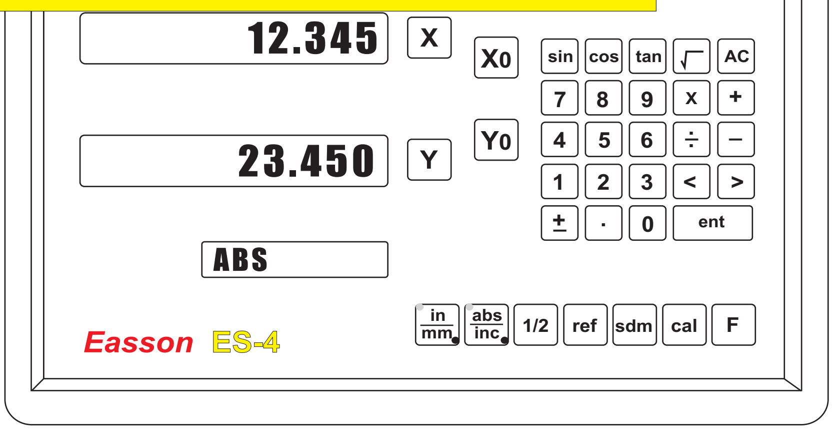
Easson

Always Committed to Quality Technology & Innovation

ES-4 DRO Counter
Operation Manual

Easson Technologies Co., Ltd.

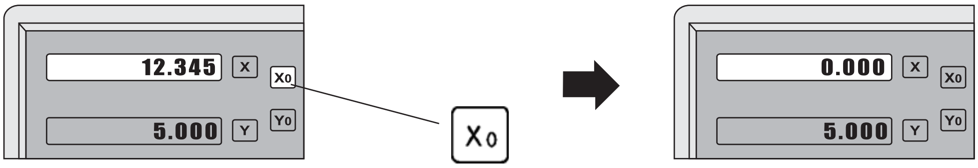
Basic Functions



Set Display to Zero

Purpose : Set the current position for that axis to zero

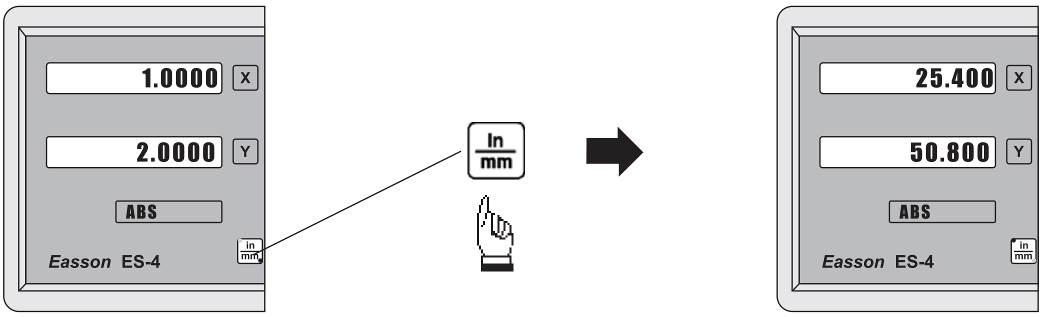
Example : To set the current **X Axis** position to **zero**



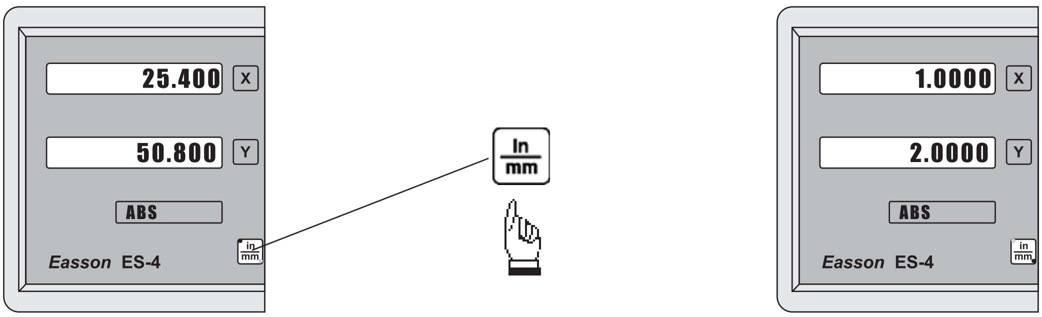
Inch / Metric Display Conversion

Purpose : Switches between inch and metric display

Example 1 : Currently in **inch** display, to switch to **metric** display



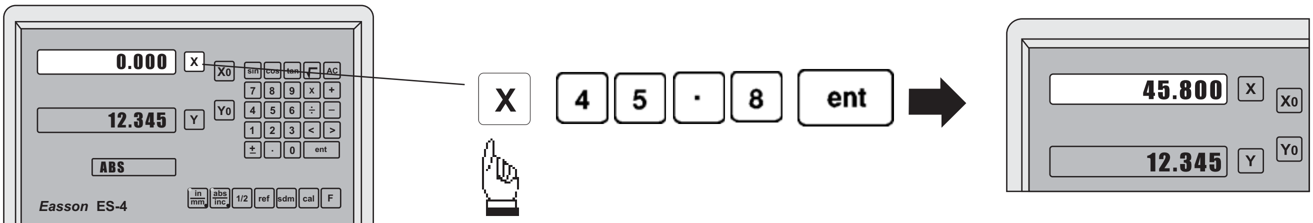
Example 2 : Currently in **metric** display, to switch to **inch** display



Enter Dimensions

Purpose : Set the current position for that axis to an entered Dimension

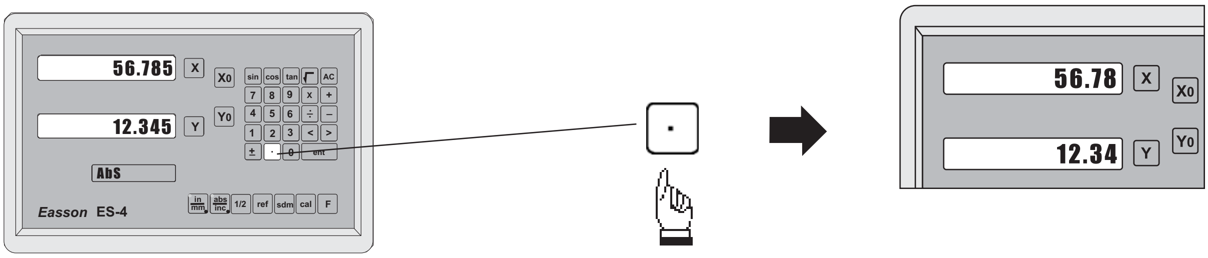
Example : To set the current **X Axis** position to **45.800 mm**



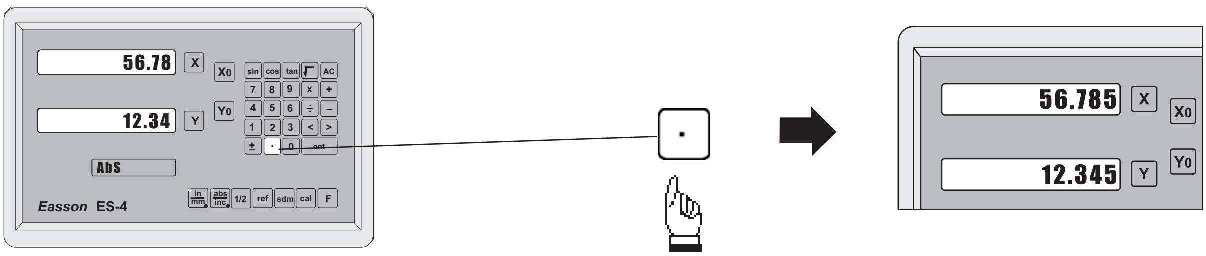
0.005 / 0.01 resolution display switches

Purpose : Switches between 0.005mm/(0.0002") and 0.01mm(0.0004") resolution display

Example 1 : Currently in **0.005mm** display resolution, to switch to **0.01mm** display resolution



Example 2 : Currently in **0.01mm** display resolution, to switch to **0.005mm** display resolution



ABS / INC Coordinates display switches

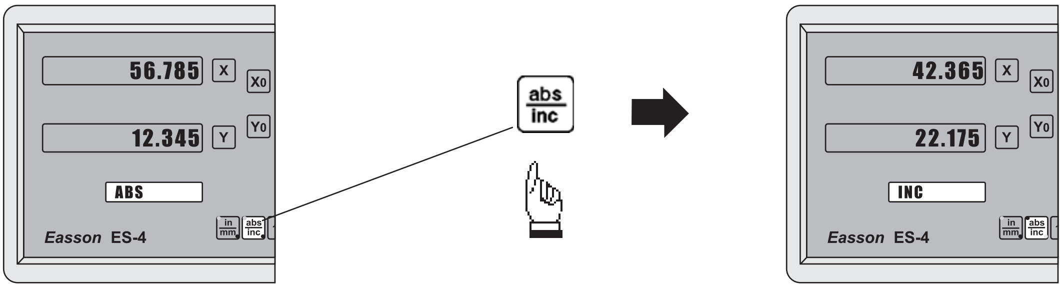
Purpose : **ES-4** provides two sets of basic coordinate display, they are **ABS** (absolute) and **INC** (incremental) displays.

During machining operations, the operator can *store the work piece datum (zero position) in ABS coordinate, then switch to INC coordinate to continue machining operations.*

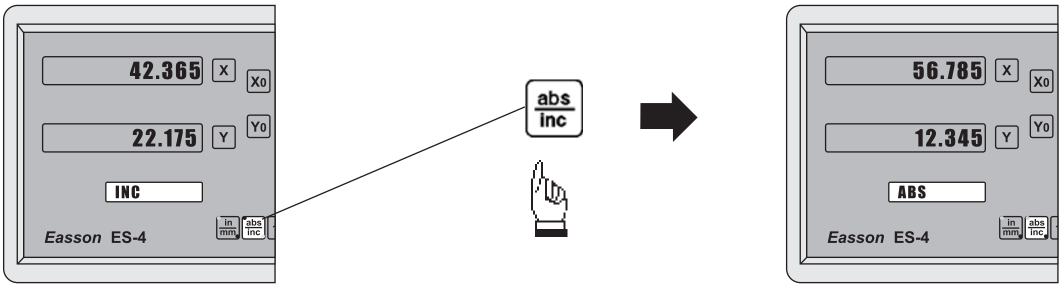
The operator is then free to zero the axes or preset any dimensions into any axis in INC coordinate for relative position machining. The work piece datum (work piece zero position) is still retained in ABS coordinate by the ES-4.

Operator can then toggle between ABS (absolute) and INC (incremental) coordinates without losing the work piece datum (work piece zero position).

Example 1 : Currently in **ABS** display coordinate, to switch to **INC** display coordinate



Example 2 : Currently in **INC** display coordinate, to switch to **ABS** display coordinate

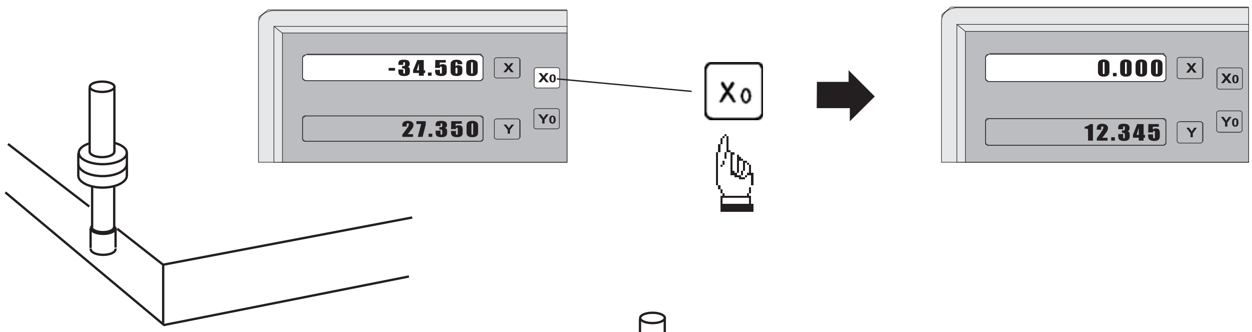


Centre-find

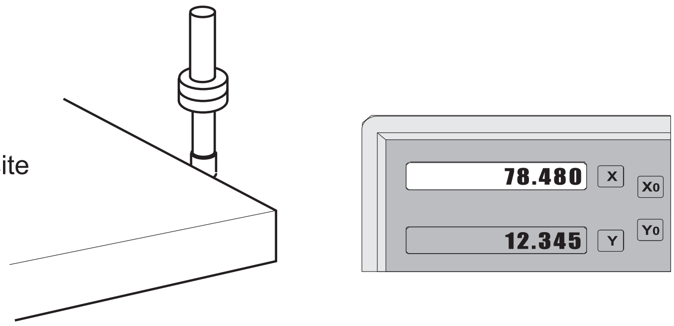
Purpose : ES-4 provides the centre-find function by halving the current display coordinate, so that the zero point of the work piece is located at the centre of the work piece.

Example : To set the X Axis zero point at the centre of the work piece.

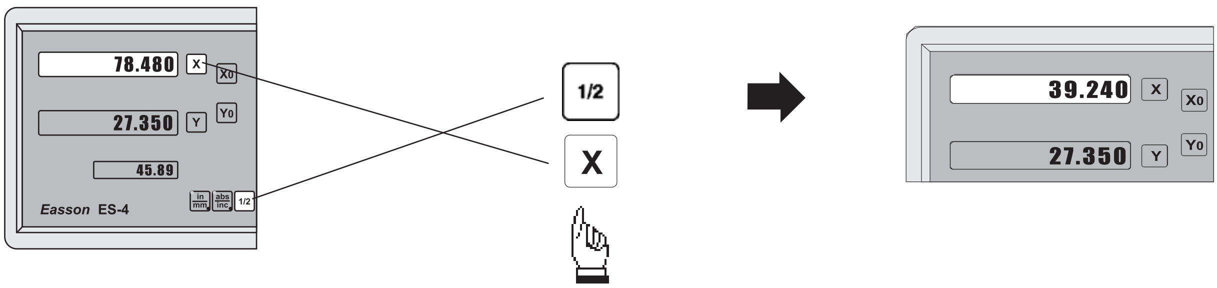
Step 1 : Locate the edge finder at one end of the work piece, then zero the X Axis.



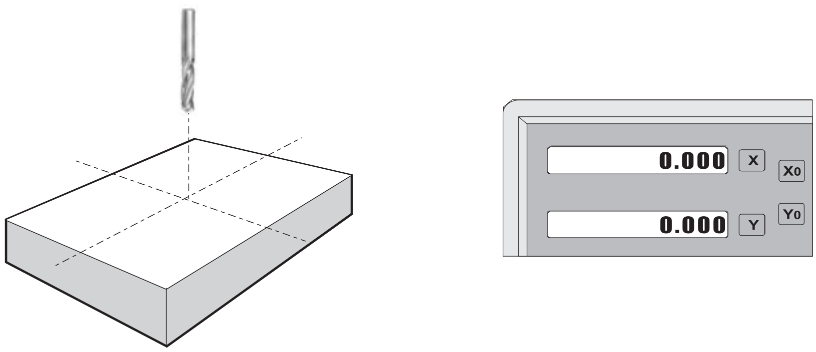
Step 2 : Locate the edge finder at the opposite end of the work piece.



Step 3 : Then half the display coordinate using centre-find function as per follows:



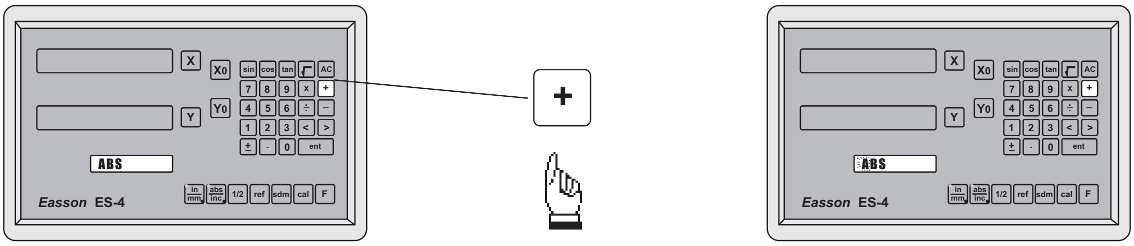
Now the X Axis zero point (0.000) is located at the X centre of the work piece.



