EL 750

Operational Manual

Digital Readout System

For

Machine Tool

electronica

Table of Contents

1. Introduction

Congratulations on purchasing EL750 series Digital Readout System (DRO) from Electronica Mechatronic Systems. Our DRO incorporates the latest state of the art technology; giving you world class features which help in improving productivity, reducing rejection and at the same time giving ease of operation to user with its ergonomic design.

Some of the key features of EL750 series DRO are:

- Adaptability to various types of machines, old and new, simple and complex.
- Ease of installation.
- Soft touch keyboard for improved life and ease of operation.
- 4 axes version with provision of 4 axes display with option of internal summing of two axes.
- Display of dynamic tool position improving productivity and ease of operation.

- ✓ **Note: Please familiarize yourself with the contents of this Operators manual to benefit from all features provided by EL750 DRO.**
- ✓ **Electronica Mechatronic Systems (I) Pvt. Ltd. Reserves the right to change specifications without prior notice.**

2. DRO Specifications

Electrical:

Mains Supply:	90 VAC to 265 VAC (50 / 60 Hz)
Fuse Rating:	800mA Slow Blow 20mm
Power Consumption:	15W SMPS
Standard Compliance:	EMC and Low Voltage Compliance BS EN61326 RoHS

Environmental:

Storage Temperature:	-20ºC to +70ºC
Operating Temperature:	0ºC to 50ºC
Relative Humidity:	20% To 85% Non-Condensing

Mechanical:

Dimensions (mm)	192 mm X 290 mm X 76 mm Height X Width X Depth
Net Weight:	Approx1.5 Kg
Display:	7” Colour TFT Display with LED backlight.

Connections

Encoder Input:	RS422
Encoder Connector Type:	9-Pin D-Type Female
Encoder Resolution Supported:	0.1/0.2/0.5/1/2/5/10/20/50/100 Micron
Auxiliary Connectors:	15-Pin D-Type Female for Auxiliary Output (Optional), Encoder Jack Plug connector for Probe input. USB B type Connector

CE ISO 9001 COMPANY

3. Read Before Proceeding

- The EL750 DRO is sophisticated electronic equipment and should be carefully handled to avoid any damage.
- The rated supply to DRO should be within specified limits and should not be exceeded under any circumstances. Doing so may cause irreversible damage to DRO.
- DRO should be opened by authorized person only. Otherwise it will invalidate the warranty of the unit.
- Equipotential Point (Ground) should be provided to avoid erratic operations of DRO.
- Cable routing of DRO and encoders should not be routed through or nearby high capacity switching/inductive load or where it can cause danger.
- EL750 DRO is standard compliant with
    - EMC Directive EN61326 Standard 61326-4-2, 61326-4-4, 61326-4-11, 61326-4-5, CISPR 16-1 and 16-2.
    - RoHS compliant.

- **Warranty will be considered void if and not limited to**
    - Failing to meet manufacturers specified supply conditions.
    - Abusive handling.
    - Environmental conditions outside of Manufacturers specifications.
    - Manipulation, tampering of electronics.
    - Replacement of original parts with other parts than specified by manufacturer.
    - Used with encoders other than those supplied by the manufacturer.

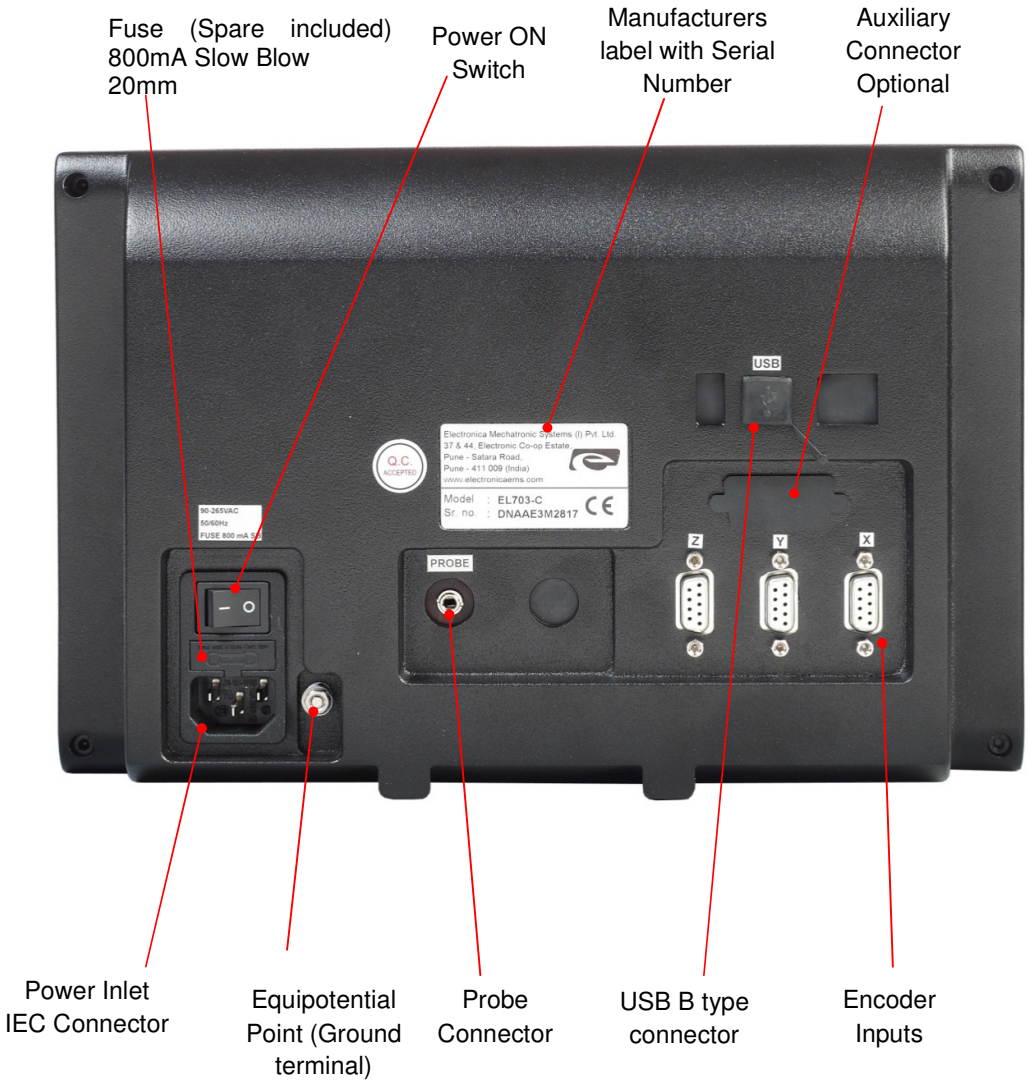
- **Disposal**

  At the end of its life the EL750 DRO systems should be disposed of in a safe and environmentally sympathetic manner as applicable to local legislation. The casework and other components may be suitable for recycling. DO NOT BURN.

