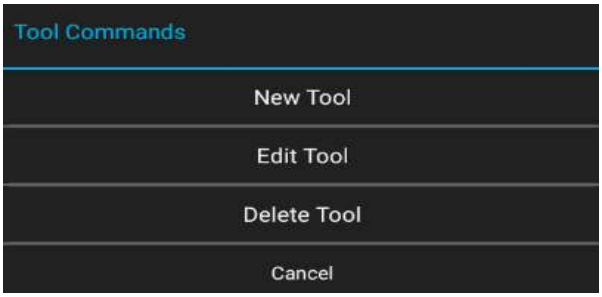
- Define a name for the tool
- Define a description for the tool
- Select in. or mm
- Enter the flute diameter
- The teeth or flute count
- And the Z offset

You may define a virtually unlimited number of tools, and set the offsets by selecting those tools you have added to the library. Setting tool offset on a milling machines by clicking the appropriate tool in the "Tools" pane and selecting the offset direction. On a lathe there is no need to set the offset direction, the offset is set by simply selecting a tool.

A YouTube Video is available at:
https://www.youtube.com/watch?v=wym0ncNPr28

6.2 Clearing tool from library:

Long pressing a tool in the library will bring up a tool commands dialog screen.



Touching new tool will allow you to add a new tool to the library. Edit tool will allow you to change the tool you touched to get this screen. If something was entered wrong, it allows you to change rather than deleting and reentering it.

Delete tool will remove the tool from the library list, and cancel removes dialog box.

6.3 Selecting tool from list:

This may be done in two ways:

- By selecting tool from list (touching listed tool).
- By opening tool offset dialog box.

If the tool is selected from the tool library, the drop dialog box will request a tool position as;

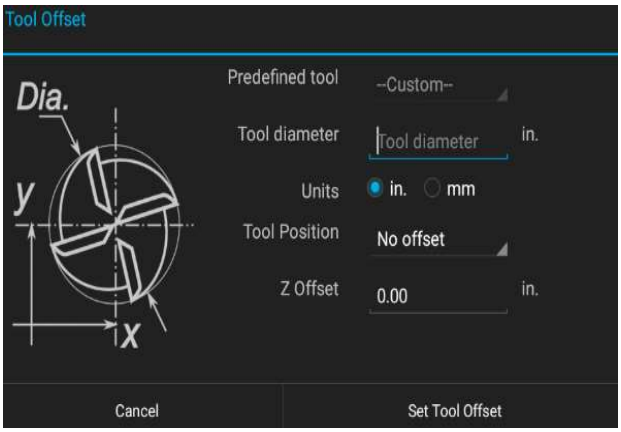
- Rear
- Rear Right
- Right
- Front Right
- Front
- Front Left

You may then select, *set tool offset* or *cancel*.

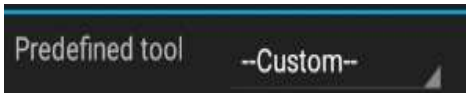
If the tool offset button is touched, the dialog box will have the option to select a tool from the predefined *custom* tool list. It will also request a tool position outlined above. You may then *set tool offset or cancel*.

Depending upon what tool position is selected the *X, Y, or Z* readout will turn red indicating it has been set, and the tool if in the list will turn green.

6.4 Tool offset button:

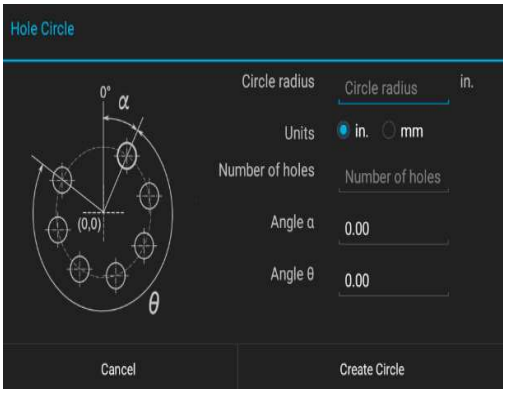


Touching the tool offset button will bring up this dialog box. If there are any tools in the tool list, the predefined tool will appear as below and a tool may be selected.



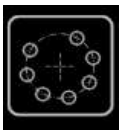
If a one off operation tool is desired you may enter parameters here for setting the tool offset. Setting this tool will not go into the tool list and will be lost when the offset is canceled.

Section 7 Hole Circle Function:



7.1 Hole Circle Dialog:

Touching the Hole Circle button;



Brings up the dialog box as above. If the DRO is set in inch mode it will come up in inch other wise mm. It will ask for:

- Circle radius
- Units in./mm
- Number of holes
- Angle a
- Angle θ

If the *circle radius, units* and *number of holes* is specified, you may touch *create circle* and the holes will be evenly space on a 360 degrees circle.

If the *circle radius, units* and *number of holes* is specified and you enter a degree in Angle a say (45º degrees) then touch create circle. The holes will start at 45º off the center point and each successive hole 45º from the last hole.

If you specify Angle ***a*** at 45º and Angle **θ** at 180º, it will start the first hole at 45º and end the last hole 180º from the first hole.

The points or hole location will be listed under the default workspace column as circle 1 with the x and y quadrant's , circle 2 quadrant's etc. To preview the workspace touch the three dots next to default workspace.

This will bring up the dialog box (select *preview workspace*).