DIGITAL FILTER

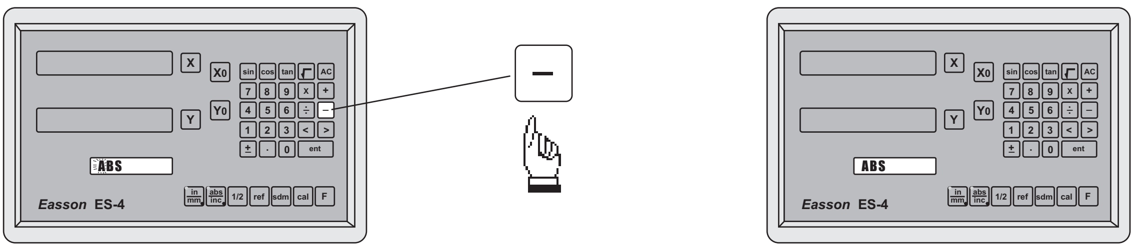
Function：The “DIGITAL FILTER” function of ES-4 has been designed to eliminate the jitter of DRO display，which caused by grinding machine's working table reciprocation，that in most cases the resolution of grinding machine is higher than 1 μm，when working table moving，the display of DRO is jitter，the “digital average” method is used to stabilize the display for operator easy to reading and machining.

step 1：Start Digital Filter Function



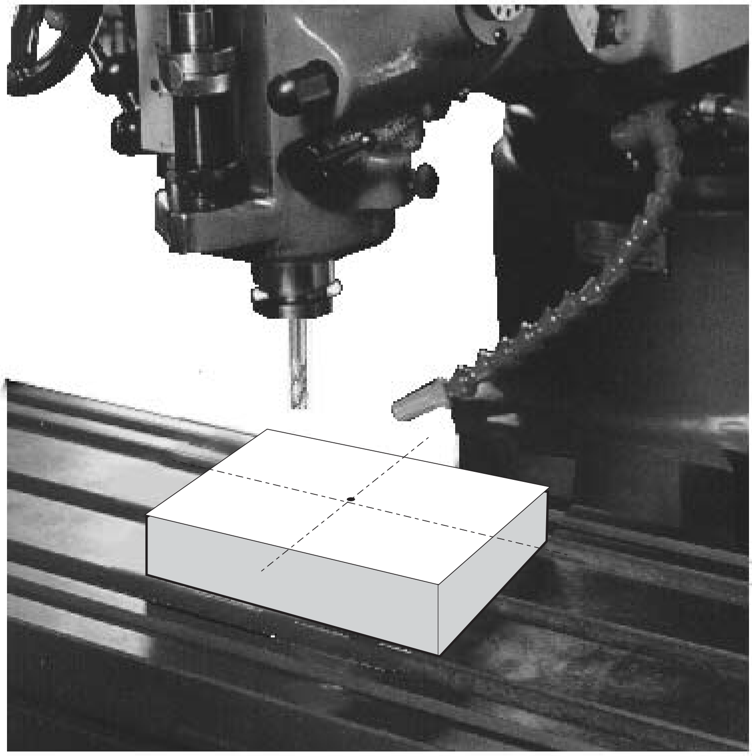
ABS windows “A” character flash

step 2：Stop Digital Filter Function



ABS windows “A” character flash is stop

ref datum memory



ref datum memory function

function : During the daily machining process, it is very common that the machining cannot be completed within one working shift, and hence the DRO has to be switched off, or less commonly, a power failure occurs whilst machining which leads to loss of the work piece datum (work piece zero position). The re-establishment of work piece datum using edge finder or other method inevitably introduces machining inaccuracies, because it is not possible to re-establish the work piece datum exactly at the previous position.

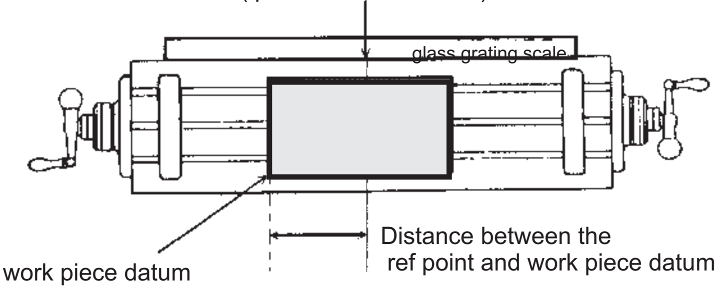
To allow the recovery of work piece datum very accurately, with no need to re-establish the work piece datum using an edge finder or other methods, every transducer has a reference point location to provide a datum point memory function.

The working principal of the ref datum memory function is as follows.

- **There are a permanent and fixed mark (position) on the transducer, normally called *ref* mark or *ref* point..**

Since this *ref* point position is permanent and fixed, it will never change or disappear when the DRO system is switched off. Therefore, we simply need to store the distance between the *ref* point and the work piece datum (zero position) in DRO's memory. Then, in case of the power failure or the ES-4 being switched off, we can recover the work piece datum (zero position) by presetting the display zero position as the stored distance from the *ref* point.

Example : to store the X axis work datum



Operation : **ES-4** provides one of the most easy-to-use ***ref*** datum memory function.

There is no need to store the relative distance between the ***ref*** mark and your work datum zero into the **ES-4**, *whenever you alter the zero position of **ABS** coordinate, such as by zeroing, centre find, coordinate preset or etc.., **ES-4** will automatically store the relative distance between **ABS** zero and the **ref** mark location into **ES-4**'s memory.*

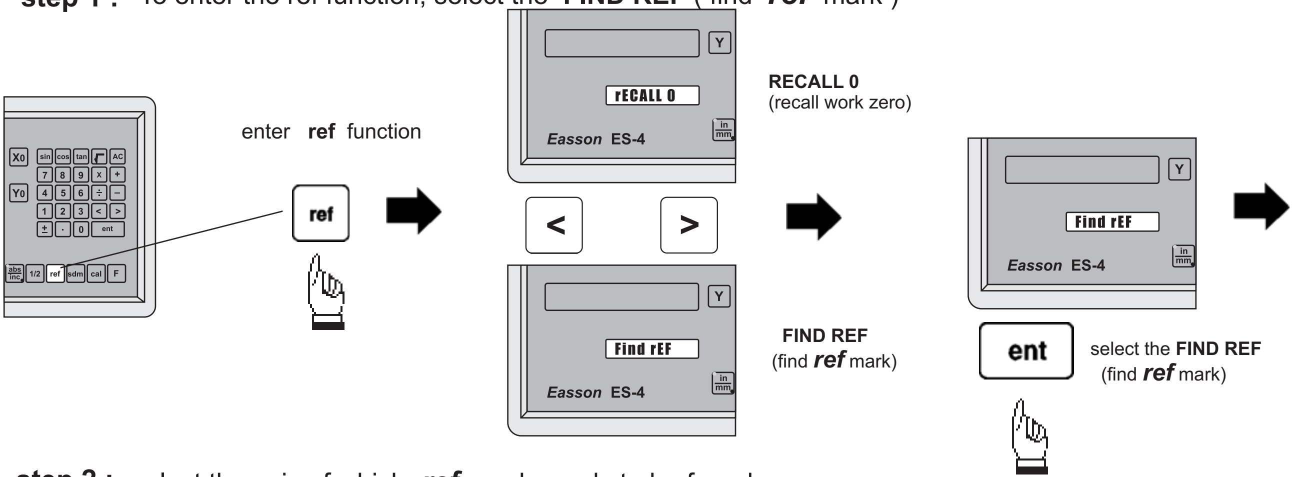
In daily operation, operator simply needs to locate the ***ref*** mark position whenever they switch on the **ES-4** to let it know where the ***ref*** mark position is, then **ES-4** will automatically do the work datum storage on its' own . In the case of a power failure or the **ES-4** being switched off, the operator can recover the work piece datum easily by using the **RECALL 0** procedure.

Find the scale's *ref* mark position (**FIND REF**)

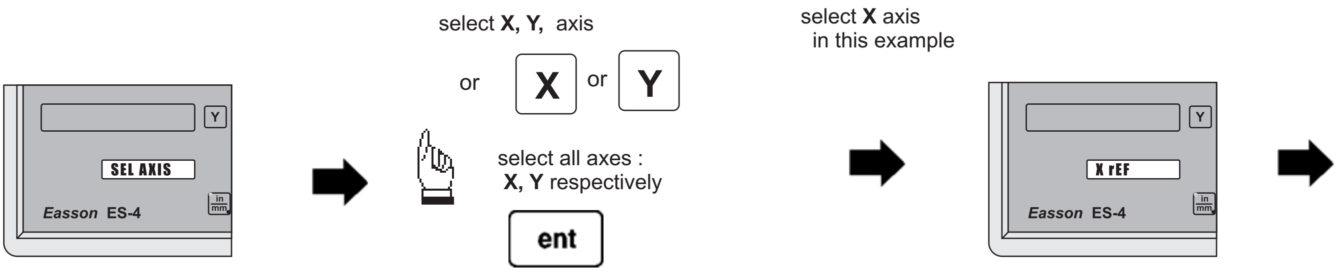
function : In ref datum memory function, the **ES-4** will automatically store the relative distance between the ***ref*** mark position and the work piece datum (zero position) whenever the operator alter the **ABS** zero position, such as zeroing, centre find, co-ordinate preset or etc...

Therefore, the **ES-4** needs to store the ***ref*** mark position prior to any machining operation. So that the loss of the work piece datum (zero position) is avoided during any accidential or unexpected events, such as power failure or etc.. it is recommend that the operator finds the ref mark position using the (**FIND REF**) function whenever he switches on the **ES-4**.

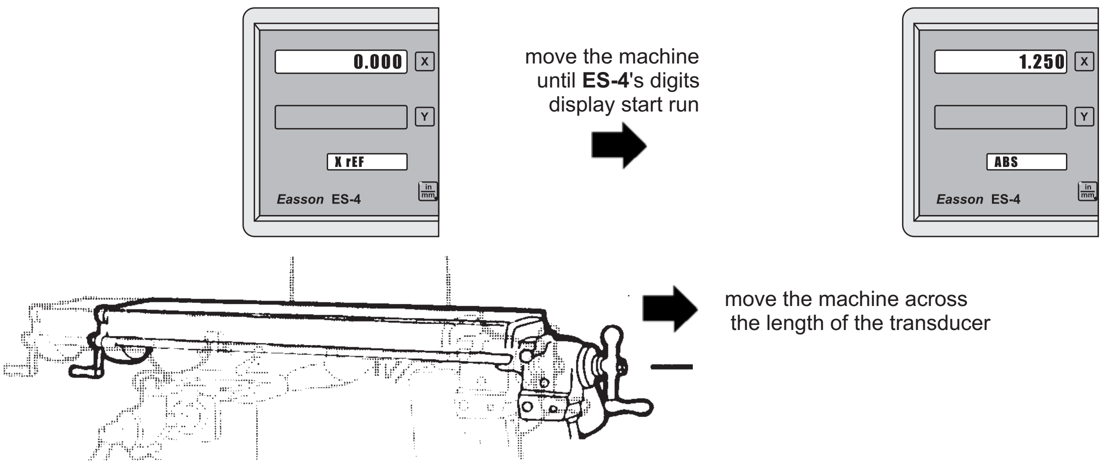
step 1 : To enter the ref function, select the **FIND REF** (find ***ref*** mark)



step 2 : select the axis of which ***ref*** mark needs to be found



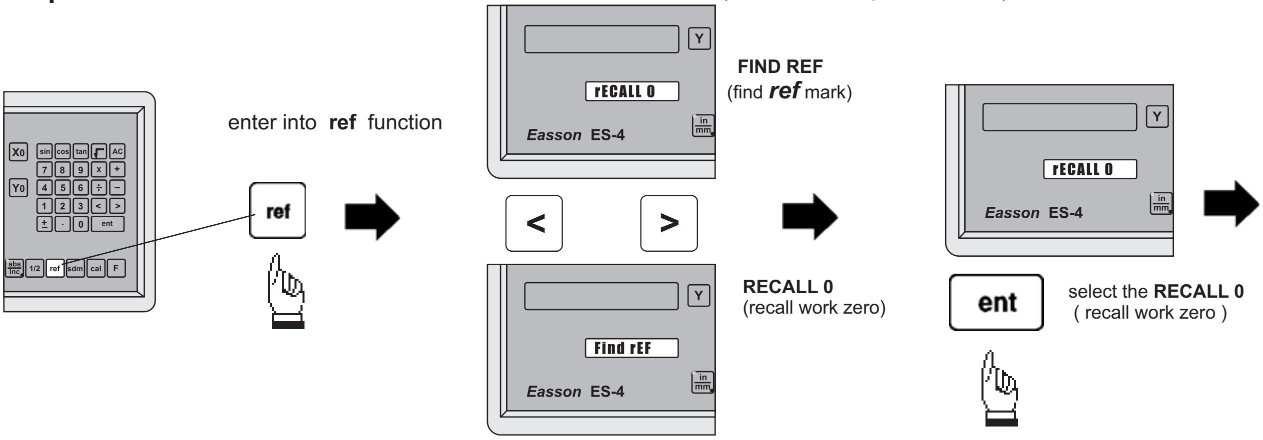
step 3 : move the machine reader head across the length of the transducer until digits display in ES-4 start to count.



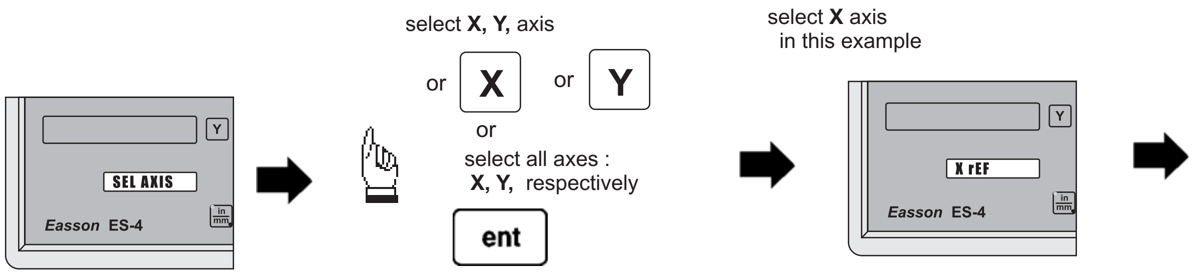
Recall the work datum zero (**RECALL 0**)

function : If the ref point is lost for any reason, the work piece datum can be recovered by **RECALL 0** function as follows:.

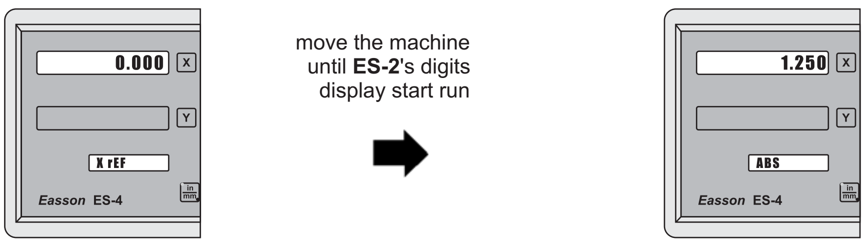
step 1 : enter into the **ref** function, select the **RECALL 0** (recall work piece zero)

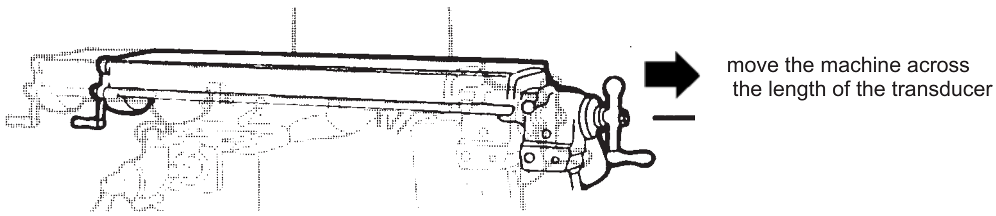


step 2 : select the axis of which work datum (zero position) needed to be recovered

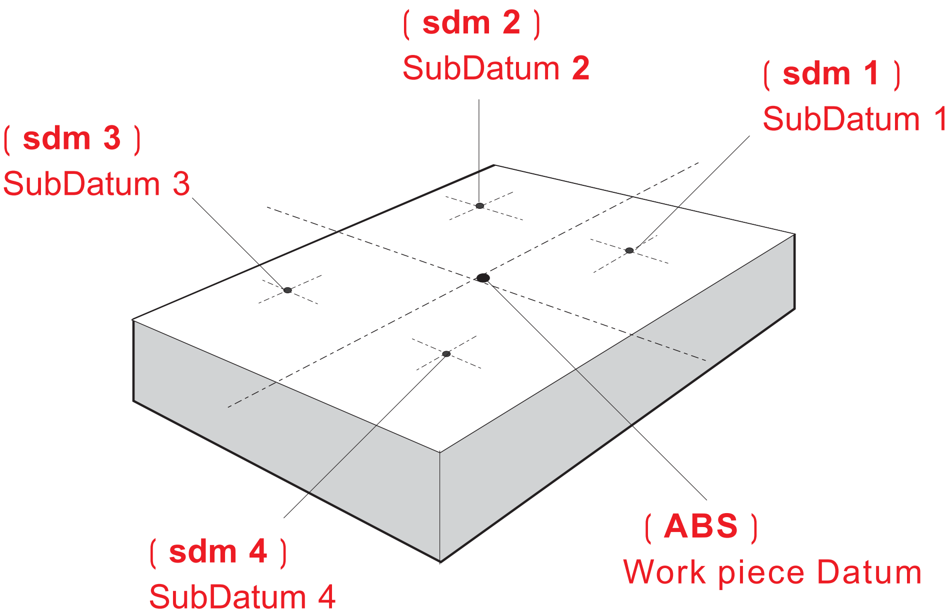


step 3 : move the machine across the length of the transducer until the **ES-2** display starts to count, then the work piece datum is recovered





199 SubDatum Function



199 SubDatum function

Purpose : Most DRO cabinet on the market provide just two set of work co-ordinates - ABS/INC. It was found that ABS/INC was inadequate and inconvenient to use, and, particularly in the case of complex machining or repetitive work, which needed more than just two sets of working co-ordinates.

ABS / INC operation has the following shortfalls :

- In much machining work, the work-piece machining dimensions are derived from more than two datums, therefore, the operator has to switch between ABS and INC to set up the machining datums time after time. This process is very time consuming and prone to error.

- In the case of batch machining of repetitive work, the operator has to set up and calculate all the machining positions time after time.

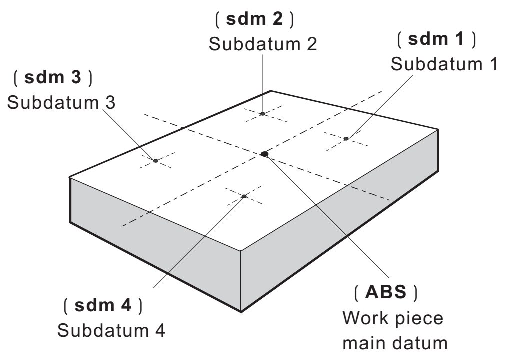
ES-4 provides a 199 subdatum (sdm) memory to cope with the shortfalls of ABS/INC. SdM function does not just simply provide 199 sets of INC co-ordinates, it is specially designed to provide much more convenient features for the operator to cope with repetitive work.
The difference between INC and SdM is as follows:.