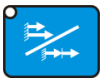
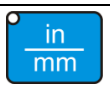
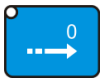
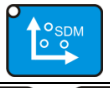
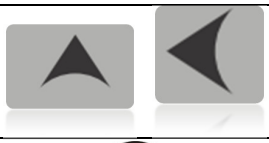
4. Getting Started

4.1 Front View

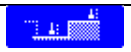
4.2 Rear View


Fuse (Spare included) 800mA Slow Blow 20mm
Power ON Switch
Manufacturers label with Serial Number
Auxiliary Connector Optional
USB
PROBE
Z
Y
X
Power Inlet IEC Connector
Equipotential Point (Ground terminal)
Probe Connector
USB B type connector
Encoder Inputs

4.3 Keyboard layout

Symbols	Description	
	ABS / INC	FUNCTION KEYS
	Inch / mm	
	Reference	
	Preset	
	SDM Function	
	Numeric Keys	NUMERIC KEYBOARD
	Toggle Sign	
	Decimal Entry	
	Enter	
	Cancel	
	Navigation Keys	
	Soft key Selection / Axis Selection	COMMON OPERATIONS
	LCD standby Key	

4.4 Soft Keys

Key	Description
	Height Measurement
	Corner Measurement
	Angle measurement
	Skew Measurement
	Internal measurement
	External Measurement
DATUM	Datum
	Calculator
CALC	Calculate
	Diameter
	Internal diameter
	External diameter
	Linear Measurement
	Step Length Measurement
CENT.	Center
ENG	English
OPEN	Open
SEL	Select
EXIT	Exit
Fn	Function
1/2	Half

Key	Description
M/C	Machine reference
HOME	Homing
ST-RF	Set reference
DIA	Diameter
TOOL	Mill/Lathe Tool set
DELET	Delete tool
ON	Tool On
OFF	Tool Off
	Vector Angle
SDMON	SDM ON
NEXT	Next SDM
DELET	Delete SDM
NO	Select NO
OFF	OFF
ON	ON
OUTPUT	Output configuration Key
INPUT	Input configuration Key
LINEA	Linear encoder mode
ANGUL	Angular encoder mode
PROBE	Probe

Key	Description
NEW	New job
DELET	Job delete
LCOMP	Linear Compensation
SCOMP	Segmented compensation
SAVE	Save
EDIT	Edit
MULTI	Multimode
SINGLE	Single
SET	Set
RESET	Reset
SETUP	Setup
SEL	Select
ZERO	Zero
MEAG	Probe measurement

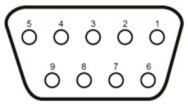
Key	Description
NEXT	Next arrow
JUMP	Next hole
ON	Apply the tool
OFF	Exit from tool
X+Z'	Plane selection
NO	No
YES	Yes
Z+Z'	Plane Selection
POS.	Position

4.5 Power Supply

The EL750 DRO series uses a Switch mode power supply inside which covers the universal power input range i.e. 90VAC to 265VAC / 50 to 60 Hz. Ensure the input power is within the specifications before powering the unit.

The power supply to the DRO should not be given from the same source as that of any high capacity switching / inductive loads to avoid interference. Ensure proper equipotential point (Ground) connection is provided to the DRO to avoid any erratic operations.

4.6 Encoder Connections



Pin Number	Output Signal
1	ABS*1
2	/ABS
3	VCC (+5V)
4	Shield*2
5	GND (0V)
6	Phase A
7	Phase /A
8	Phase /B
9	Phase B

✓ **Note:**

*****1 – ABS is Reference Mark.

*2 – Ensure proper shielding of the encoder cables for proper functioning of the encoder and the DRO.

Encoder Cable should be properly routed as per manufacturer's guidelines. Cable should not be routed near any inductive loads to avoid electrical noise interference. It should be routed away from the machine moving parts to avoid any damage.

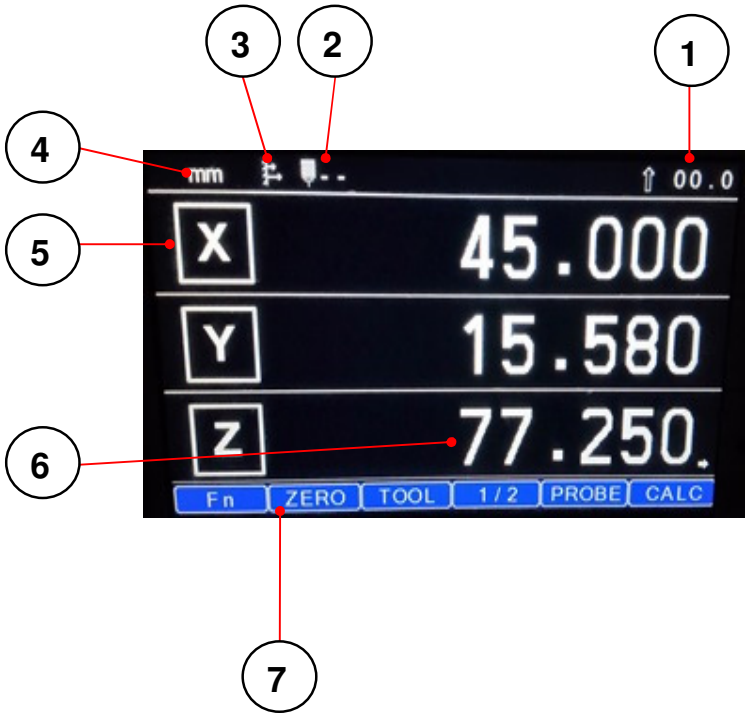
4.7 Power UP

Switch ON the power switch located on the back of the DRO. The DRO will display the power UP message momentarily as shown below

***Owing to continuous Research & Development software version may be different than displayed.**

4.8 Screen Layout

Sample screen of EL750 DRO, Labels description is as below.



Labels	Description
1	Feed rate
2	Tool No.
3	ABS/ Inc mode
4	Inch / MM
5	Axis Label
6	Display Area
7	Soft key notification

5. Setup

The EL750 setup can be accessed by pressing [ ] key followed by SOFT KEY {SETUP}. The SETUP mode screen is as shown below. Press [Enter] or {SEL} key to access the setup.

- Different menus can be navigated using [ ] [ ] keys.
- Options for each field to be selected are displayed at the SOFT Key labels. A particular option can be selected using the SOFT key.

✓ **Note**: In this manual, following notations will be used
  - [name] denotes a dedicated key name
  - {name} denotes a Soft key name

5.1 General Settings:

Sr. no.	User Setup Parameters	Description
1	**Sleep Mode Time (min)**	Defines Sleep Time Interval in minutes (5 to 120).
2	**Key Beep Enable**	To enable or disable keyboard beep ON or OFF.
3	**Zero App. Beep En**	To enable or disable Zero Approach Beep ON or OFF.
4	**Zero App. Tolerance**	This sets a tolerance value for Zero Value in Zero approach modes.
5	**Diagnostics**	This can be used checking the Keyboard, Encoder, Probe, and Display as diagnostic tool.
6	**Select Axis**	This is used for setting axis specific parameters. (Axis parameters are given below in 5.2 & 5.3)
7	**Serial communication**	Enables the user to set the Serial communications parameters.
8	**Recall OEM setting**	Recalling OEM settings will reset all the users settings related to Axis and Auxiliary I/O to Standard OEM setting.
9	**Auxiliary Setup**	This options enables user to configure auxiliary Inputs & Outputs
10	**Machine Model**	User can select Mill or Lathe machine functionality as per application requirement.
11	**Save & Exit**	To save the changes and exit from setup.
12	**Exit without saving**	Exit from setup without saving changes.

5.2 Axis Specific Settings (Linear Type):

1. **Scale Resolution:** This option is available for all axes if configured as linear type. The options available are 0.1 µm, 0.2 µm, 0.5 µm, 1 µm, 2 µm, 5 µm, 10 µm, 20 µm, 50 µm and 100 µm. The default value is **5µm**.

2. **Display Resolution:** Option available for all axis, resolution settings available are 0.1 µm, 0.2 µm, 0.5 µm, 1 µm, 2 µm, **5µm**, 10 µm, 20 µm, 50 µm and 100 µm if the axis is configured as linear type.

3. **Axis Direction:** The counting direction can be set either Left or Right for each individual axis. The default value is **left** direction.

4. **Axis Mode:** The Axis mode can be set either Radius or Diametric for each individual axis. This is valid only if the DRO is configured as Lathe model. In Mill model, all axes are forced to RAD mode.

5. **Machine Reference:** Keep the encoder position near to the desired reference on the encoder.