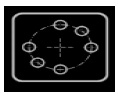
The right side of the screen shows the smaller version of the readout screen with access to the settings from each axis (by tapping the readout) and three of the most common functions, *units, mode and zero set*. This provides for a convenient way to work with complex layouts without needing to select a point manually, etc. You also have the option to center on screen and to Auto-select to the nearest point. To clear the circle settings, go to workspace commands and select Clear Points. To save a circle layout, create a workspace name first before laying out the circle holes. This will automatically enter the layout in that named workspace.

To see the hole circle function go to Youtube address below.

https://www.youtube.com/watch?v=jM1GnmwhxuQ

Section 8 Arbitrary Hole Circle:

The ability to drill holes on a circle that are not equally spaced., you may add holes one-at-a time by specifying the angular offset. Arbitrary Hole Circle function is found on the main screen lower row of buttons.



8.1 Arbitrary Hole:

Arbitrary Hole Circle is accessed by touching the button on bottom of the user interface. The dialog box will open and ask for;

- Circle Radius
- in. or mm and
- Angle a

To create circles with any arbitrary hole spacing enter the holes one-by-one, by specifying the angle of the hole from the "12-o'clock" position for each hole.

Start with Circle Radius need, select units in. or mm. Enter the Angle a degree first hole is needed, then touch the circle + button in dialog screen. This will place the degree (angle) with a circle + in red on the dialog screen.

The dialog screen will then look for the next input for Angle a. When finished touch Create Circle. The dialog will go away and return to the user interface screen. Under default workspace each circle will be listed with the *X* and *Y* coordinates.

The workspace commands may be used to:

- Preview Workspace
- Clear Points

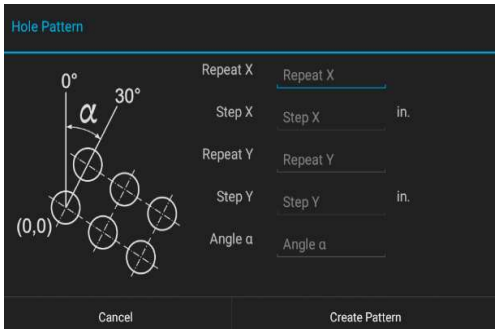
Touching a point on the user interface will turn it green and the user interface (*X and Y*) will be set to those coordinates of that point touched. In the preview screen you will see that hole highlighted in green. It serves the purpose of highlighting that point in the laid out points. If the point is touched again, it will go back to white and the *(X and Y*) coordinates will revert to the setting that was originally in the *X* and *Y* readout.

If a point (circle listed) is not in the correct place, long touch that point under the workspace. The touched point will bring up a dialog box and you may;

- Add a new point
- Edit a Point
- Remove a Point

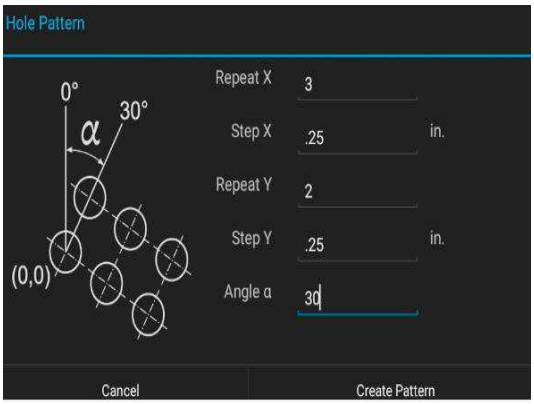
Once set the preview screen will show all points and on the right side a small user interface. This small user interface operates the same as the normal large user interface.

Section 9 Hole Pattern Function:



9.1 Hole Pattern layout:

If this pattern will be used again, create a new workspace for it. Set dimension for the first hole (*X and Y).*



In the example we have 3 holes spaced at .250" in the X axis, and in the Y axis we are calling for 2 holes deep spaced at .250". We are also calling for the layout to be at a 30 degree angle.

The image below shows the layout of the six holes with the (Center on screen) checked along with the (Auto-select nearest point) checked.

9.2 Step and Repeat Function:

The *Hole Pattern* function is used along with the *Step and Repeat* function. As with this function, if it is to be used quite often then set up a workspace for it.

Step 1 Enter the first hole for *X* and *Y* position.

Step 2 Touch the *Hole Pattern* button on bottom row. The dialog screen will be the same as the (Section 9 hole pattern) picture.

Step 3 Touch next and Repeat Y will ask for how many holes you want. Touch next and enter the step or distance apart you want the holes. If the holes needed are to be at an angle enter the angle at *Angle a* then touch (Create Pattern).

Step 4 If there is a point or hole that is important you may give it a name by long pressing that point. This will bring up the *Point Commands* dialog screen. You may;

- Create a new point
- Edit a point or
- Remove point

Step 5 On the main user interface screen you will find three grid points you have entered. Touch the three dots and the (*Workspace Commands)* dialog box will appear. Touch (*Step and Repeat),* The (*Step and Repeat Workspace*) dialog box will appear. Enter the amount of times you want to repeat your hole lay out in Repeat X.

Touch next and it will ask for the spacing between holes or points in step X. Touch (*Create Pattern*) the main screen will show all of the grid points.

There is a YouTube video on the *Step and Repeat* function

https://www.youtube.com/watch?v=iOBXDKaw3XY