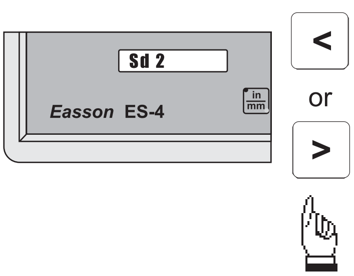
1. INC is independent of ABS and will not follow any change in ABS zero point. All sdm co-ordinates are relative to the ABS coordinates, so, all SDM positions will move together when the ABS zero position changes.

2. All SdM relative distance data to ABS can be entered directly into ES-4 memory using the keypad. No need for any additional calculations.

SdM application in a work piece that has more that one datum.

Operator can store all the work subdatums in ES-4's memory as per follows.





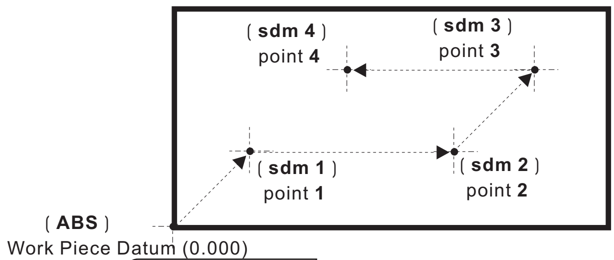
Operator then can switch between the subdatums directly by pressing key

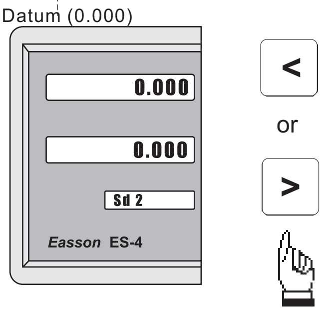
No need to refer back to ABS coordinate and set up the subdatums from their relative distance from ABS point

SdM application on the repetitive batch machining of parts

Because all sdm subdatums (0.000) are relative to ABS zero, so, for any repeative work, the operator just needs to set up the first work piece zero at ABS and store the machining position in subdatum zero.

For anymore repeative parts, just set up the 2nd, 3rd.. work piece zero at ABS, then all the machining positions will reappear





Press Up/Down key to go to machining points

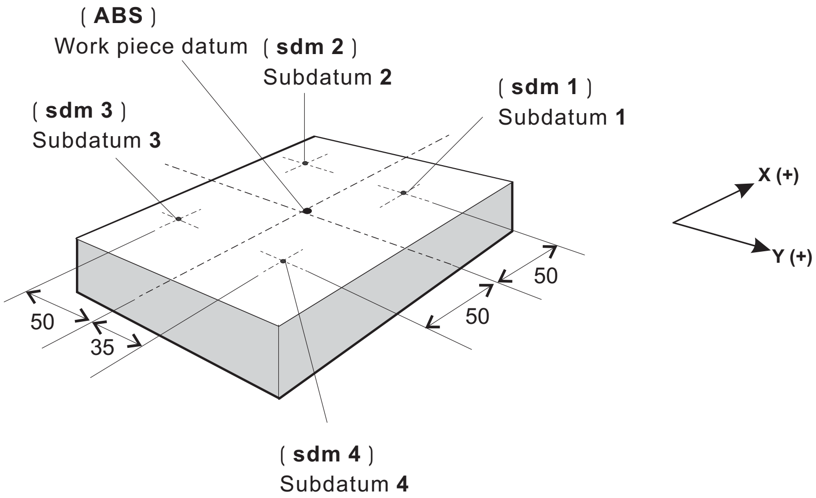
move the machine to display = 0.000, then machining location reached

199 SubDatum function

Application example:

To set up four subdatum zero (SdM 1 to SdM 4) the following two methods can be used

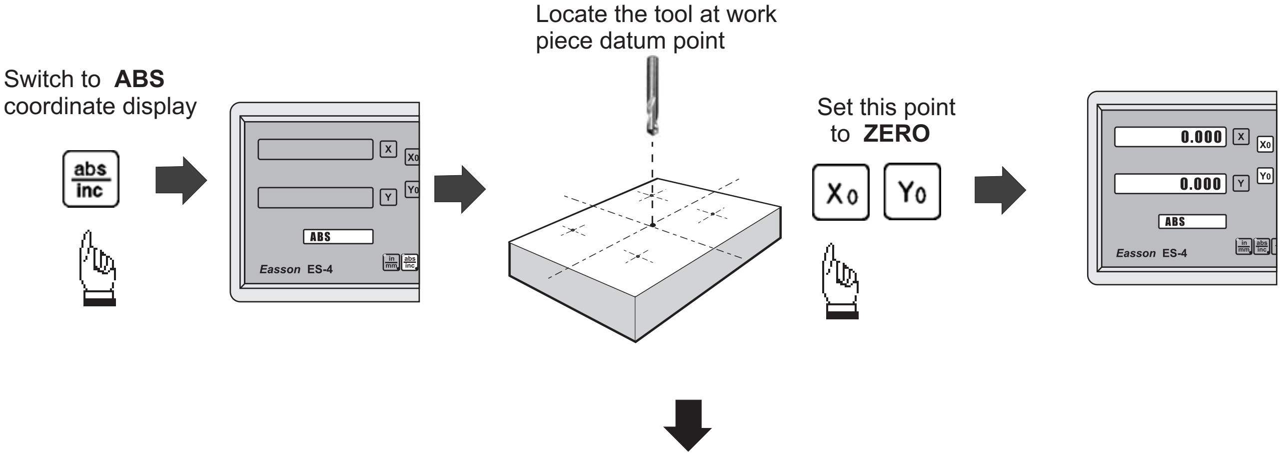
Either 1. Move machine to required subdatum position, then zero SdM display coordinates
Or 2. Directly key in the sdm zero position co-ordinates (co-ordinate relative to ABS zero)



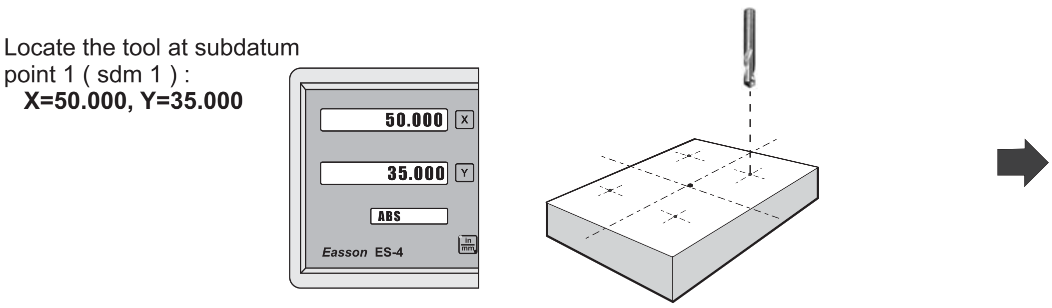
Method 1 : Move machine to required subdatum position, then zero SdM display coordinate

Set up the work piece datum in ABS co-ordinate, move the machine to the required subdatum position, then zero SdM display co-ordinate.

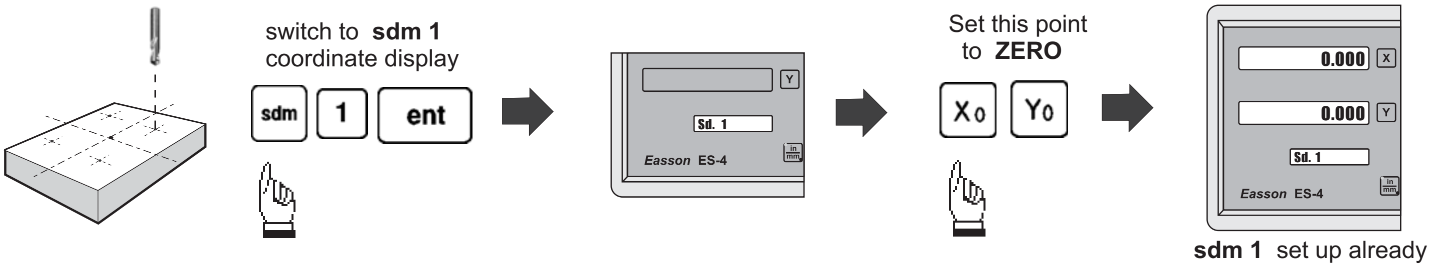
Step 1 : Set up the work piece datum in ABS co-ordinate



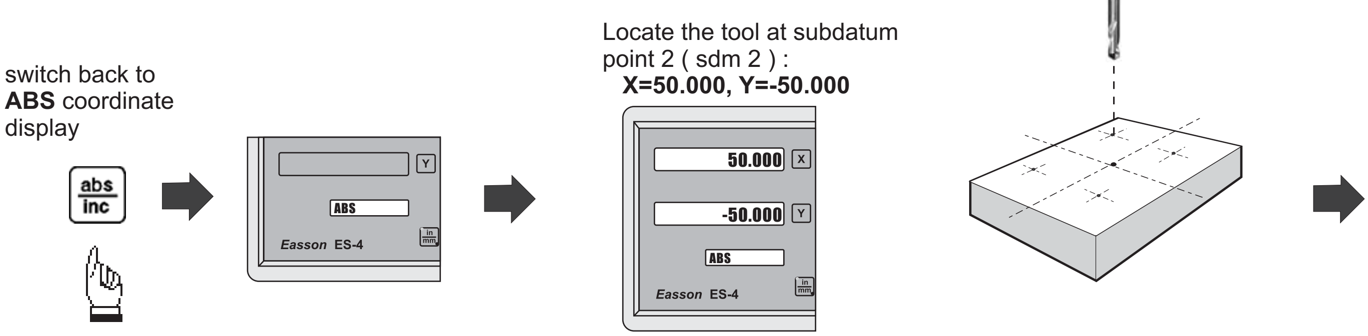
Step 2 : Set up the subdatum point 1 (sdm1)

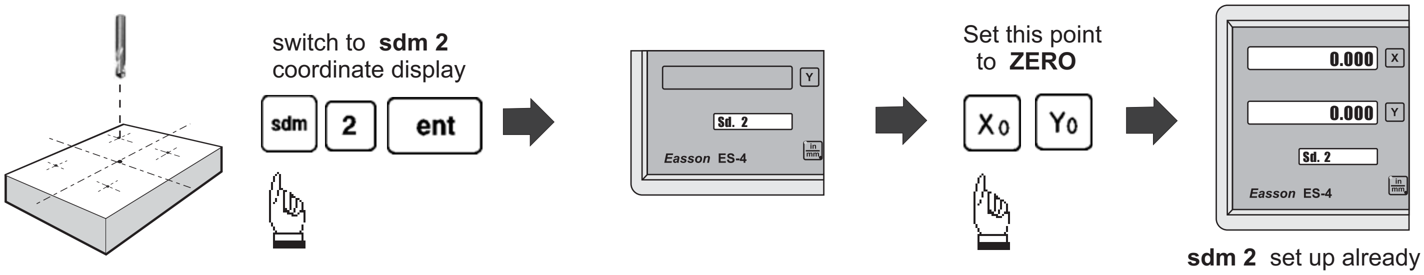


199 SubDatum function

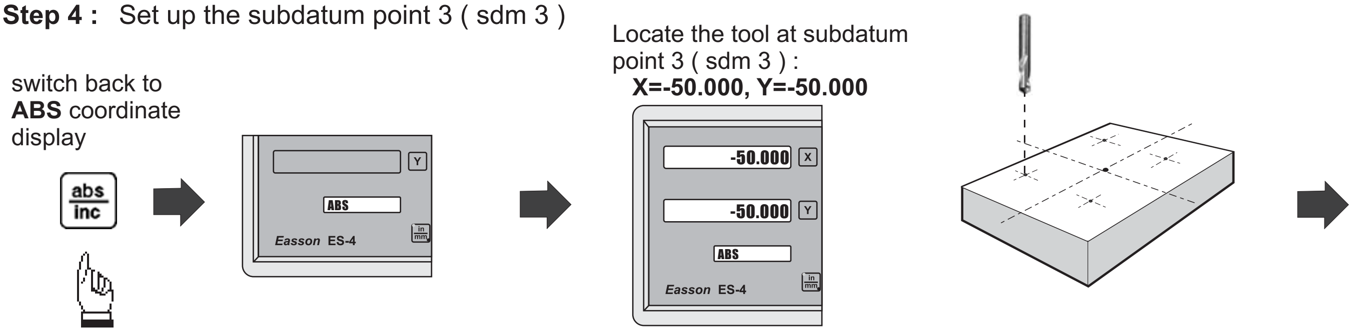


Step 3 : Set up the subdatum point 2 (sdm 2)

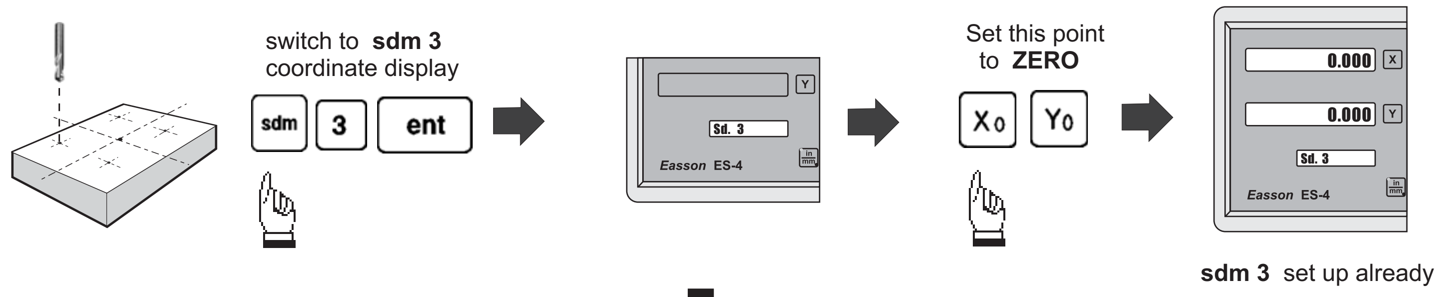




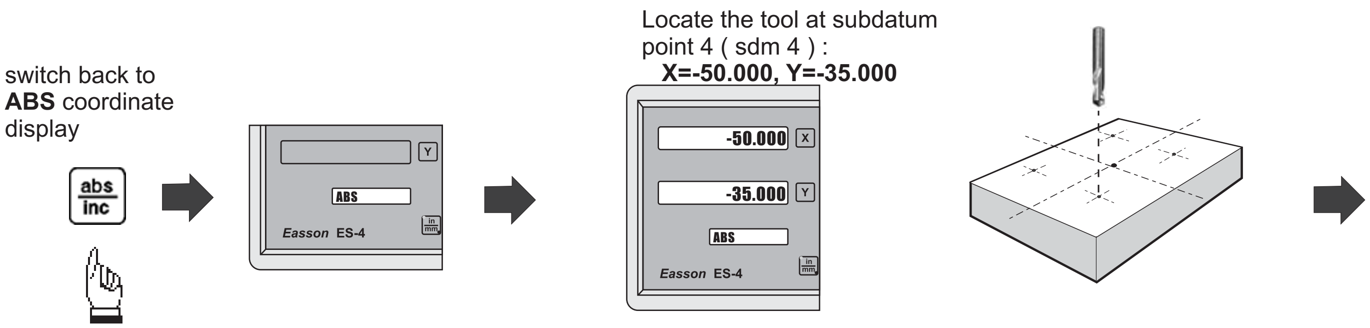
Step 4 : Set up the subdatum point 3 (sdm 3)

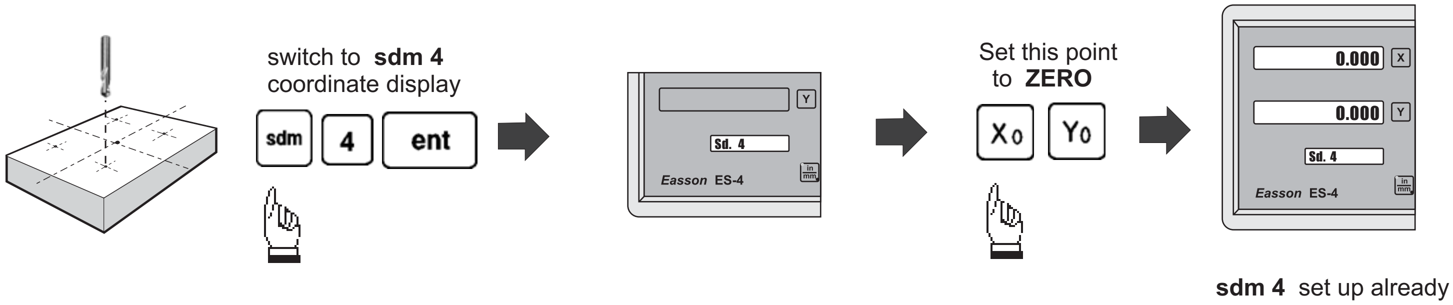


199 SubDatum function



Step 5 : Set up the subdatum point 4 (sdm 4)

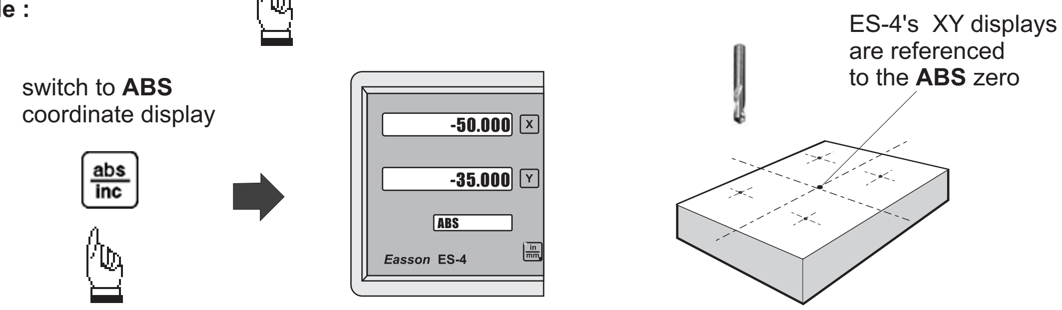




All the four subdatum points have already been set up

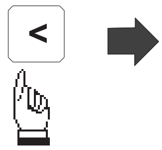
Operator can < or > to directly switch to the required subdatum (**sdm**) coordinate