Procedure:-

1) Press {ENTER} key in “Machine Ref.” in axis settings. “Homing” Message is shown on the screen.
2) Pass the reference mark on the encoder. Here the DRO will reset the axis on the reference mark.
3) Go to the machine reference position and press {SET}.

6. **Zero App. Distance:** Zero Approach Distance is the distance band for zero approach beep which is used to get operators attention when the axis count is within the band. There is also a proportional bar graph display that is shown below the axis display. The default value is “1.000 mm”.

7. **Calibrate Axis:** Axis calibration is required to compensate for errors arising due to wear and tear, encoder misalignment etc. Each axis can be calibrated for Linear Errors or Segmented errors as applicable. The detailed procedure for calibration is explained in section 5.4.

8. **Apply Compensation:** The type of compensation applied to selected axis is programmed here. Three options are possible NONE, LEC and SLEC. The default compensation type is set “NONE”.

9. **Soft Limit Settings**: It is used to indicate end point of machine slide. Soft limit can be turn ON/OFF with desired positive and negative settings**.** The soft limit working on pure absolute value.

10. **Vibration Filter:** In some applications because of vibration or unstable scale the values of the display could become unstable and unreadable. For example in grinding application because of the grinding machine vibration the values of the DRO display can become unstable. It disturbs the user. So this vibration filter function will help the operator to read the position correctly.

5.3 Axis Specific Settings (Angular Type):

1. **Counts per Revolution. (CPR):** This parameter defines the Encoder counts per rotation. Either the operator can enter this value if this is known or there is an automatic calibration process for finding the CPR value. In the automatic process, the user is prompted to pass two reference marks in the same direction. The DRO counts within them, and sets the CPR value. The default value is 4096.

2. **Resolution (Deg.):** This parameter defines the Display resolution in degrees. The default value is **0.1** degrees. The different display resolutions are available based on CPR value.

CPR Value	Resolution available (degrees)
CPR < 3600	0.5
CPR < 7200	0.5, 0.1
CPR < 36000	0.5, 0.1, 0.05
CPR < 72000	0.5, 0.1, 0.05, 0.01
CPR >= 72000	0.5, 0.1, 0.05, 0.01, 0.005

3. **Reference Mode**: This defines which reference mode to select, internal or external. For internal mode, the DRO uses the encoder reference mark for referencing. For external mode, the DRO senses an external input (Input 4) first and then references the DRO on encoder internal reference mark. This mode can be used where sometimes one machine rotation corresponds to more encoder rotations due to gear coupling. The default is set to internal.

✓ **Note:- External Reference is available only for options DRO**

4. **Axis Direction**: This defines the counting direction of the encoder, clockwise (CW) or counter-clockwise (CCW). The default is set to CW.
5. **Count Mode**: Under this parameter there are two options:
   - Rollover: The angle rolls back to zero after 360°.
   - Continuous: The angle continues accumulating after 360°.

   The default is set to Continuous mode.

6. **Machine reference**: There are two types of reference mode, as described In section 5.3.3
   a. Internal reference: -This is similar to that in linear. Only thing the value is set in degrees.
   b. External mode: - The DRO senses an external input first and then references the DRO on encoder internal reference mark.

7. **Display Mode**: The angular axis is configurable for two possible options.
   a. DDMMSS – Degrees: Minutes: Seconds (00.00.00).
   b. DDDEC – Degrees Decimal (0.0000).

The default mode is DDMMSS.

8. **Axis Lock**: Two options are possible for this parameter.
    a. Axis Lock ON
    b. Axis Lock OFF.

Axis Lock ON prevents the operator from axis setting in absolute mode. Only the operator can perform referencing. The default value is Axis Lock OFF.

9. **Zero App. Angle**: This is similar to the Zero Approach distance in linear mode. Only the setting is in angular mode. The default value is 10.00.00.

10. **Zero App. Tolerance**: This is similar to the Zero approach tolerance in linear mode. Only the setting is in angular mode. The default value is 0.00.00.

11. **Vibration Filter:** In some applications because of vibration or unstable scale the values of the display could become unstable and unreadable. For example in grinding application because of the grinding machine vibration the values of the DRO display can become unstable. It disturbs the user. So this vibration filter function will help the operator to read the position correctly.

✓ **Note**

- The changes made in the setup mode should be saved by using “Save and Exit”.
- Note that the options for each Menu item are displayed on the Soft key label. User has to press the correct soft key for required settings.
- In 4 axis mode, use up key {  } to toggle display of Z and U axis in normal counting mode of DRO.

5.4 Error compensation

- **Error compensation should be done only in case job accuracies are not as per expectations.**
- **If job accuracies are acceptable, the error compensation should not be performed.**

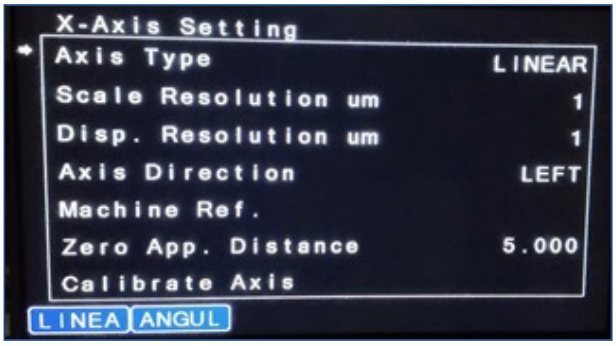
These deviations in job accuracies could be the errors in screw pitch of machine or result of deflection / tilting of axes or encoder installation.
These can be linear or non-linear and can be determined with the help of Standard measuring system or a high accuracy slip gauge / gauge block.

5.4.1 Error compensation for linear Axis

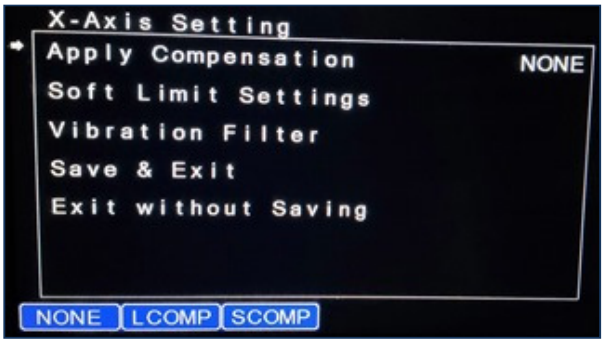
5.4.1.1 Linear Error Compensation (LEC)

Linear error compensation can be applied, if the results of the comparison with a reference standard show a linear deviation over the whole measuring length. In this case the error can be compensated by the calculation of a single correction factor.

Procedure:-
Scroll to “SELECT AXIS” in user setup mode, select the required axis to calibrate using ‘X’, ‘Y’, ‘Z’, ‘U’ soft keys. Following screen will be displayed in axis settings.

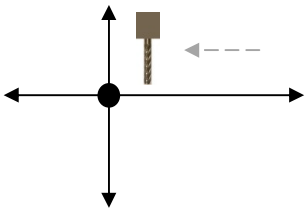


Navigate to Calibration Menu in axis setting

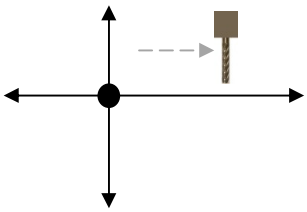


Select Linear Error Compensation {LCOMP} menu.

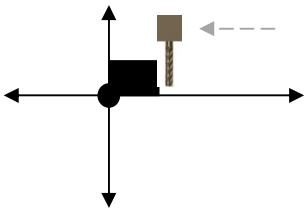
1. Move to the start position.



2. Zero the display value by pressing {RESET}.
3. Move a known distance (use a laser interferometer, slip gauge or standard).

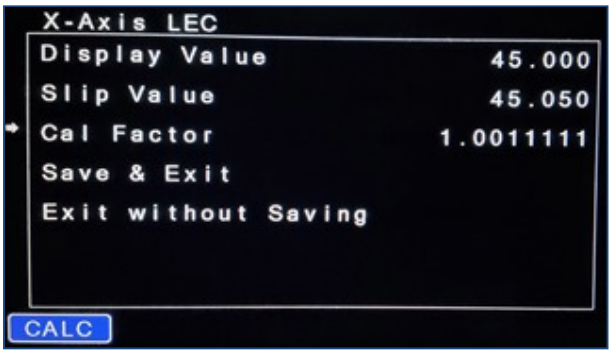


4. Move the axis to touch the slip gauge. Select 'Slip Value' and enter this known distance using the numeric keypad.



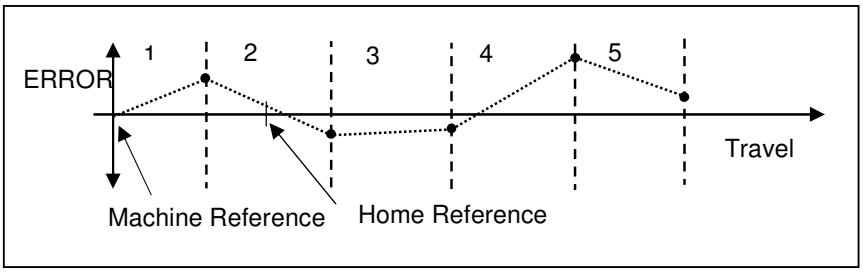
5. Select 'Cal Factor' and press {CALC}.
6. Press ‘Save & Exit’ to save the values.
7. Apply compensation {LCOMP}.
8. Save & exit the menu.

Now the linear error compensation is stored and applied.Following is sample screen shown



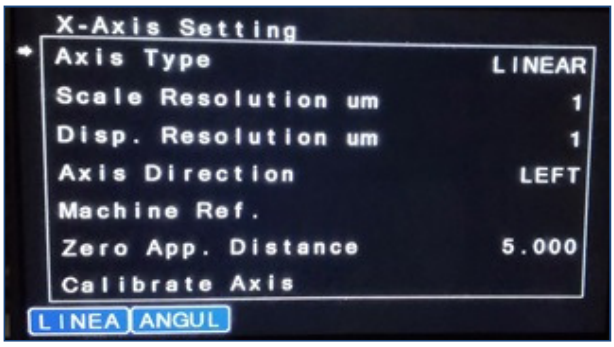
5.4.1.2 Segmented Error Compensation (SLEC)

Segmented Linear Error Compensation (SLEC) is used when the results of the comparison with a reference standard shows non-linear error. In SLEC the entire axis travel is divided into as many as 25 user defined segments. The error in each segment is compensated with a single correction factor. Each correction point is measured with respect to the starting point. This starting point is usually set close to the end of the scale. This starting point can coincide with the absolute datum point.

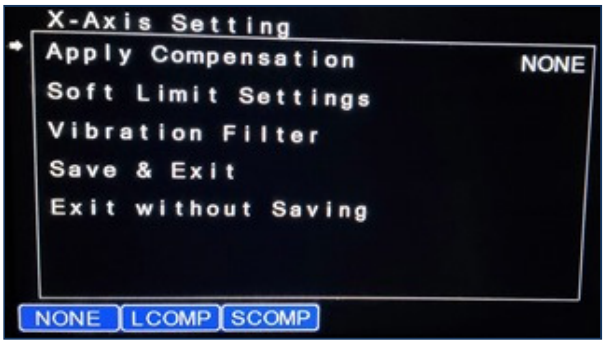


Procedure:-

Scroll to ‘SELECT AXIS’ in user setup mode, select the required axis to calibrate using ‘X’, ‘Y’, ‘Z’, ‘U’ soft keys. Following screen will be displayed in axis settings.



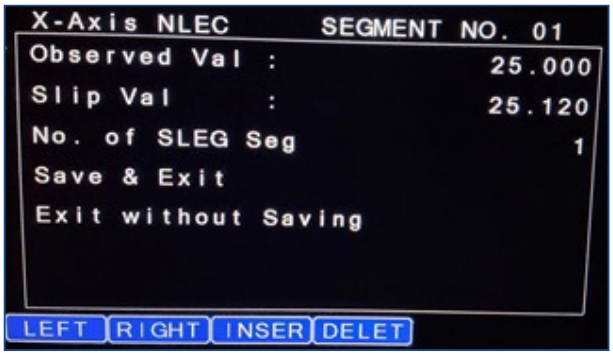
Navigate to Calibration Menu in axis setting



Select Linear Error Compensation {SCOMP} menu.

1. Perform Machine reference in the axis settings. Refer to Section 5.5 and 6.7. After performing machine reference do not set or reset the axis till the complete SLEC calibration is complete.
2. Divide the travel into user defined segments.
3. Enter into standard measurement mode (DRO mode).
4. Note down all the standard values and the observed values for each segment.
5. Enter the setup mode and select {SCOMP} for the respective axis.
6. Start entering the Slip values and observed values one by one.
7. Press {RIGHT} to move to the next segment, Repeat the procedure for each segment.
8. Save & exit the menu.

Now the Nonlinear error compensation is stored and applied.Following is sample screen shown



✓ **Note**

If DRO is in SLEC compensation mode, “M/C Ref” message will appear after Power ON.

5.5 Machine reference

Machine referencing is used when datum is not at the reference mark on encoder but at a fixed distance from reference mark.

Setting the machine reference

Scroll to “Select Axis” in user setup, select axis ‘X.Y, Z, U’ from the soft keys. In axis setting keys Select machine Ref. & follow the steps below.

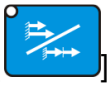
1. Press {ENTER} key when “Machine Ref.” is highlighted.
   The screen displays the message **“homing...”** Move the slider to the reference point on encoder.
   Mark this reference position for future use.
2. Once the reference mark is sensed screen will display **“Set MC Ref.”** Message.
3. Now travel to the desired position on the machine till marked machine reference point is achieved.
4. Press the {SET} key.

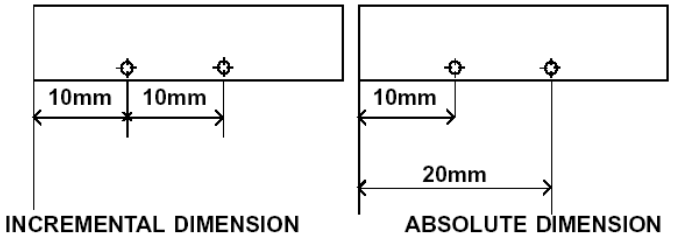
The axis machine reference is now saved in DRO. To use this reference as your absolute zero in operations, you will have to recall machine reference by pressing [] key.

This is very important when you use segmented axis compensation.

6. Primary functions

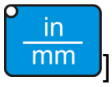
6.1 Absolute / Incremental mode (ABS / INC)

The [] key toggles between the Absolute / Incremental position display.
Absolute mode displays the positions of all axes from a fixed datum.
The Incremental mode displays each position relative to the last position. This is also known as point to point use.
After switching to incremental mode, the user can reset the axis without changing the absolute datum. When switched back to Absolute Mode the original datum is intact.



- ✓ **Note**: At the beginning of each working session, set the datum in Absolute Mode, and then switch the DRO to Incremental Mode. By using the DRO in this way, you can return the machine to its absolute datum at anytime, simply by switching back to Absolute Mode**.**

6.2 Inch Metric Display (In / mm)

The [

] key toggles between the Inch units (in) or the millimeter units (mm).
The unit is displayed at top on left side of the display.

6.3 Axis Set/Reset

This function is used to set the axis with a known value or reset the axis to Zero.

6.3.1 Axis Set: -

This function is used to set the axis with a known value.