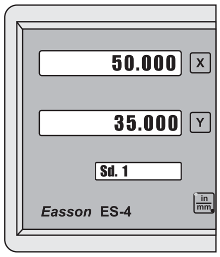
Example :

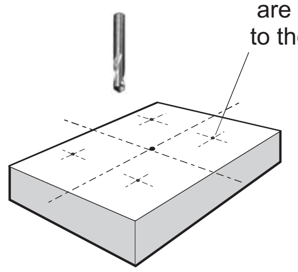


199 SubDatum function

switch to next (**up**)
sdm coordinate display

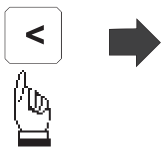


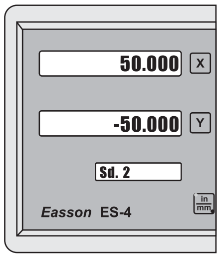


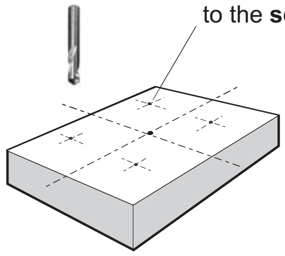


ES-4's XY displays
are referenced
to the **sdm 1** zero

switch to next (**up**)
sdm coordinate display

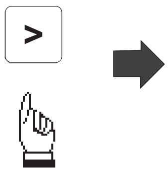


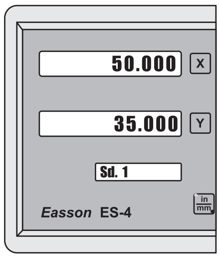


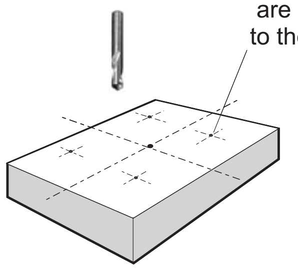


ES-4's XY displays
are referenced
to the **sdm 2** zero

switch to previous (**down**)
sdm coordinate display







ES-4's XY displays
are referenced
to the **sdm 1** zero

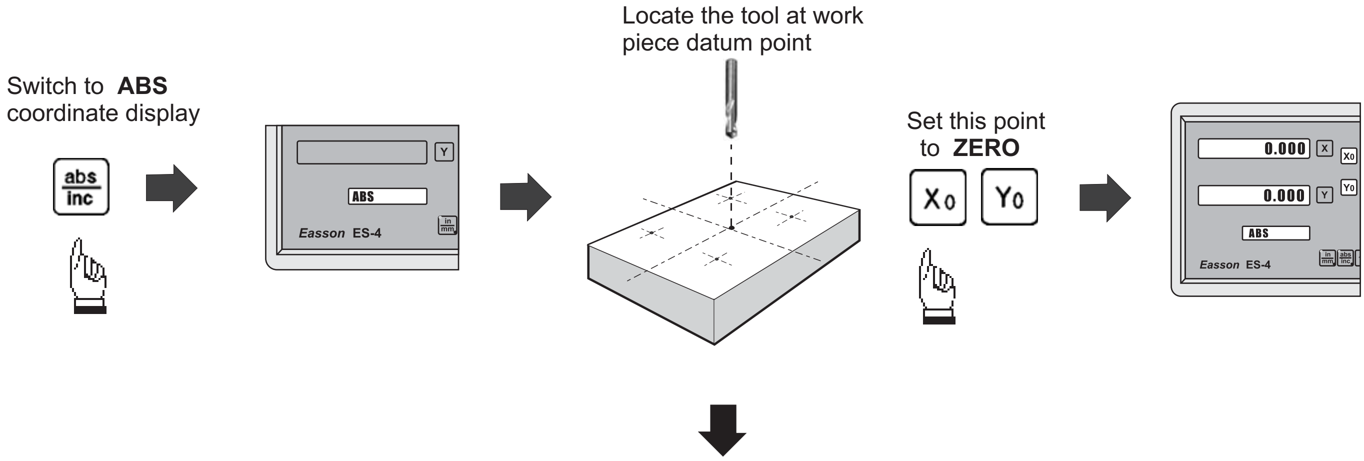
199 SubDatum function

In a case where many subdatum (sdm) points need to be set up,the operator will find that the method of **direct keying in the of SdM zero position co-ordinates (co-ordinate relative to ABS zero)** is much quicker and less prone to error.

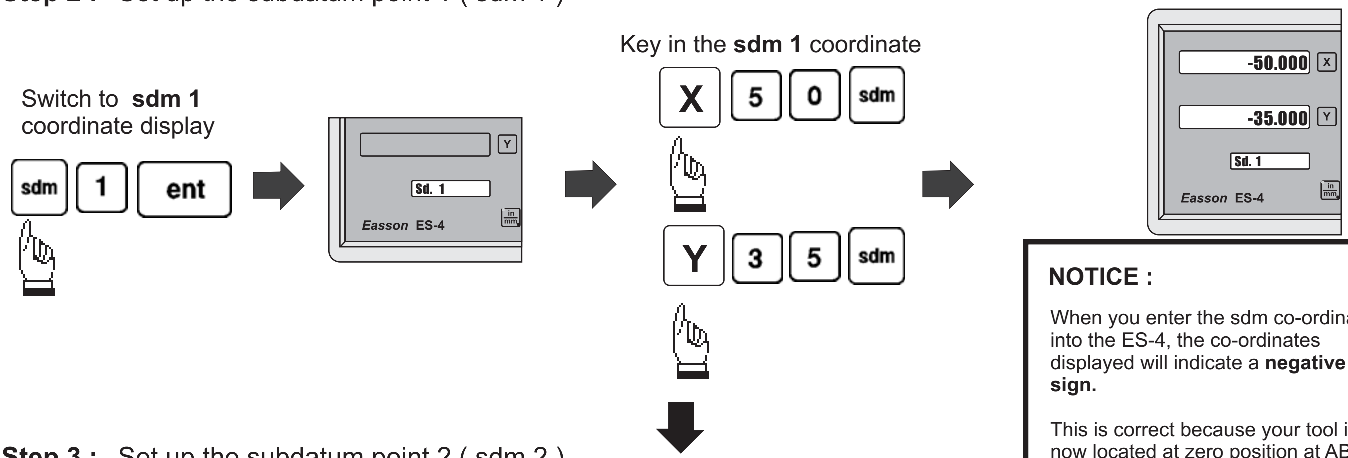
Mtheod 2 : Direct keying in the of SdM zero position co-ordinate (co-ordinate relative to ABS zero)

Set up the work piece datum (ZERO) at ABS co-ordinate, then move the tool located at the work piece datum (ABS zero point)and directly key in all subdatum point co-ordinates (the relative position to ABS zero) using the keypad.

Step 1 : Set up the work piece datum in ABS coordinate



Step 2 : Set up the subdatum point 1 (sdm 1)

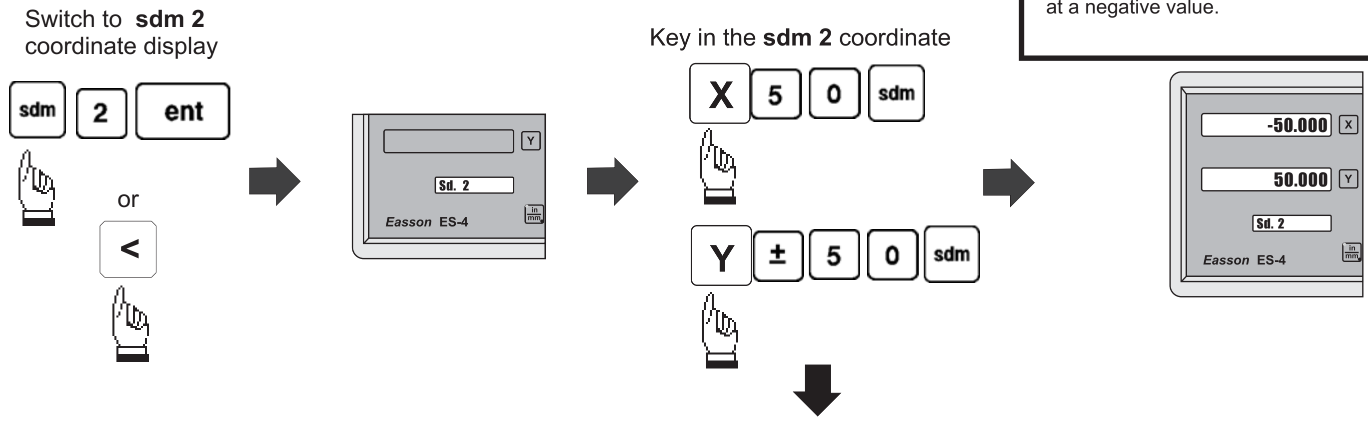


NOTICE :

When you enter the sdm co-ordinate into the ES-4, the co-ordinates displayed will indicate a **negative sign.**

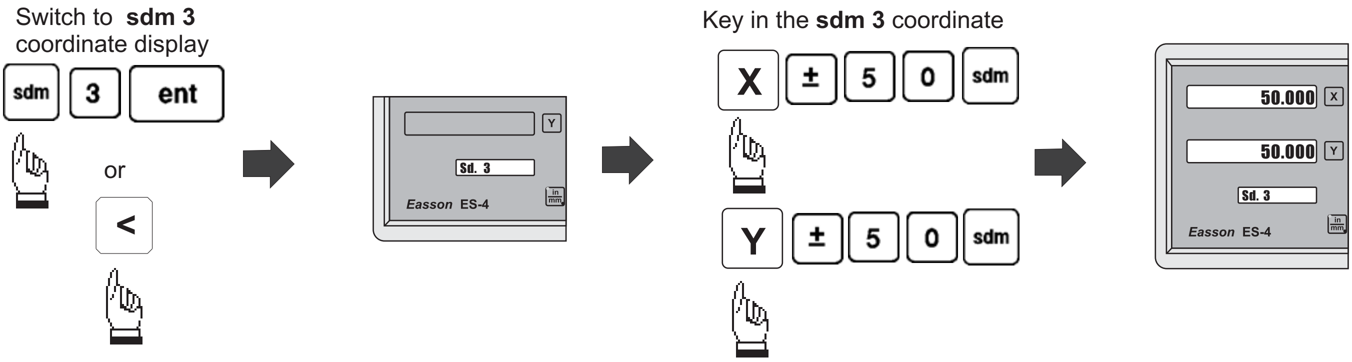
This is correct because your tool is now located at zero position at ABS coordinate. If you calculate from the sdm co-ordinates, the tool is at a negative value.

Step 3 : Set up the subdatum point 2 (sdm 2)

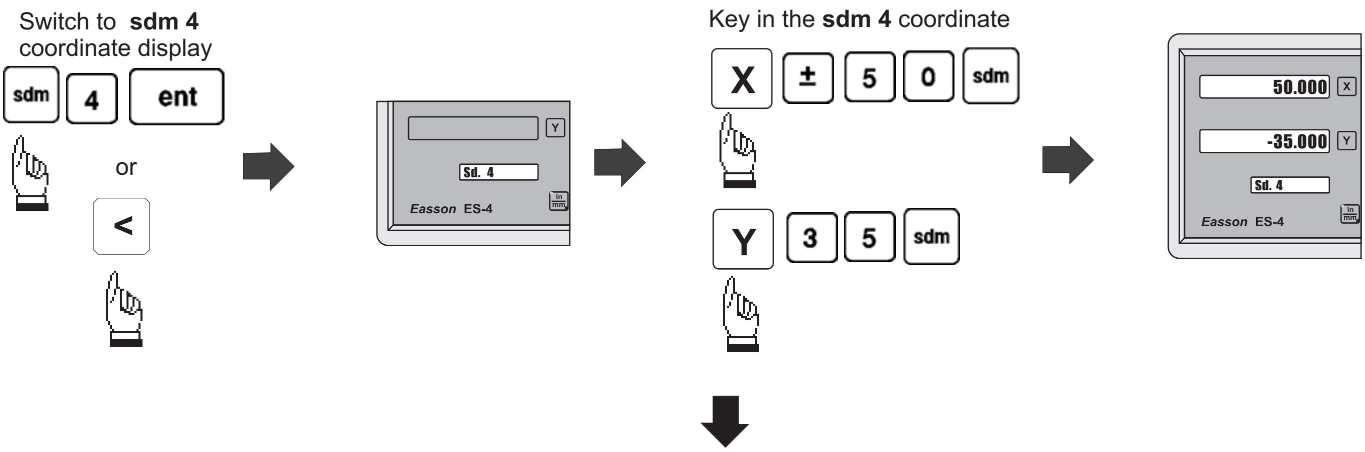


199 SubDatum function

Step 4 : Set up the subdatum point 3 (sdm 3)



Step 5 : Set up the subdatum point 4 (sdm 4)

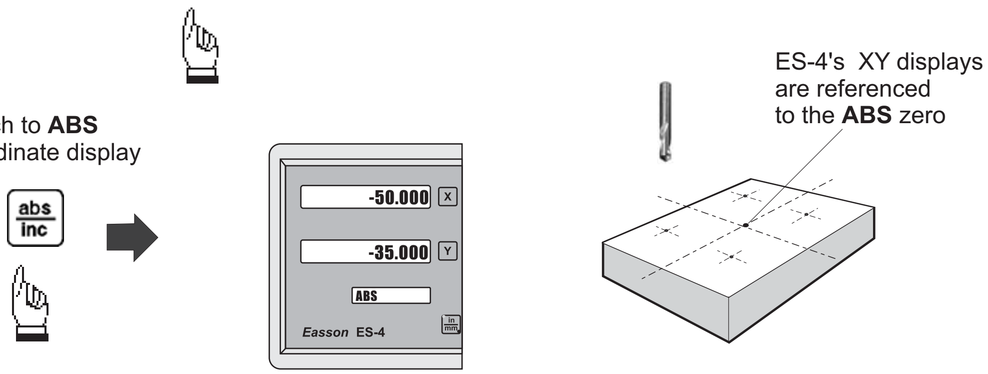


All the four subdatum points have already been set up

Operator can < or > to directly switch to the required subdatum (**sdm**) coordinate

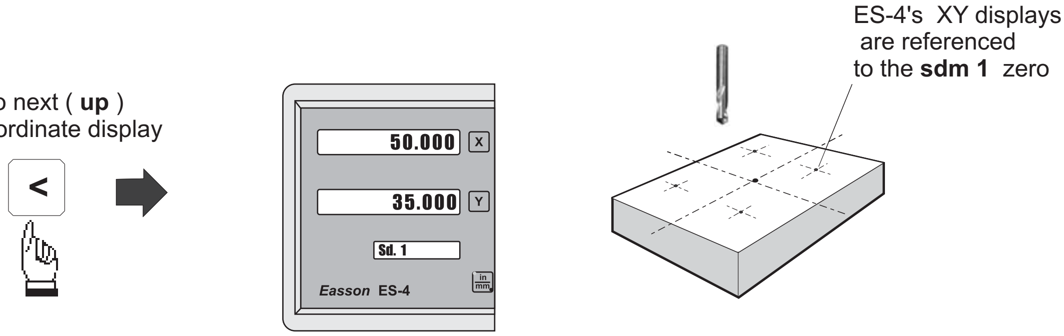
Example :

switch to **ABS**
coordinate display

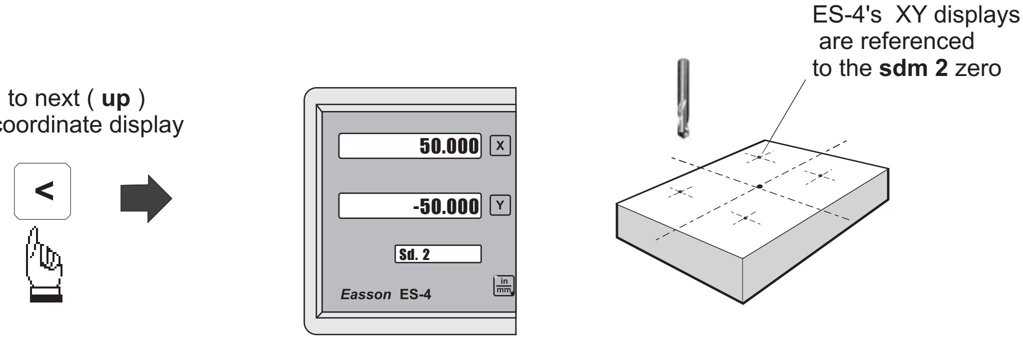


199 SubDatum function

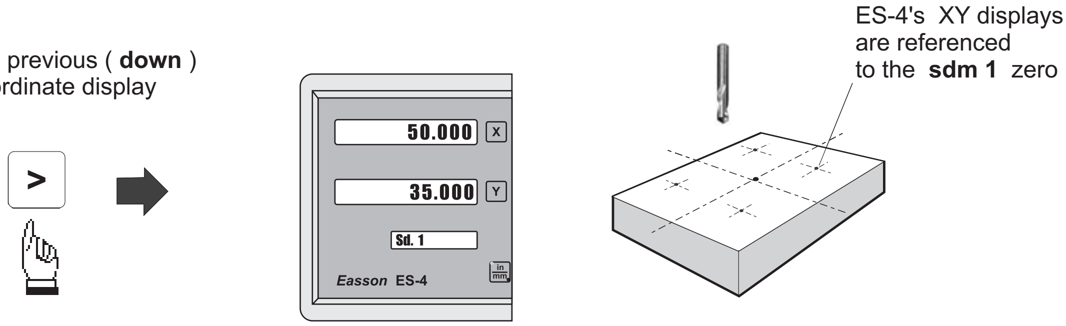
switch to next (**up**)
sdm coordinate display