Press {SET} key to switch DRO in set mode, Select the axis to set be pressing the []. Enter the numeric value to be set using numeric keypad and press [Enter] to confirm. Incorrect numeric entries can be cancelled one by one using [C] key.

6.3.2 Axis Reset: -

This function is used to Zero the axis.

Press {ZERO} key to switch DRO in reset mode, Press the [] key to be reset.

When axis Set/Reset function is activated in ABS mode, it will redefine the datum of the travel, and then it is not possible to restore the old datum.

6.4 Half Function

This function is used to find the center of a work piece by halving the displayed distance on the selected axis.

Press {1/2} key followed by required axis [] key which will half the value of axis display.

It is recommended to use this function in INC mode. If you press this key in ABS mode, it will change the datum point of the axis.

6.5 Probe Measurement

The probe function {PROBE} allows the operator to set an axis value or measure a work-piece feature. There are different modes of operation for this.
The basic modes of operation are:

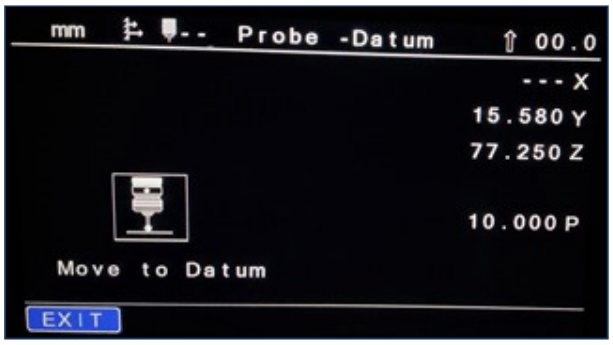
a. Datum Axis {DATUM }
b. Linear Measurement mode {MEAG }
c. Angle Measurement mode {ANG }
d. Diameter Measurement mode {DIA}

- **Datum Axis: This is the most basic operation of the probe. Here an axis can be loaded with a datum position as determined by a probe touch.**

Operation:

a. Press {DATUM} key to enter in axis datum mode.
b. Select the required Axis by pressing [ ] key.
   - Message windows shows [Probe – Datum]
   - Probe message window shows [Move to datum]
   - The axis display shows '---'
c. Move the axis to the desired datum point. When probe is sensed the datum for the selected axis sets at the probe point.
d. The Operator needs to press {EXIT} to go the basic probe window.

Following display will be seen

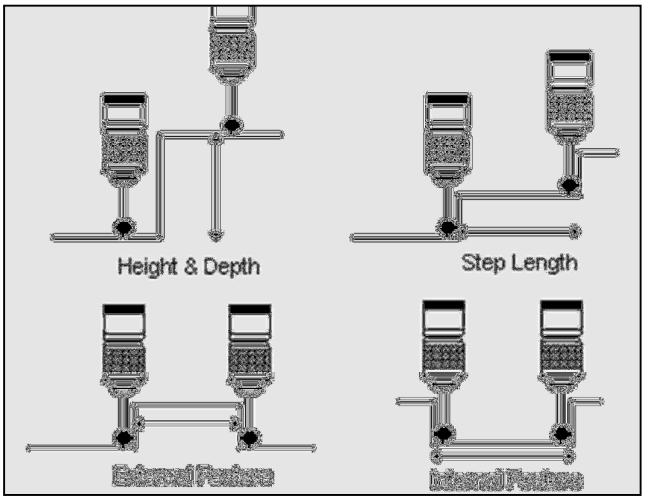


- ✓ **Note**: Whenever Datum or Half function is executed DRO automatically changes from incremental to absolute mode.
- ✓ **Note**: All other axes continue to display as normal. If multiple axes require being datumed then they must be done one at a time using the procedure above.
- ✓ **Note:** If touch probe is used probe event can be captured on contact with the job.

✓ **Note:** If any other type of probe is used then probe event can be captured by pressing [Enter] key when the probe makes contact.

✓ **Note:** Procedures are explained assuming second methods.

➢ **Linear Measurement mode: This is performed using the {MEAG} soft key and can be used for Height and length both inside and outside measurements. Under this mode, there are different options:**



Operation:

- Select Measure mode

  Press {} key to measure height or depth.

  Press {} key to measure step length.

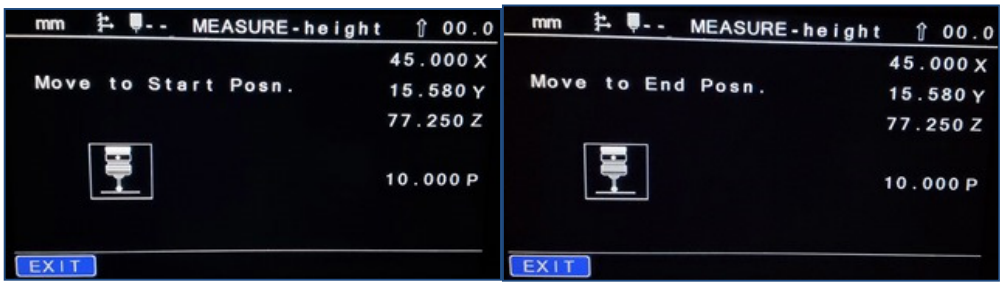
  Press {} key to measure external feature.

  Press {} key to measure internal feature.

- Select the required Axis by pressing relevant {} key.
- Move to start position and touch.
- Move to end position and touch.
- As per the measurement option, the results are shown.
- Press {EXIT} key to return back to probe function menu.

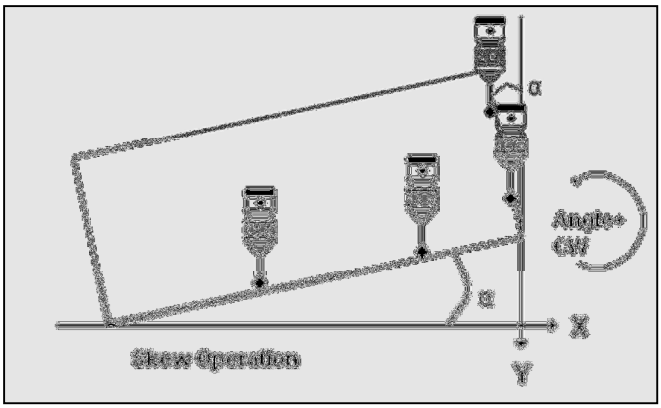
✓ **Note**: This operation functions in both Incremental and Absolute modes depending on the DRO operating status.

Sample Screens of Height & depth measurement



➢ **Angle Measurement mode: This function can be used to measure angles on the work-piece. It can also be used to calculate work-piece skew angles. Under this, there are different options:**

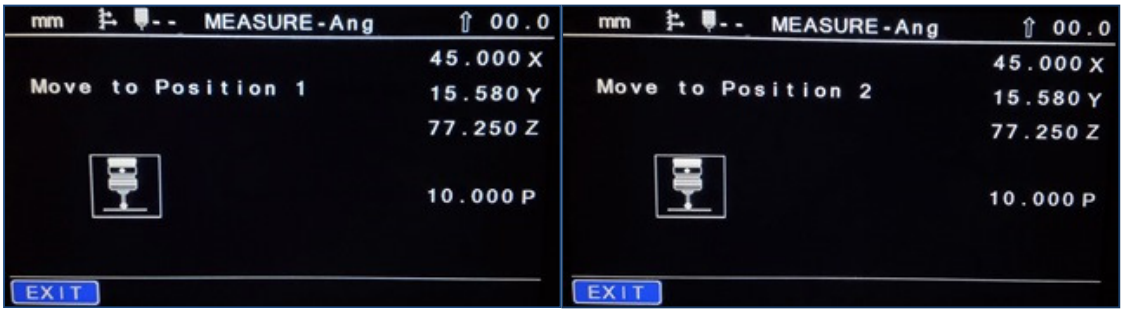
➢ Skew Operation:



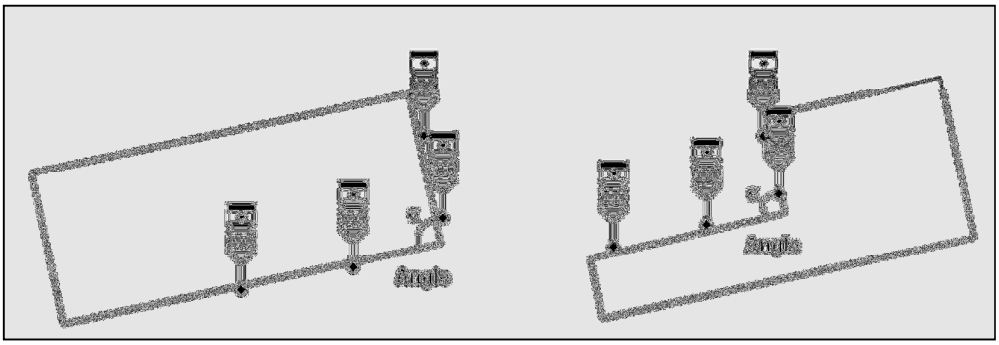
- Press {ANG} key.
- Select {0} key.
- The probe display shows 'Move to Position 1'.
- Move to the starting position and press [Enter]
- The probe display shows 'Move to Position 2'.
- Move to the next position and press [Enter]
- The probe display shows 'Move to Position 3'
- Move to the next position and press [Enter]
- The probe display shows 'Move to Position 4'
- Move to the next position and press [Enter]

- Skew Angle of the work-piece with respect to the selected axis is displayed on the screen

Sample Screens of Angle measurement



➢ Corner Angle Operation:



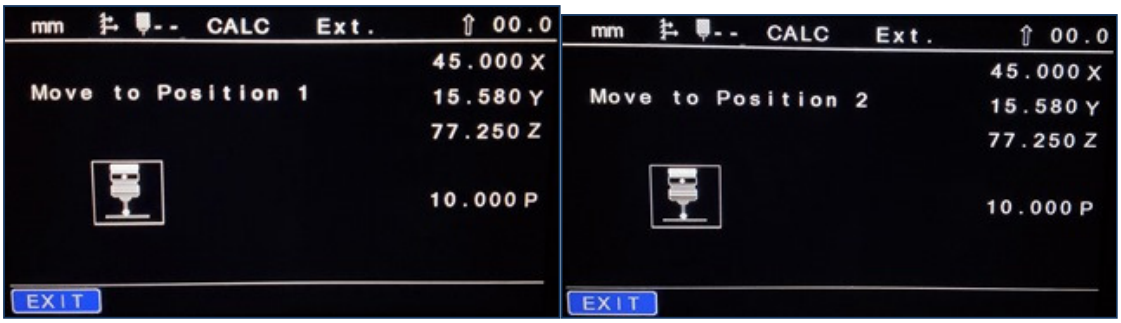
- Press { ANG } key.
- Select { } key.
- Select the required axis key.
- Move to start position press [Enter].The DRO beeps.
- Move to new position press [Enter]. The DRO beeps.
- The result is displayed on the screen.

- **Diameter Measurement mode: This function allows for the diameter of a circular feature to be calculated from three points. Under this there are different measurement options.**
  - Internal Diameter Measurement.
  - External Diameter Measurement.

For both the measurement modes use following sequence:

- Press {DIA} key to enter in diameter measurement mode.
- Select mode of operation {INT ⌀ , EXT ⌀}
- The probe display shows 'Move to Position 1'.
- Move to the starting position and press [Enter]
- The probe display shows 'Move to Position 2'.
- Move to the next position and press [Enter]
- The probe display shows 'Move to Position 3'
- Move to the next position and press [Enter]
- The result is displayed after probing the third point.

Sample Screens of Diameter measurement



✓ **Note**: For every probe function, after displaying the results, two more soft keys are enabled:

- Repeat Soft Key {AGAIN}: This key can be used to execute the current function again from the beginning.
- Center Soft Key
  - {CENT.}:- center key in diameter mode
  - {1/2}:- Linear measurement.

✓ **Note: - This key can be used to set the center of the measurement as an origin. This forces the DRO in the Incremental mode, and sets the center as origin in Incremental mode.**

6.6 Calculator

Calculator function enables the operator to do Basic/Trigonometric calculations. Following screen is displayed when { } is pressed in Normal mode of operation. As shown in the above screen, the big square on the LCD contains all the results and the small rectangle is for the present number entry. The results are displayed when [Enter] key is pressed. This result can be loaded to any axis by pressing the respective axis keys.

We can perform following functions on calculator

a. Addition
b. Subtraction
c. Multiplication
d. Division
e. Percentage
f. Inverse
g. Modular division
h. Trigonometric function (sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$)

✓ **Note: - Maximum 9 characters are allowed excluding sign. "Over range" message will appear on exceeding the limit.**

6.7 Setting Reference

This function allows user to set a machine zero point. With this machine zero point users can restore the work coordinates even if the machine is moved when the DRO is in OFF condition. Generally each encoder has reference marks present at every specified interval. One of these reference marks is used to recall the same datum point every time.

This function works only in ABS mode. It will not be executed in INC mode.

6.7.1 Homing reference

In this function, the Datum is set at the reference mark on the encoder. Follow the procedure for the homing reference.

1. Press [] key.
2. The soft key menu displays {HOME}, {M/C} and {ST-RF}.
3. Press {HOME} The Information Bar message window displays “SELECT AXIS”
4. Axis will display ‘Homing....’ Message. Move the slider to the reference point
5. After crossing reference mark DRO will start counting. Your reference is now set.

✓ **Note:** It is highly recommended to mark an indicator on the encoder so as to use the same reference mark while finding the datum point.

6.7.2 Recalling machine reference

In this function, the Machine reference is recalled as set in the user setup. Follow the procedure for the Machine reference.

1. Press [] key.
2. The soft key menu displays {HOME} and {M/C}.
3. Select {M/C}. The Information Bar message window displays ‘SELECT AXIS’
4. Press the required axis [] key. The selected axis displays 'M/C REF.'.
5. Move the axis to the reference point on encoder which was used for setting machine reference.
6. Now the DRO will display the ‘distance to go’ for machine reference position.
7. Now if you will move the slide to make the DRO reading zero, you will achieve the machine reference position.

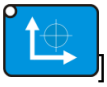
6.7.3 Setting the machine reference

1. Press {ST-RF} key to set machine reference

The screen displays the message **“homing...”** Move the slider to the reference point on encoder.

Mark this reference position for future use.

2. Once the reference mark is sensed screen will display “Set MC Ref.” Message.
3. Now travel to the desired position on the machine till marked machine reference point is achieved.
4. Press the {SET} key.

The axis machine reference is now saved in DRO. To use this reference as your absolute zero in operations, you will have to recall machine reference by pressing [] key.
This is very important when you use segmented axis compensation.

7. Secondary Functions

7.1 Preset

The Preset function provides a simple mechanism for stepping through repeat positions using the work-to-zero principle. Press [0] key to enter this mode. It also takes into account positioning errors for repeated points. The first time that you enter the function, the previous move error is set to zero. In this way pressing only {RECAL} recalls any previous axis preset value.

Axis preset values are not maintained after a power cycle. The setting of the axis preset value does take into account the error of any previous move. The value that you enter is the step move value.