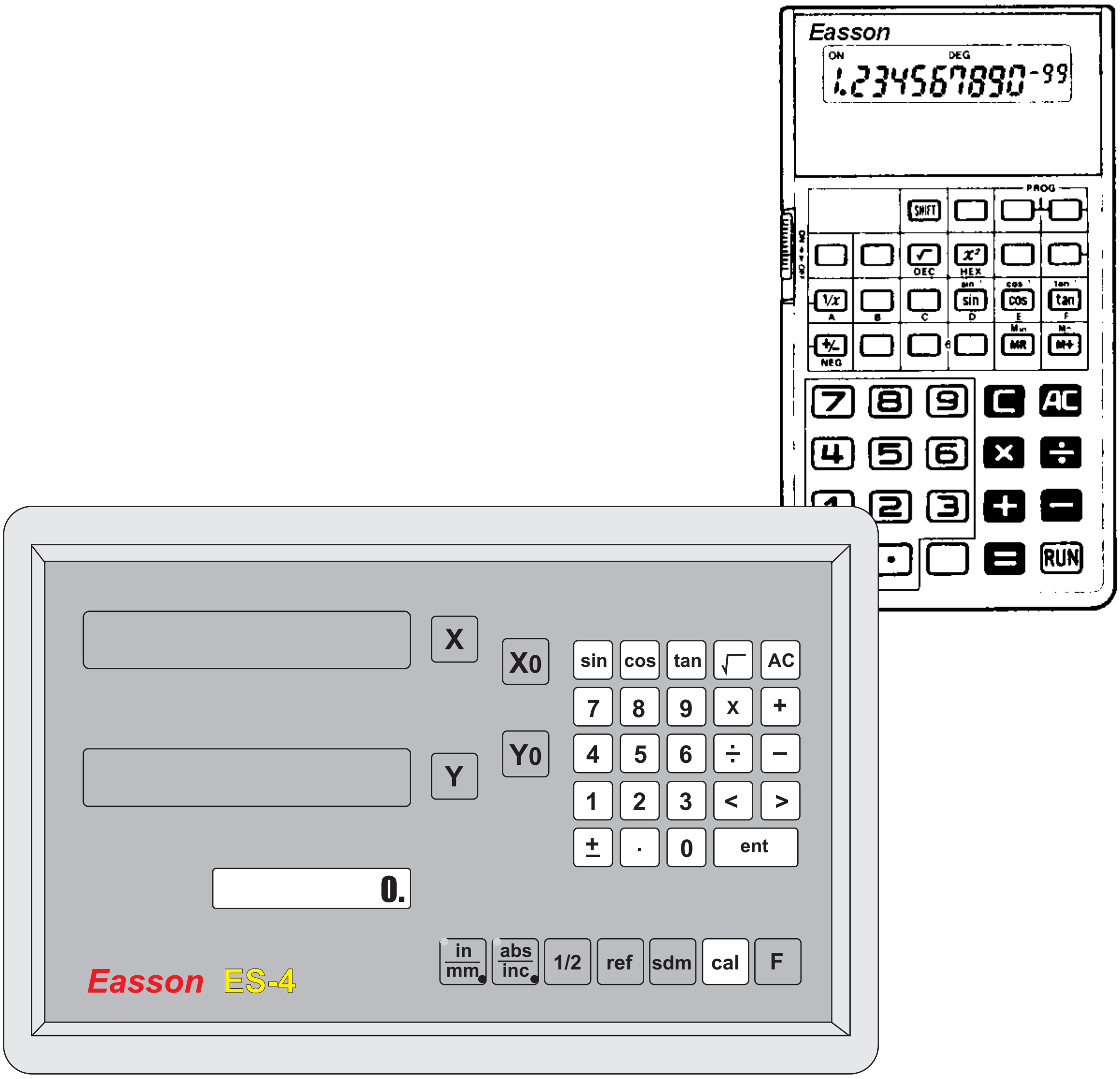
switch to next (**up**)
sdm coordinate display



switch to previous (**down**)
sdm coordinate display



Built- in Calculator



Built in Calculator

Function : A calculator is used frequently during a manual machining process..

ES-4 is the first DRO that has a built-in calculator

The built-in calculator of the ES-4 not only provides normal mathematical calculations such as add, substract, multiply & divide, it also provides useful trigonometric calculations that are frequently required during a machining process such as **SIN, COS, TAN, SQRT** and also ***inv* SIN, *inv* COS, *inv* TAN, SQUARE...**

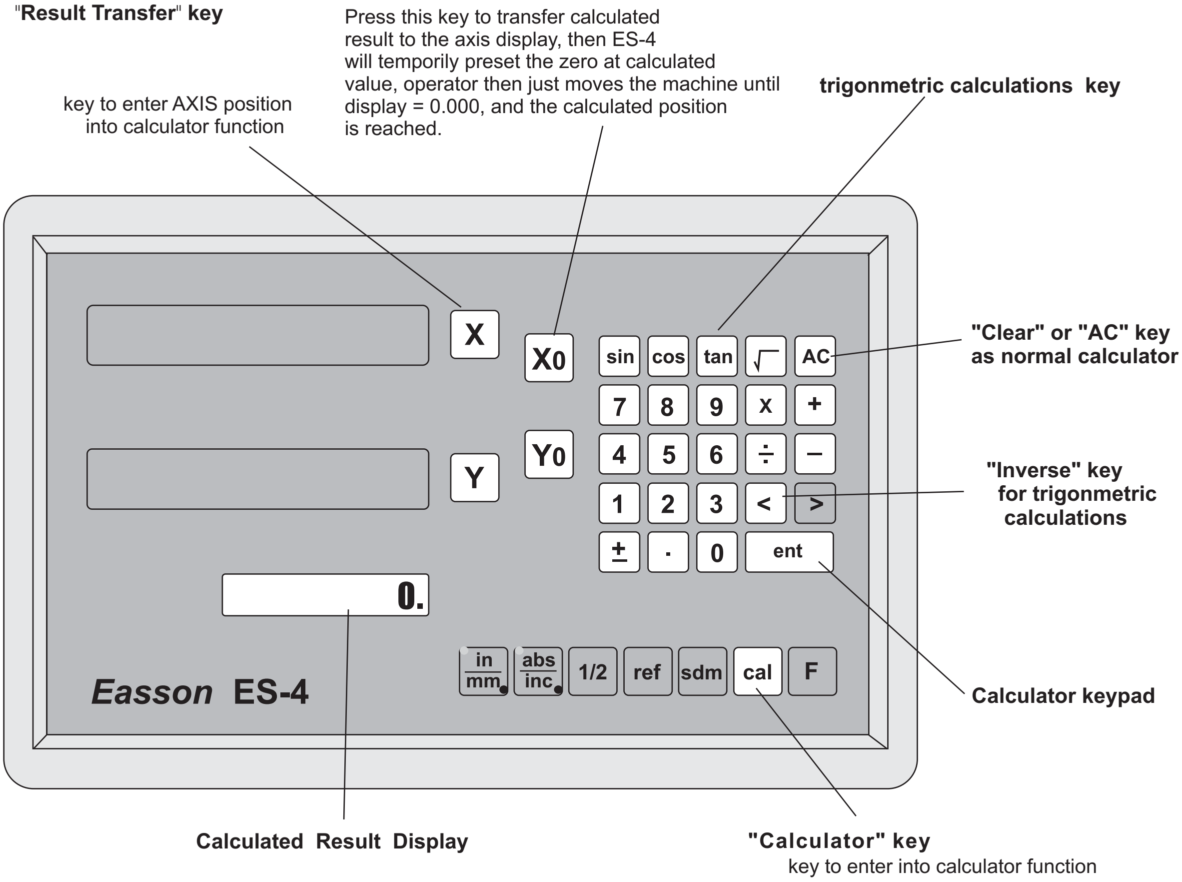
In addition a major feature of the calculator of the ES-4 is "***Result Transfer***", in that all calculated results from the calculator of ES-4 can be "transferred" to any axis to enable you to position the tool. After the result has been transferred to an axis, the ES-4 will ***temporarily*** preset the zero position at the calculated value, enabling the operator to simply move the machine back to axis display = 0.000, leaving the tool positioned at the calculated coordinate .

The built-in calculator offers the following advantages :

1. Operations are the same as commerically availiable calculators and it is easy to use ;

2. The calculated result can be directly transfered to any axis, eliminating the need to make notes of a calculation on paper, thus saving time and avoiding errors;

3. No unnecessary down-time in finding or sharing calculators whenever you need one to make calculations.



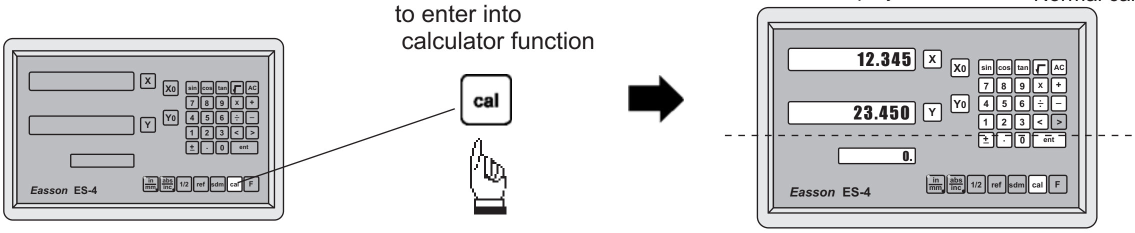
Key layout of the built-in calculator

Built in Calculator

Example :

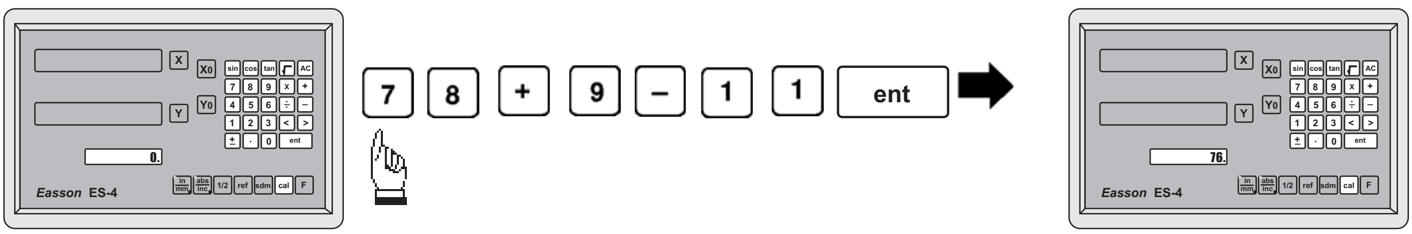
Working principle of ES-4's calculator function

when the ES-4 is put in calculator mode, the operation of ES-4 actually divided into two parts as follows

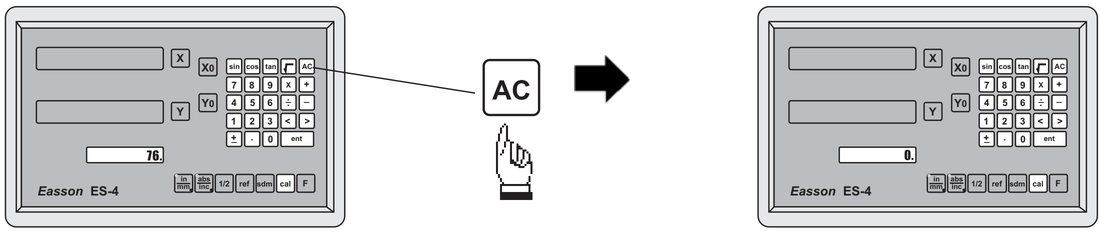


The operations of ES-2's built-in calculator is the same as other ordinary calculators

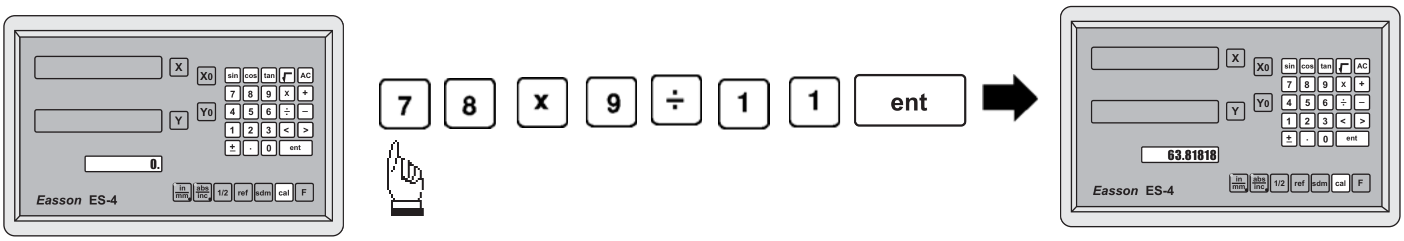
i.e. Basic mathematics **- add ; substract :** 78 + 9 - 11 = 76



Clear - Restart the calculation

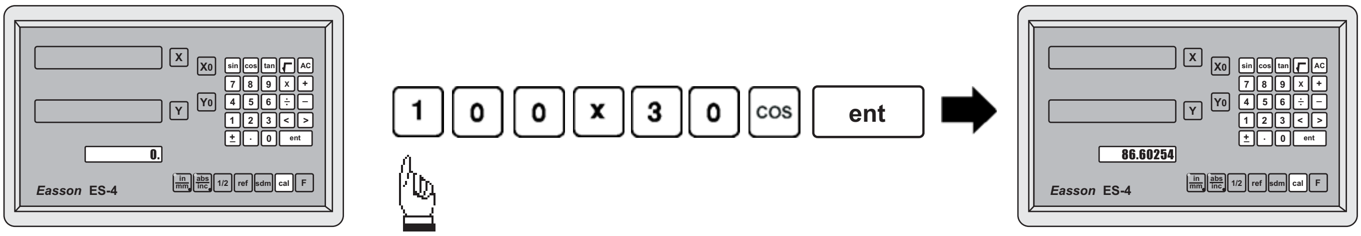


i.e. Basic mathematics **- multiply, division :** 78 X 9 / 11 = 63.81818

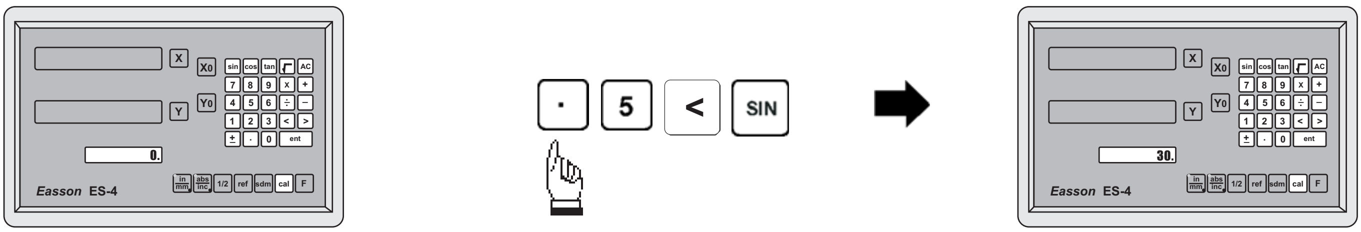


Built-in Calculator

i.e. Trigonometric calculation **- COS :** 100 X COS 30° = 86.602540

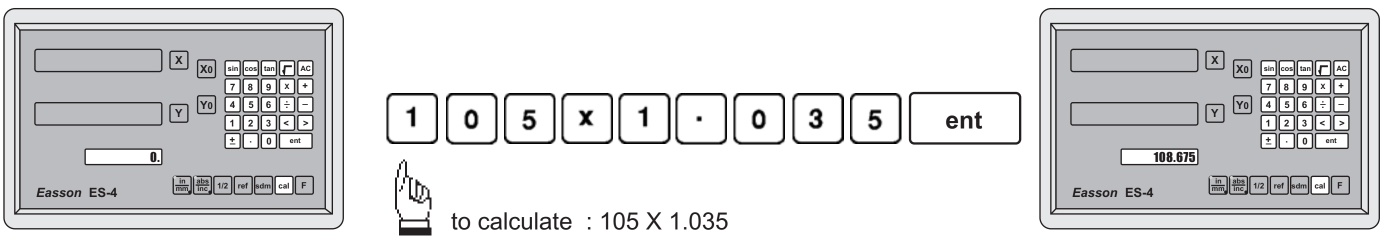


i.e. Trigonometric calculation **- inverse SIN :** $SIN^{-1}0.5 = 30^{\circ}$



Result Transfer

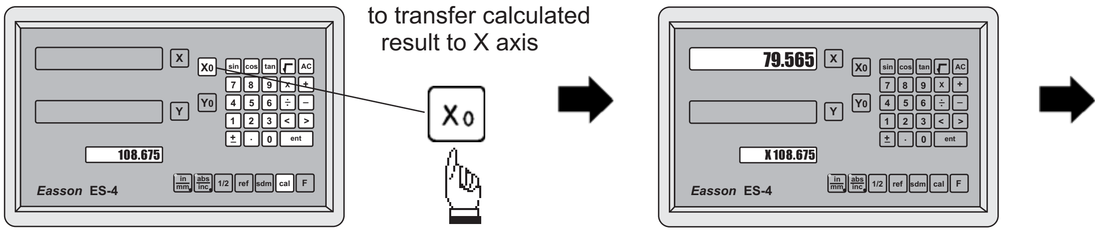
i.e. : **To move the tool at the position of X axis coordinate :** 105 X 1.035 = 108.675



to calculate : 105 X 1.035

transfer the calculated result : 108.675
onto the X axis for tool positioning

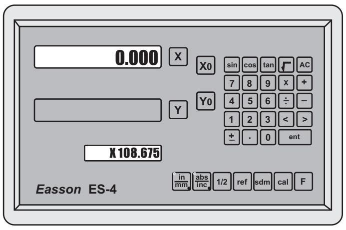
X axis zero position is now
temporarily preset at X = 108.675