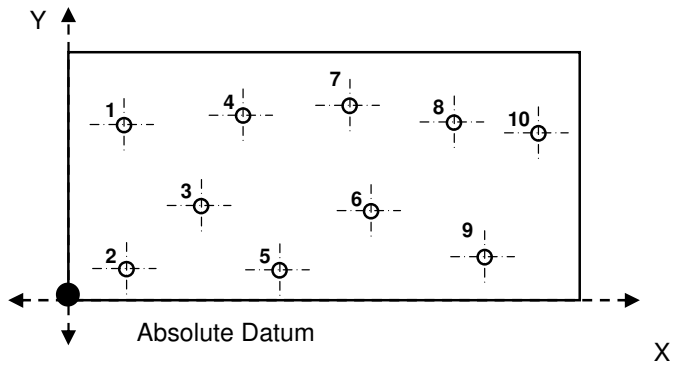
Pressing {RECAL} again recalls the axis preset value and takes into account the error of any previous movement. Pressing {RECAL} after a power cycle results in a zero value.

The value of the axis Preset value that you enter is maintained until power-off. In this way pressing after returning to the Preset function after exiting it previously, recalls the previous axis-preset, without error adjustment as the error is set to zero on initial entry.

The values displayed do not affect the axis positions and the axis datum is restored when you exit the Preset mode function.

7.2 Sub Datum Memory (SDM)

This function allows the DRO to store upto 1000 sub datum points. Each Sub-Datum stores coordinates for all 3 axes (X, Y, and Z). In operation, the datum of the machine is replaced by each Sub-Datum in turn, allowing the operator to work to zero for each Sub-Datum instead of having to constantly refer to printed list of coordinates. SDM no. is displayed on the main screen during working in this function

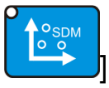


Sub-Datums are different machining steps that you may need. In operation, the absolute datum of the machine is replaced by each Sub-Datum in turn, so you can work to zero for each step instead of having to constantly refer to a printed list of coordinates.

Using this function, you can create as many as 50 jobs each containing up to 20Sub-Datum. Here, a job is a group of Sub-Datums for a particular job. Each job labeled with “SDM-JOB” which is stored in the permanent memory. Example: if at top side “SDM-JOB 2/7”, display means there are total 7 SDM job present and out of which 2 is currently selected.

There are three options under SDMs.

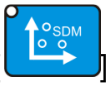
Creating a job

1. Press [].
2. From the Sub-Datum selection screen press {NEW}. This opens a new Sub-Datum job.
3. Press {OPEN} to edit current SDM job.
4. You can either enter the axis co-ordinates using the axis load or move the axes to the required position.
   To use axis load:
   Press the [] key to load. Enter the coordinate value using numeric keypad and then press [].
5. Press {NEXT} key to save the coordinates and move to the next step.
   The information bar shows the current step / total of saved steps.
6. If you make a mistake or decided to remove any point, go to that point and press {DELET} key.
7. Once you have entered all the Sub-Datum points, press {EXIT} twice. The job is automatically named ‘SDM-JOB’ and then press {SAVE}.

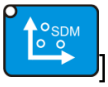
Editing a job

Occasionally, you may need to edit a Sub-Datum job as specifications change.

Adding or deleting steps from a sub datum

1. When in normal mode, press []. A list of existing jobs is displayed. The numbers on the right indicate the number of Sub-Datum for each job.
2. Select the SDM job to be edit using [] [] keys.
3. Press {OPEN} key. The information bars shows 'SDM'. It also shows (current step) / (total number of steps). The Sub-Datum number and name are displayed.
4. Use [] [] keys to go to required step.
5. Use {NEXT} key to add a step.
6. Use {DELET} to delete a step.
7. To exit Sub-Datum edit mode, press {EXIT} twice.

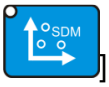
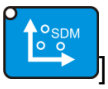
Editing sub datum coordinates

1. When in normal mode, press []. A list of existing jobs is displayed. The numbers on the right indicate the number of Sub-Datum for each job.
2. Use the [] [] navigation to select a job.
3. Press {OPEN} key. The information bar shows 'SDM'. It also shows (current step) / (total number of steps).
4. Use {NEXT} to go to the next step. Use to back up a step.
5. You can either enter the axis coordinates using axis load or move the axis to the required position.

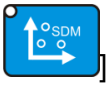
   To use axis load, Press the [] key to load. Enter the coordinate value using numeric keypad and then press [Enter].
6. To exit Sub-Datum from graphical mode, press {EXIT} twice.

Any changes that you make are automatically saved.

Using sub datums

1. When in normal mode, press []. A list of existing jobs is displayed. The numbers on the right indicate that number of Sub-Datums for each job.
2. Use the [] [] navigation keys to select a job.
3. Press {OPEN} key. The information bar shows ‘SDM’. It also shows (current step) / (total number of steps).
4. If you prefer to use Sub-Datum in normal display mode instead of graphical mode. Press {SDMON}. While in normal display mode, you can move from point to point using the [] [] navigation keys. The EL750displays 'SDM - (Current Step) / (total steps)' below axis display in the lower left hand corner. Press [] to return to graphical mode.
5. Move each axis until it reaches zero. Perform the machining step.
6. Use the [] key to go to the next step. To back up a step, press []. To exit Sub-Datum from graphical mode, press {EXIT } key twice.

Deleting a job:

1. When in normal mode, press []. A list of existing jobs is displayed. The numbers on the right indicate that number of Sub-Datums for each job.
2. Use the [] [] navigation keys to select last a job and press {DELET } key.

3. Conform delete operation by pressing { YES } key.

Note: In 4 axis mode, During SDM run use Numeric key-7 { 7 } to toggle between Z & U axis on DRO screen.

7.3 Soft Limit Settings:

Soft limit function is provided to indicate end points of the machine slide.

Soft limit always working on pure absolute reading coming from the encoder.

Positive and negative limit can be set different for each axis. Soft limit enable and disable option is used to set warning indication ON/OFF. The **25mm** tolerance need to be consider while setting positive and negative limit

Scroll to "Select Axis" in user setup, select axis 'X, Y, Z, U' from the soft keys. In axis settings keys Select Soft Limit Settings & follow the steps below.

1. Press { EDIT } key when "Soft Limit Settings" is highlighted.
   The screen displays the soft limit setting menu, which consist of five menus:
   i) Soft Limit Function – It is use to enable or disable soft limit function
   ii) Positive Limit – It is use to edit positive limit of machine slide
   iii) Negative Limit – It is use to edit negative limit of machine slide
   iv) Save & Exit – It is use to save the settings
   v) Exit without saving- It is use to exit menu without saving

When soft limit function is enabled and machine slide reached near soft limit position then "AXIS LIMIT" message display on particular axis.
After reaching soft limit indication move machine slide within defined range and press Enter key to return the DRO to normal counting mode.

7.4 Vibration Filter (Digital Filter):

In some applications because of vibration or unstable scale the values of the display could become unstable and unreadable. For example in Milling/grinding application because of the grinding machine vibration the values of the DRO display can become unstable. It disturbs the user. So this vibration filter function will help the operator to read the position correctly. This vibration filter will never add any position error
Vibration filter level can be set to 0 to 20 level, use level 0 for disable vibration filter operation, whereas non-zero value sets vibration filter level. The level can be selected as

per requirement. Select Level 1 and check the display stability. Go on increasing the filter level till you get stable display readings.
To change the vibration filter level, the procedure is as follows:

Scroll to “Select Axis” in user setup, select axis ‘X.Y, Z, U’ from the soft keys. In axis settings keys Vibration Filter & follow the steps below.

2. Press {EDIT} key when “Vibration Filter” is highlighted.
   The screen displays the Vibration Filter menu, which consist of four menus:

   i) Vibration Filter – It is use to enable or disable Vibration Filter

   ii) Vibration Filter Val – It is use to edit the value ranging from 1 to 20

   iii) Save & Exit – It is use to save the settings

   iv) Exit without saving- It is use to exit menu without saving

Note: Vibration filter function is also available for Mill & Lathe machine model.