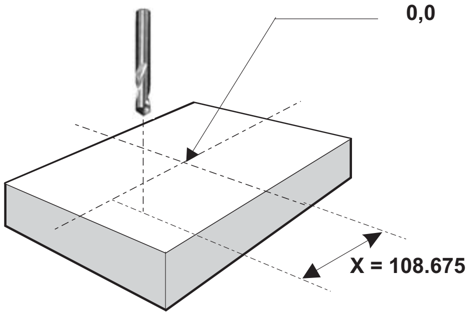


to transfer calculated
result to X axis

Built-in Calculator

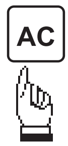
Move the machine to X display = 0.000
then it is at the position of X = 108.675

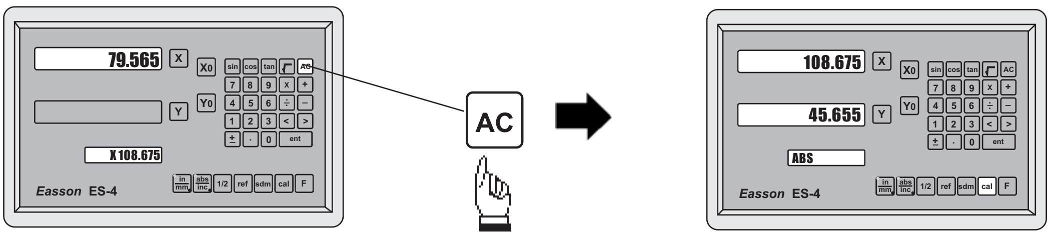




The tool is now at the position of the calculated result
(X = 108.675 in the above example)
To get back to normal coordinate display to continue
the machining

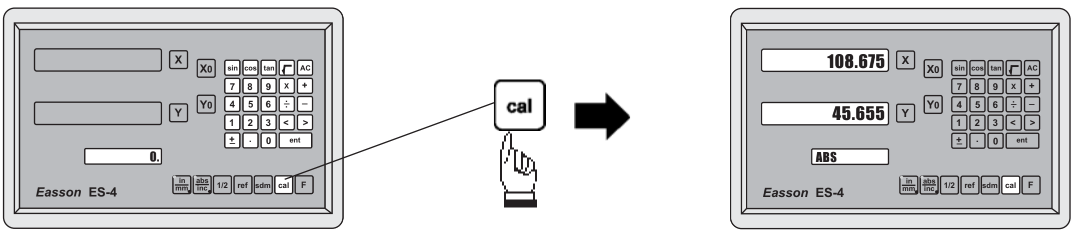
OR





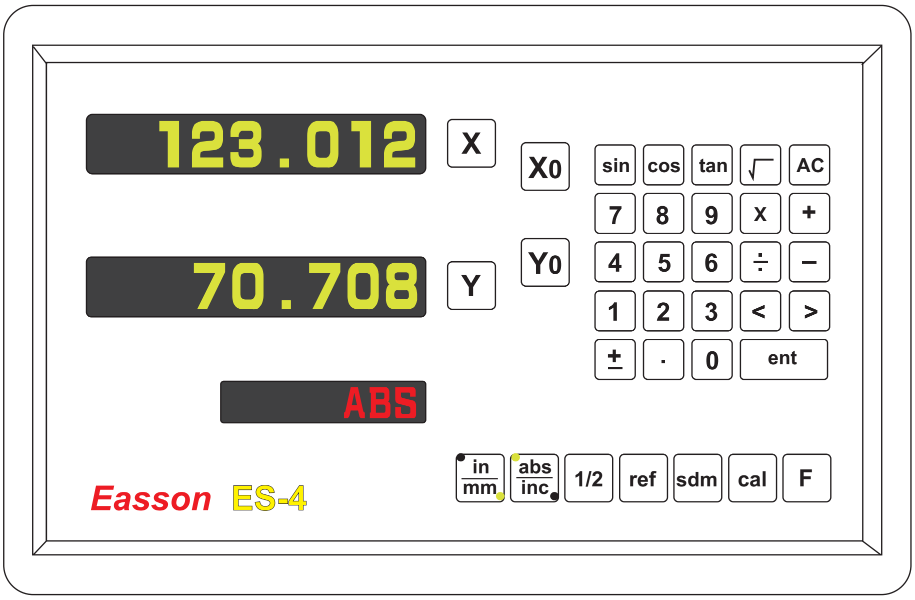
When you are in calculator mode, you can

to exit the calculator mode, to return to normal coordinate display to continue the machining.

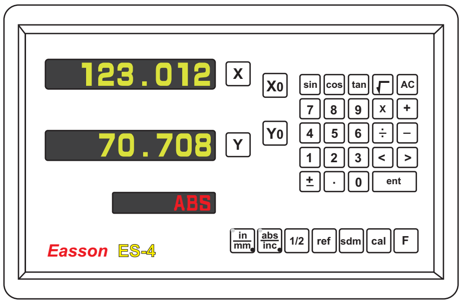


ES-4

Digital Readout Setup Function



ES-4 ORIGINAL PARAMETER RESET FUNCTION



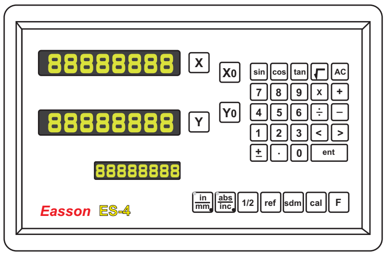
Some inscrutable cases or improper operations cause the chaos of parameter, then you need to initialize the parameter to reset the system.

Operational procedure：

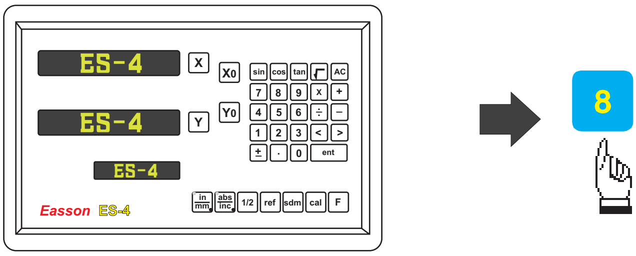
(1) Turn off the ES-4.

(2) Power on ES-4 once again, when "ES-4" moving in display window, please press "8" key then ES-4 enters into the RESET function.

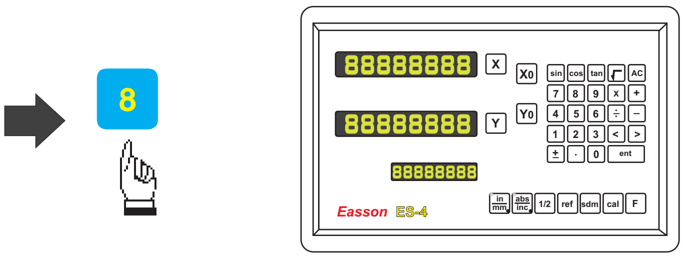
power on the DRO, then DRO starts the self-test function



when "ES-4" appears in display window, please press " 8 " key.



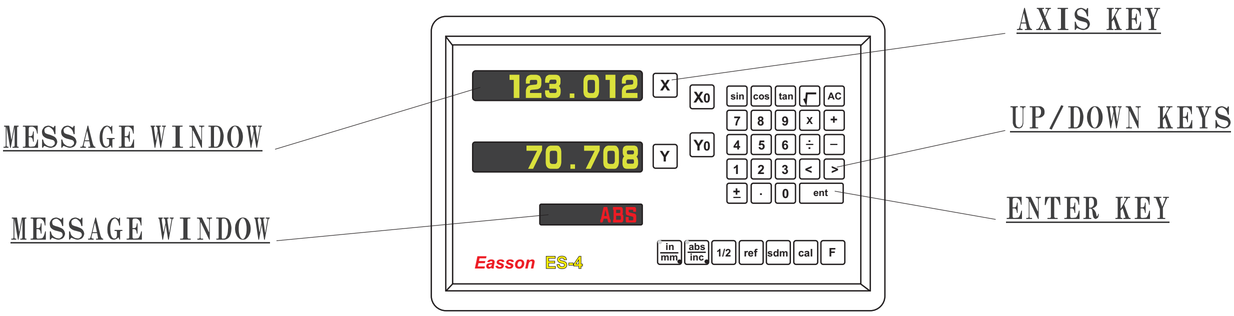
after press " 8 " key, the wore "8" can appear and continuously nove in display window.



(3). Wnen enter inyo the RESET function, the word "8" appears and continuously moves in display window. After the word "8" moves 2～3 trips, the DRO will complete the reset.

(4). Turn off the DRO after complete the reset, then power on DRO once again.

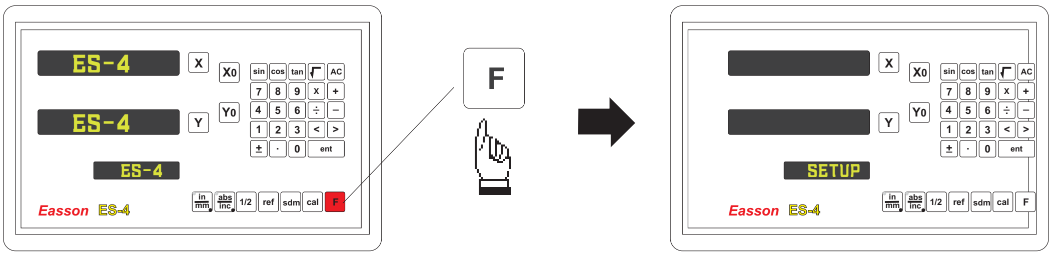
ES-4 SETUP FUNCTION



During changing the different program version IC or some abnormal voltages and operations, you need to SETUP the DRO.

Procedure :

1). Turn off the ES-4.
2). Power on the ES-4 once again, when the message "ES-4" showing in the MESSAGE WINDOW, please F key immediately then the DRO ES-4 starts entering into the SETUP function.



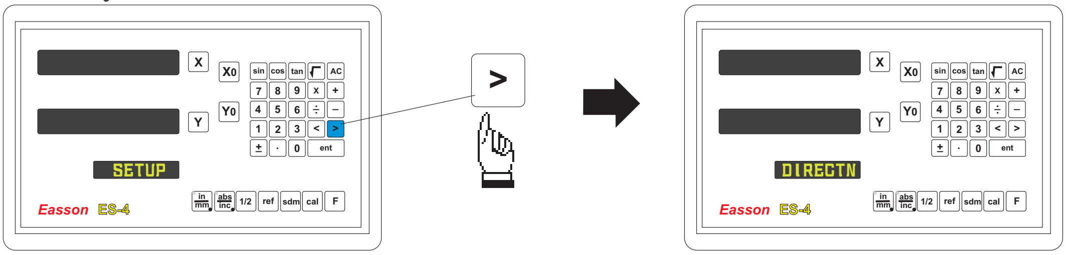
When the DRO displays some messages over, it will into the "SETUP" function.

The SETUP procedure is written in a menu mode which enables you to scroll through the top level options and enter, configure and exit the sub-functions as they arise.

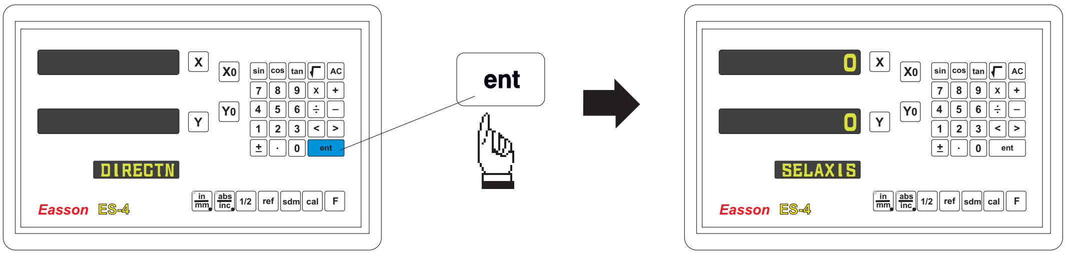
The top level menu headers in order are as follows :

DIRECTIN	specifies the direction of count for each axis
LIN COMP	permits linear error compensation to be input
NL ERROR	permits non linear error compensation to be input (point compensation)
REF SIGN	specifies the signal of the reference point for each axis
RAD/DIA	radius and diameter setting functions
AXIS NO	configures the DRO axis number
FILTER	permits the filter value to be set
NORMAL	returns the DRO settings to the factory preset values
QUIT	exits the SETUP function to proceed to normal working

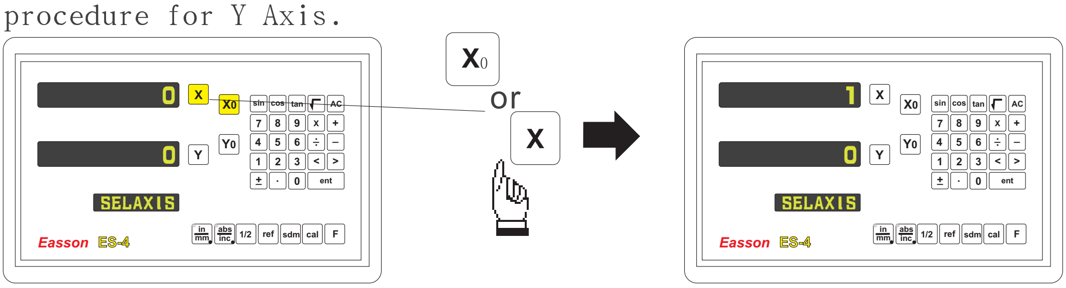
3.) Press > key to select the "DIRECTN" (counting direction) function. Press < key to return to the last function.



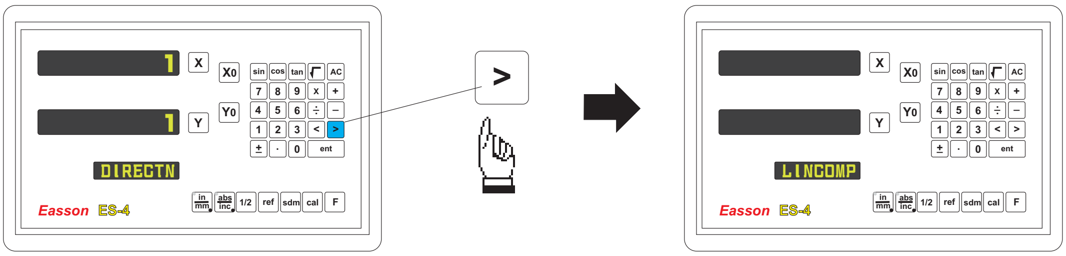
Press ent key into the direction setting function, the 0 represents a positive, 1 represents a negative.



Press X0 or X key to set up a negative direction "1" for X Axis, make a same procedure for Y Axis.



4.) Press ent key to make your setting, then press > key to select the "LIN COMP" (linear compensation) function.



Press ent key into the linear error compensation function, the formula as below：

error value X -(1000/measuring length) = compensation value

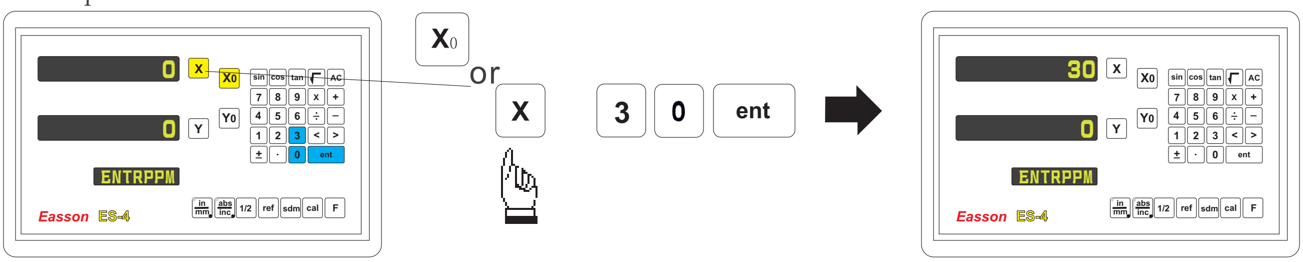
(ML) measuring length unit = mm, error unit = μm

Example： ML=500mm Error = -15μm

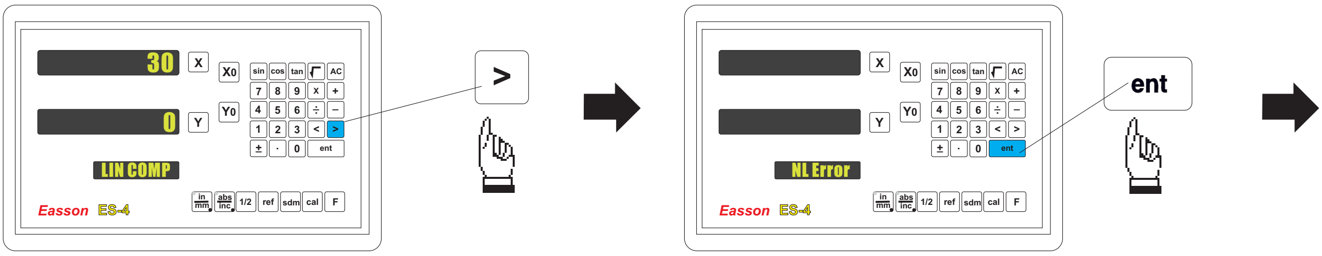
-15μ X -(1000/500) = 30μm

the compensation value is 30μm

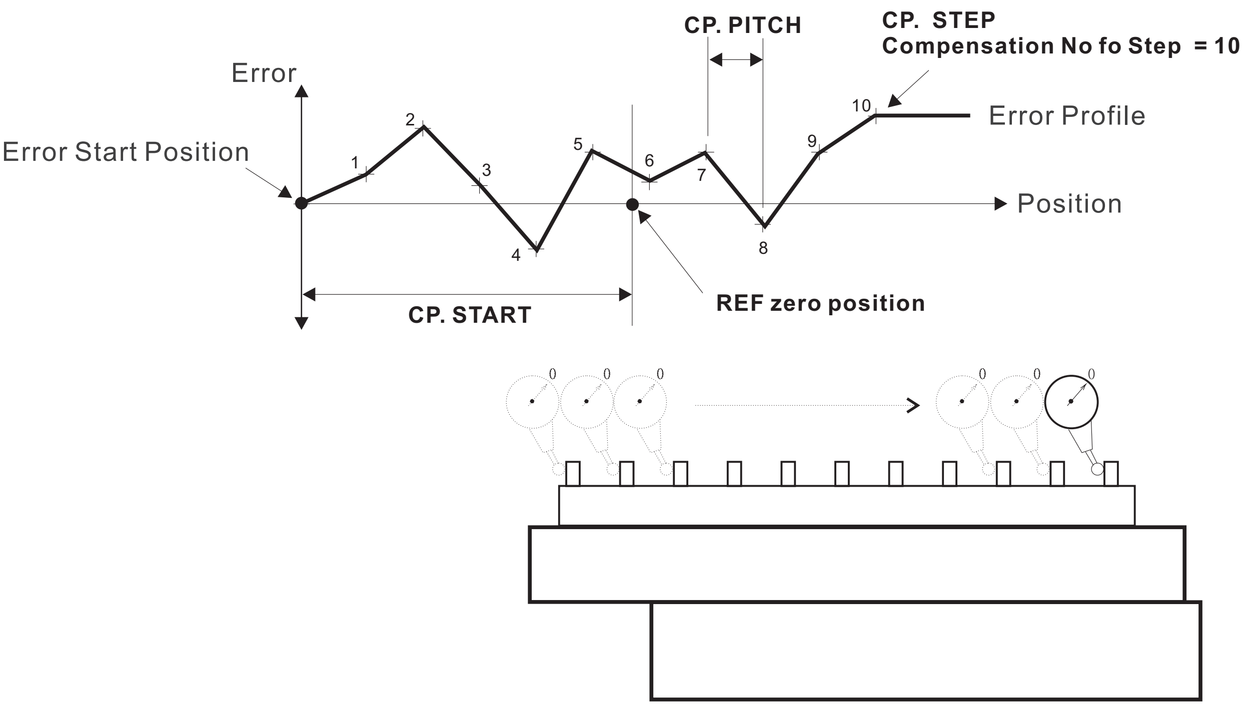
If set up the linear compensation value of X Axis = 30, through the AXIS key make a same procedure for Y Axis.



5.) Press ent key to make your setting, then press > key to select the "NL ERROR" (non-linear error compensation) function.



Non-Linear Error Compensation

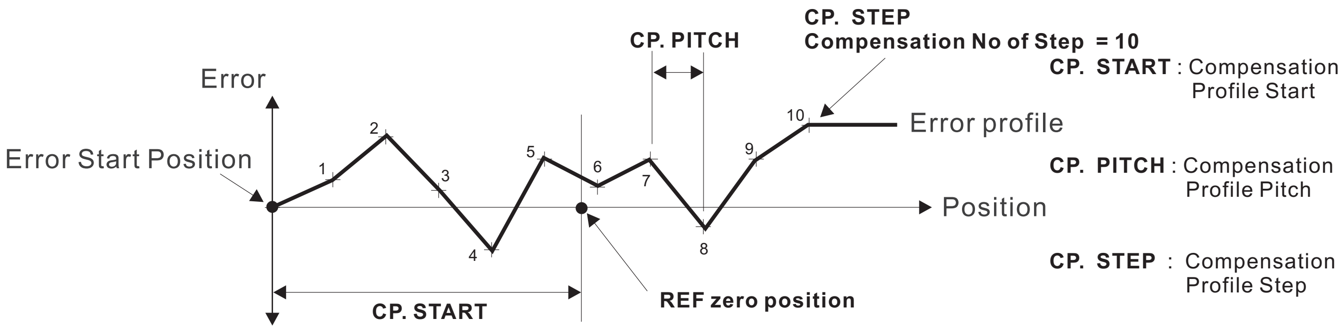


ES-4 Non-Linear Error Compensation

The main function of ES-4 Non-Linear Error Compensation is to improve the measuring accuracy.

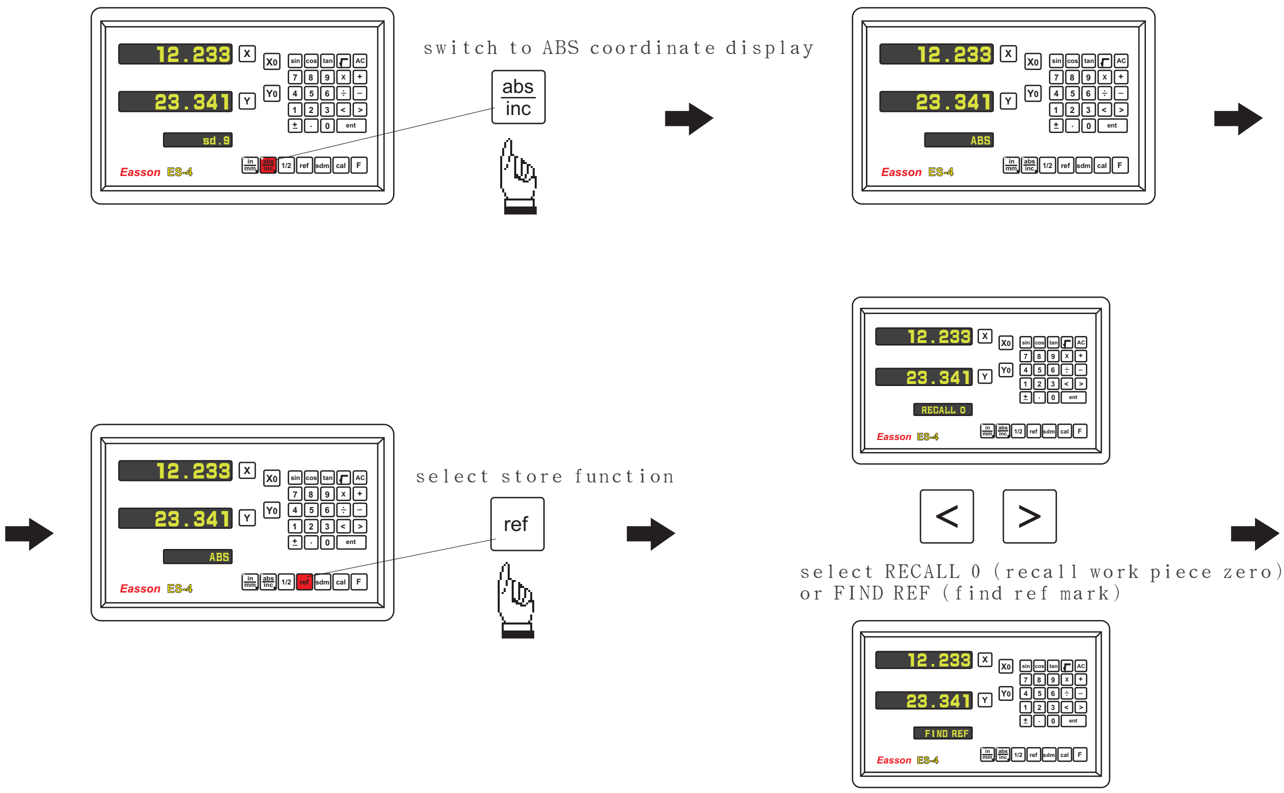
Principle:

Non-Linear Error Compensation uses the ref mark (REF zero position) to be a reference datum point and from the Compensation Start (CP. START) memorizes the Error Profile in the RAM of ES-4. and then the microcomputer of ES-4 will compensation the error step by step upon the current position of scale.

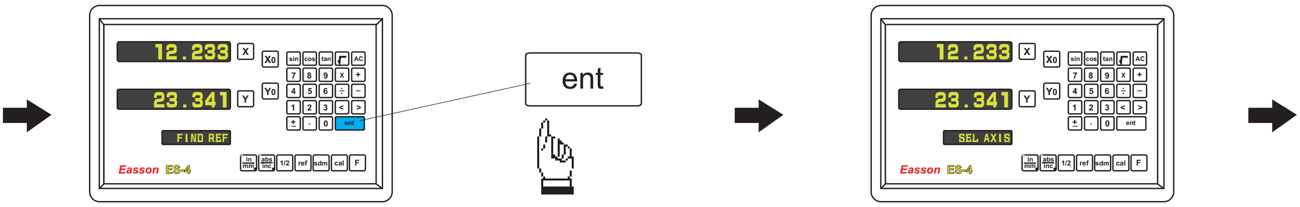


Operational procedure:

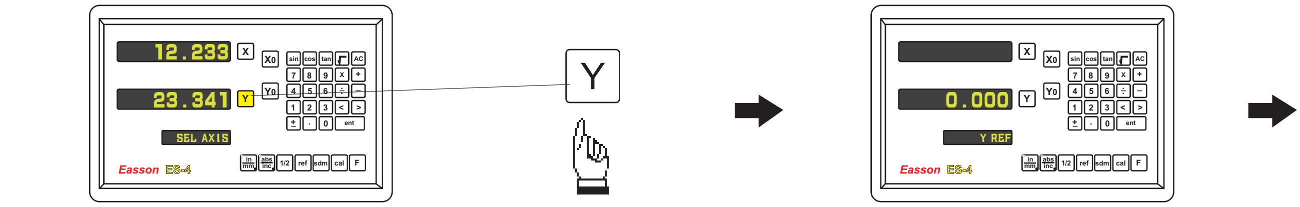
(1). Find ref mark position in ABS coordinate display:



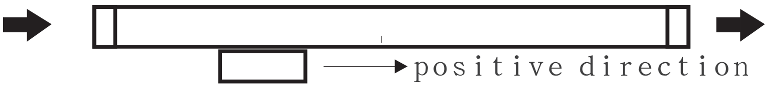
select FIND REF (find ref mark)　　　　select X or Y axis



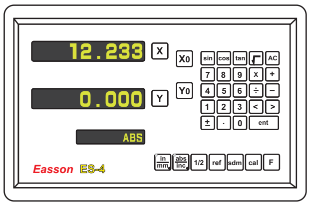
Exampl : select Y axis



move the Axis across the ref point by positive direction, until ES-4 figure displays.



ref mark position is in Y=0.000

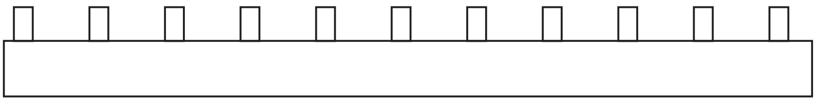


(2). Find CP. START position:

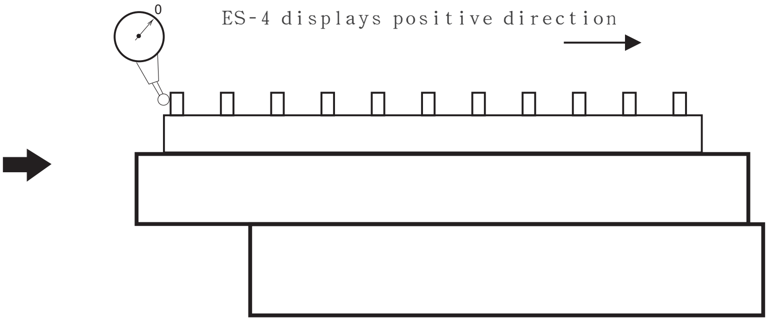
ES-4 Non-Linear Error Compensation always counts by positive direction, so CP. START position must be in the most negative point of Travel.

e.g. In this example. we use a step gauge 25mm pitch to be our measured norm and total compensation travel (the largest possible travel of step gauge) is 250mm, therefore

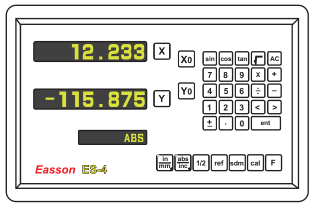
CP. PITCH = 25mm
CP. STEP = (total compensation travel - 250mm) / CP. PITCH = 10



Put the start of step gauge in the most negative display of moving Axis and make the test indicator aim at this point is zero position.



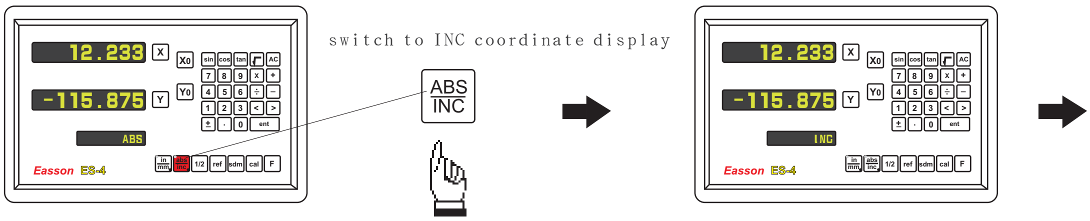
after you aim this point, the CP.START is the coordinate that show in the display window of Y Axis, please note that the compensation of ES-4 always toward the positive direction, so if the ref is the middle of Travel, the CP.START is a negative forever.

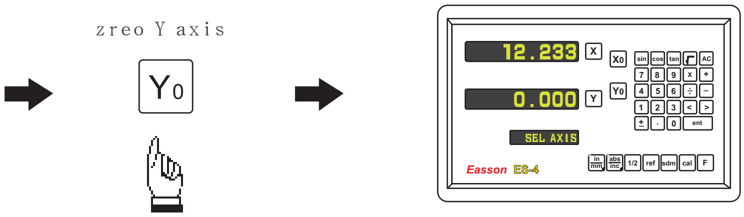


in this example, please write down the value CP. START = -115.875

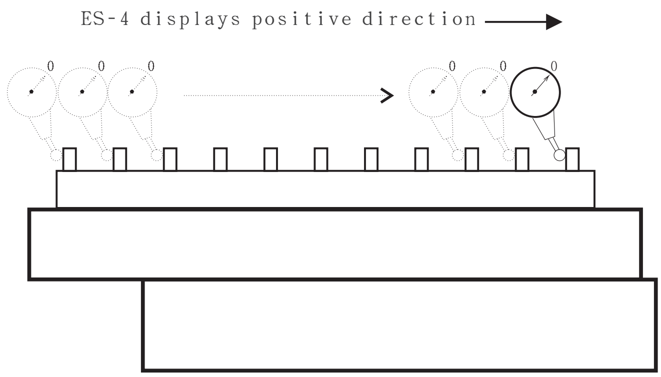
(3). Start to measure errors:

In order to measure errors conveniently, we suggest ES-4 to switch to INC coordinate display and to zero in the first measured point, then start to measure.





satrt to measure, and fill the measured value in the following form.



When use the Incremental Mode ES-4 non-linear compensation, you do not need to calculate the error only enter the measured value, therefore you need to design a form for the measured value as follows:

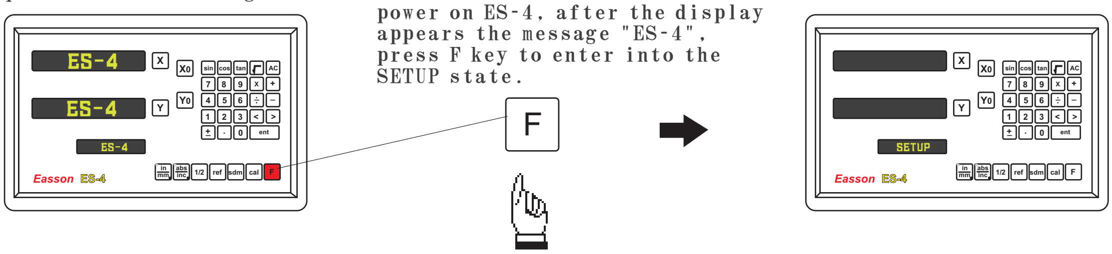
Standard position	Measured value
25.000	25.008
50.000	50.004
75.000	75.017
100.000	99.995
125.000	125.002
150.000	150.012
175.000	174.997
200.000	199.988
225.000	225.007
250.000	250.015

CP. START = -115.875
CP. PITCH = 25.000
CP. STEP = 10

(4). Enter the value of non-linear error compensation to ES-4:

after turn off ES-4, please power on ES-4 once again.

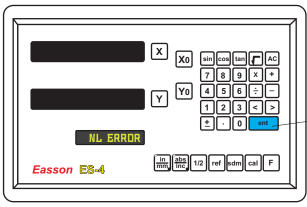
power on ES-4, after the display appears the message "ES-4", press F key to enter into the SETUP state.



after enter into the SETUP state, press down key until the NL Error appears.

>

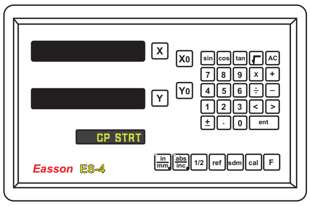
NL Error is Non-Linear Error



press ent key to confirm the selection.

ent

enter CP. START

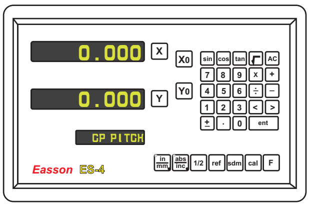


Y ± 1 1 5 · 8 7 5 ent

enter CP. PITCH

next step

>

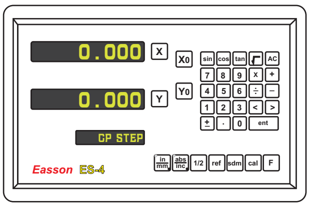


Y 2 5 ent

enter CP. STEP

next step

>

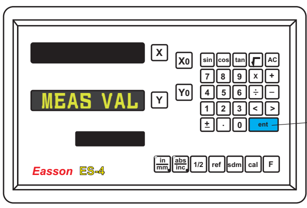


Y 1 0 ent

MEAS VAL is Measured Value

next step

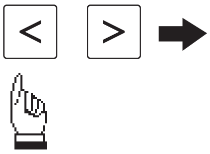
>

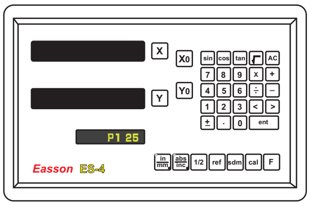


press ent key to confirm the selection.

ent

after enter into the MEAS VAL
state, press down key to select
Step of point.

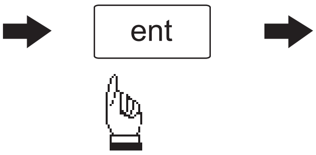


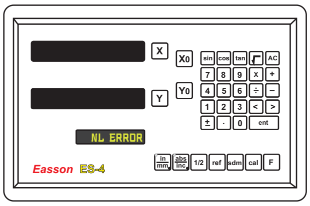


Y ...measured value.... ent

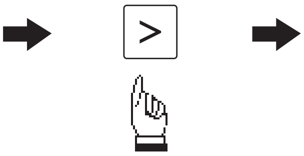
P1 25 25.008
P2 50 50.004
P3 75 75.017
.
.
.
P10 250 250.015

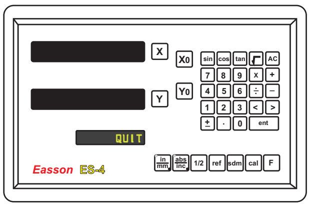
complete all procedures
then press ent key to exit





press down key until the
QUIT appears

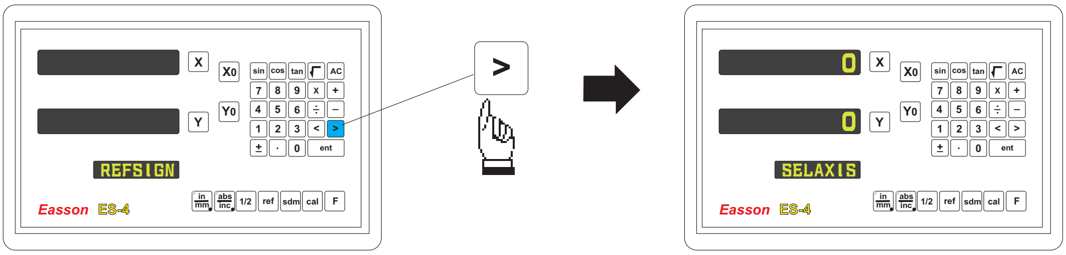




must turn off ES-4 then power
on ES-4 once again, otherwise
you cannot do the error
compensation.

- **After complete the error compensation function, you must turn off the ES-4 then power on the ES-4 again, otherwise your compensated value will invalid.**

6). Press > key to select the "REF SIGN" function.



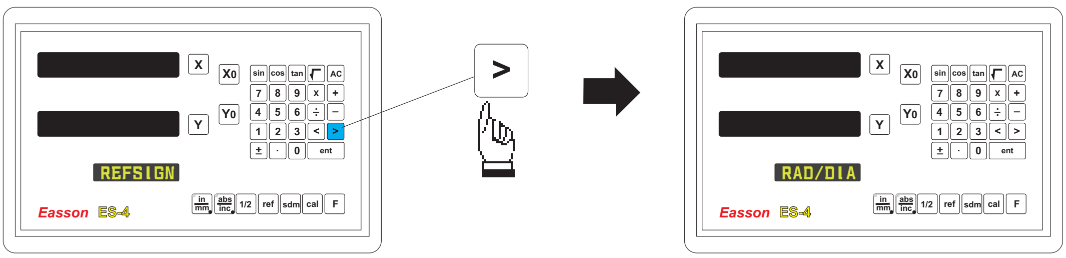
Press the UP/DOWN keys until the word "REF SIGH" is shown in the MEASSAGE WINDOW, Press the ENTER key to access the next menu level. Press the DOWN key once and the message "SEL AXIS" appears in the MESSAGE WINDOW. Press the individual axis key and enter a 0 or 1 in accordance with the instructions below. Press the ENTER key to store the value. Press the UP/DOWN keys to move to the next menu item.
In the market there are many gratings using a 20μm pitch. There are two types of electronic signal which generate the reference point. The first associates the signal with a rise in voltage, the second with a drop.

```
     Example 1                                  Example 2
      +-------+                            -------+       +-------
      |       |                                   |       |
-------+       +-------                            +-------+
```

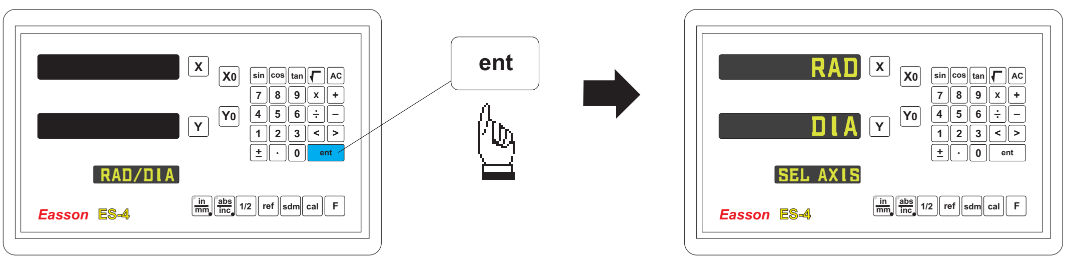
REF SIGN = 0	REF SIGN = 1
Normal Voltage = 0V	Normal Voltage = 5V
At ref point = 5V	At ref point = 0V
Suppliers-Easson, Mitutoyo, Futaba	Suppliers-Fagor

When fitting an EASSON scale always set to 0

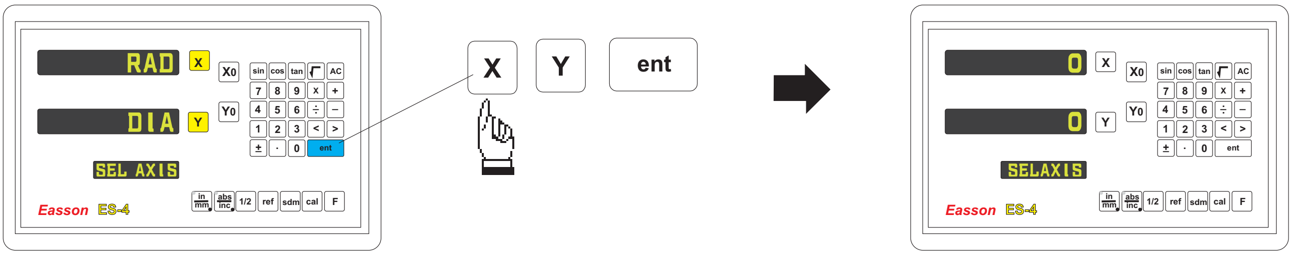
7.) Press ent key to make you setting, then press > key to select the "RAD/DIA" function.



Press ent key into the "RAD/DIA" function.



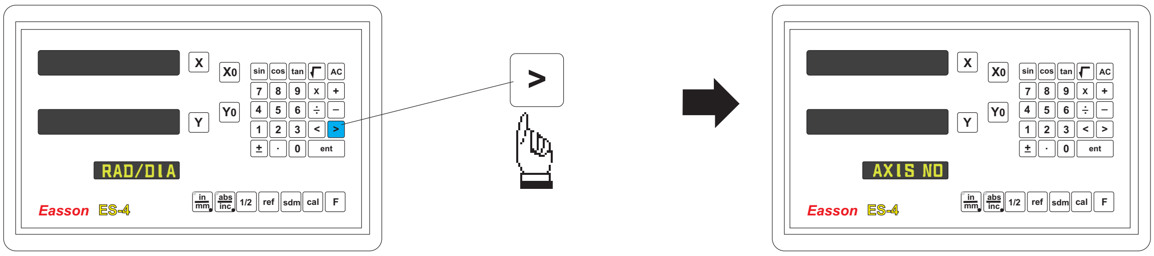
Press X or Y key to set up X or Y Axis to "RAD/DIA", then press ent key to make your setting.



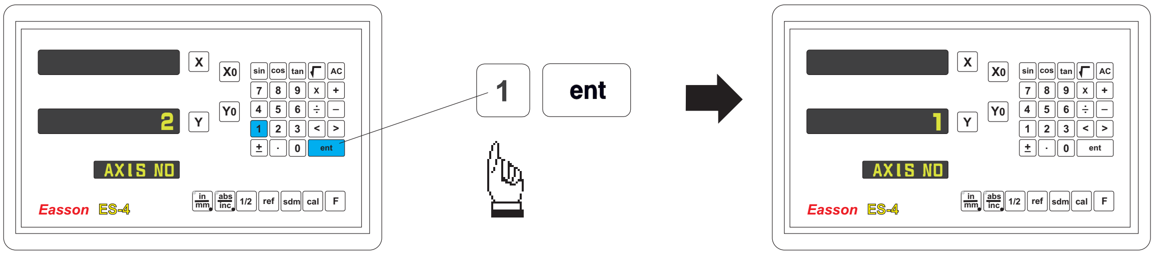
When set to "RAD", the displayed value = the measured value

When set to "DIA", the displayed value = the measured value x 2

8.) Press > key to selsct the "AXIS NO" function.

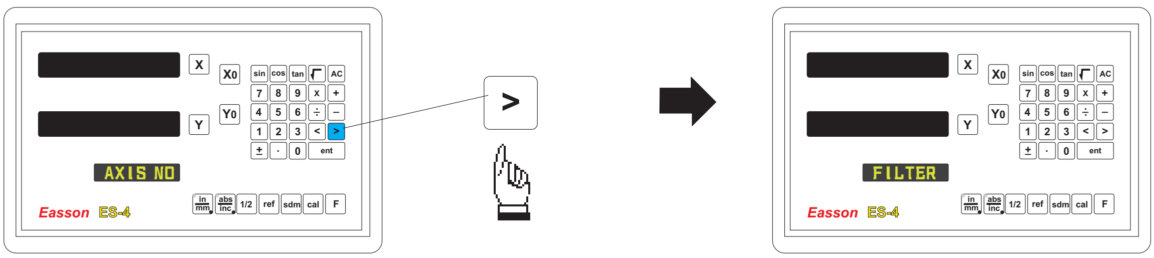


Press ent key into the setting function, i.e. your setting axis number is "1".

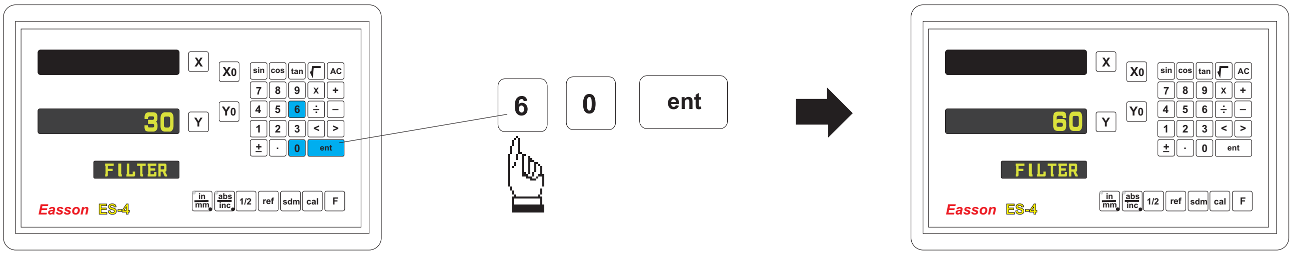


After entering the SETUP mode shown overleaf, push the UP/DOWN keys on the keypad until the word "AXIS NO" is shown in the MESSAGE WINDOW. Press the ENTER key to access the next menu level. Press the DOWN key once and the message "2" (for a 2 axis etc) appears in the Y AXIS WINDOW. Press the individual axis key and enter a number to specify the axis number. Press the ENTER key to store the information. Press the UP/DOWN keys to move to the next menu item.

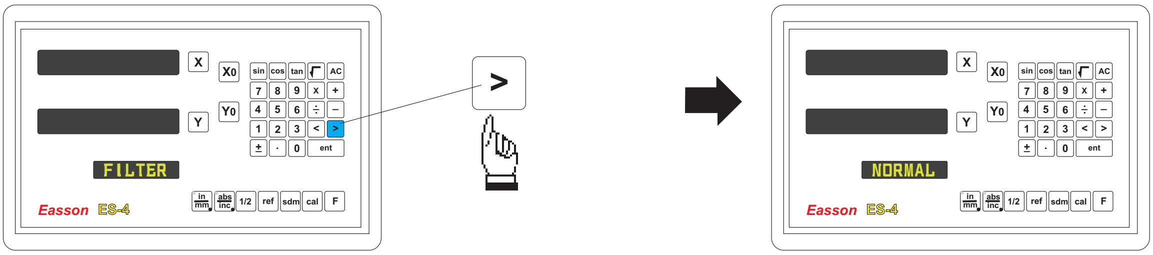
9.) Press > key to select the "FILTER" function.



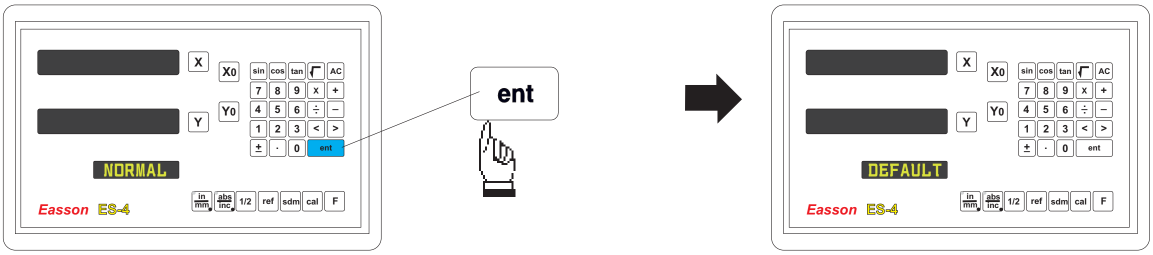
Press ent key into the digital filter setting function, then you can increase digital value until the digital does not pulsate. Please note that the value of DE (digital filter) is larger means the integrate is larger then the display is more stable.



10.) Press **ent** key to make your setting, then press **>** key to select the "NORMAL" function.

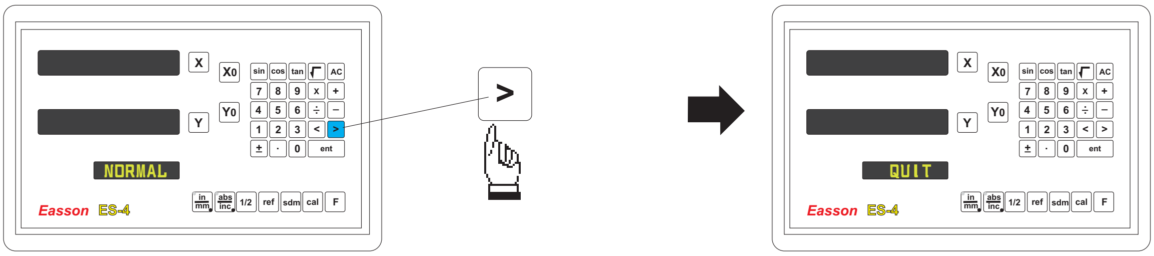


Press **ent** key into the setting function, the meassage "DEFAULT" is shown in the MESSAGE WINDOW.

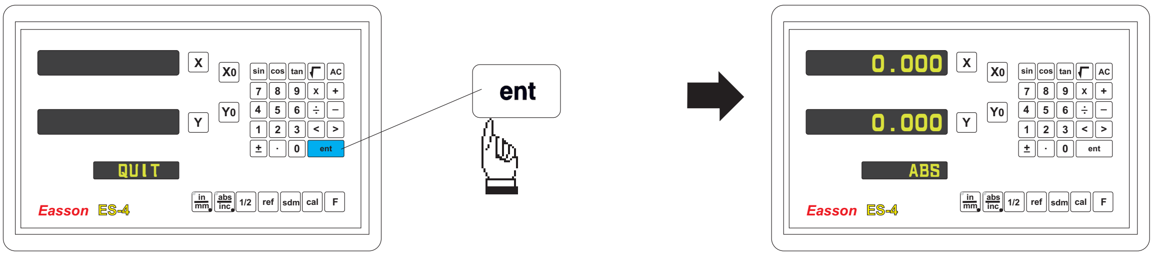


After entering the SETUP mode shown overleaf, push the UP/DOWN keys on the keypad until the word "NORMAL" is shown in the MEASSAGE WINDOW. Press the ENTER key to access the next menu level. Press the DOWN key once and the message "DEFAULT" appears in the MEASSAGE WINDOW. By pressing the ENTER key the software is restored to default level. Press the UP/DOWN keys to move to the next menu item.

11.) Press **ent** key to make your setting, then press **>** key to select the "QUIT" function.



Press **ent** key to make your selection, then the DRO will exit the SETUP function and return to the "ABS" state.



By pressing the ENTER key the DRO exits the SETUP program and is ready for machining operations. If use the error compensation function, you must turn off the DRO then power on the DRO again, otherwise your compensated value will invalid.