7.5 Feed rate display:

In some application it is necessary to monitor feed rate of particular axis to ensure proper operation. Feed rate display in top right corner of DRO counting screen as shown:

Axis Feed rate

To display feed rate of desired axis follow procedure:

1. Press {Fn} key.
2. Use the [ ] [ ] navigation keys to select “Select Feedrate Axis” menu.
3. select axis ‘X,Y, Z, U’ from the soft keys
4. Press {EXIT} key.

After selection of desired axis, only selected axis feed rate display at top right corner of DRO screen. If feed rate selected with “None” option then only currently moving axis feed rate display on screen.

8. Machine Specific Functions

8.1 Milling Machine Specific Functions:-

If the DRO is of Mill type, following functions are available on {Fn} key:

- Bolt Hole (Circular, Arc & Custom)
- Line Hole
- Grid
- Frame
- Arc Contouring
- R-Function
- Pocket
- Slot
- Polar Coordinates
- Axis Summing [Only for 4 axis DRO]
- Zero approach
- Shrinkage factor
- Select Feed rate Axis

Below function is available on Tool offset function, Press {TOOL} and {ON}key.

- Tools

All these functions have following soft keys

Sr .No	Soft Keys	Function
1	New NEW	Shows the parameter list for the selected function.
2	Exit EXIT	Exits from the Function List.

8.1.1 Circular Bolt Hole Function (PCD)

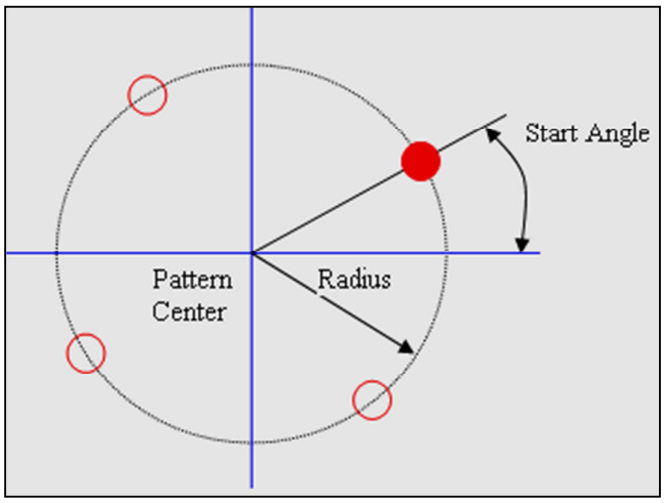
This function is used to calculate the locations of Holes in a circular pattern. This is also known as Pitch Circle Diameter (PCD). The following Parameters are required:

- Co-ord. 1 of center.
- Co-ord. 2 of center.
- Circle radius
- Starting Angle
- No. of Holes(0 - 30)
- Depth
- Select Plane (X-Y, Y-Z, X-Z)

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.

This opens counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. We can jump to particular number of hole by pressing {JUMP} key. Press {EXIT} key to exit this function.

8.1.2 Arc Bolt Hole Function

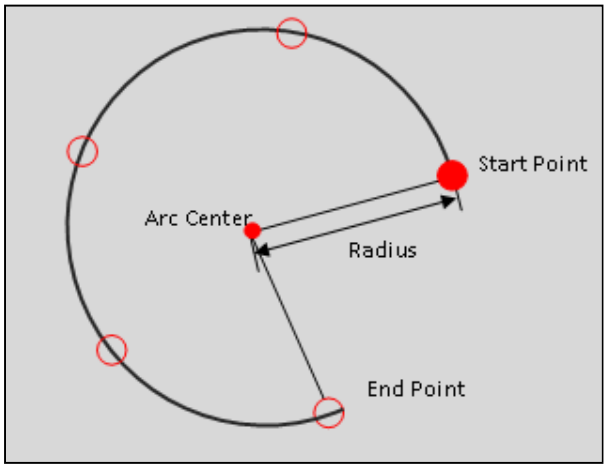
Arc Bolt Hole function is very similar to Circular Bolt Hole function, except in arc hole function user can enter the starting and ending angle of an arc. This angle is always with respect to positive X-axis and is calculated in anti-clockwise direction. The following Parameters are required:

- Co-ord. 1 of center.
- Co-ord. 2 of center.
- Arc radius
- Starting Angle
- End Angle
- No. of Holes(0 - 99)
- Depth
- Select Plane (X-Y, Y-Z, X-Z)

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.

This opens a counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. We can jump to particular number of hole by pressing {JUMP} key. Press {EXIT } key to exit this function.

8.1.3 Custom Bolt Hole

A Custom Bolt Hole feature has been added to EL750 Bolt Hole function. Unlike Bolt Hole Circle where each holes are separated by equal angle and angle is calculated automatically based on number of Holes, in Custom Holt Hole user can define angle for each Hole (Up to 30 such holes). This gives great flexibility where Bolt Holes are spaced non-linearly.

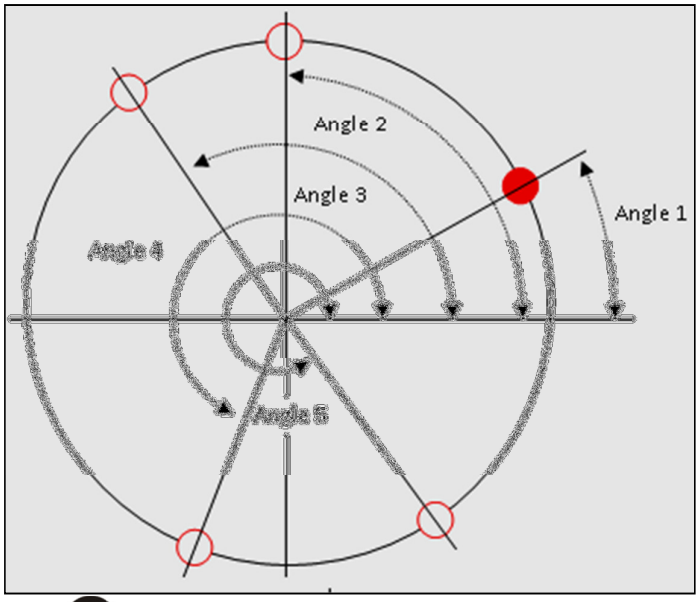
Following Parameters are required:

- Co-ord. 1 of center.
- Co-ord. 2 of center.
- Circle radius
- No. of Holes(0 - 30)
- Bolt Holes Angles
- Depth
- Select Plane (X-Y, Y-Z, X-Z)

- To Enter Bolt Hole Angles Scroll down to “Bolt Hole angles” menu, and press [Enter] key to edit the angles for each hole.
- Enter the angles for each hole. Press {SAVE} key.

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. We can jump to particular number of hole by pressing {JUMP} key. Press {EXIT } key to exit this function.

8.1.4 Line Hole

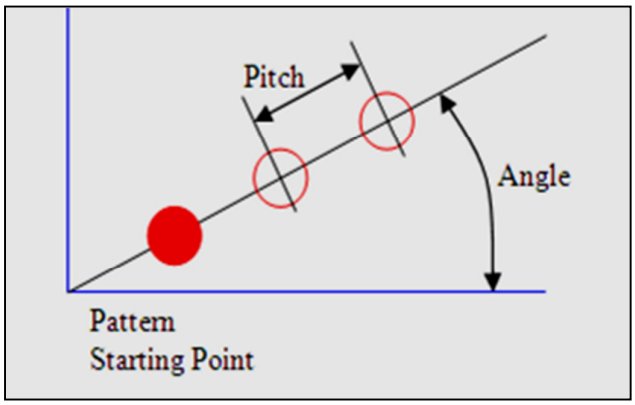
This function is used to calculate the locations of Holes in a linear pattern. It is also known as Linear Bolt Hole. The following Parameters are required:

- Co-ord. 1 of center.
- Co-ord. 2 of center.
- Pitch Distance.
- Angle.
- No. of Holes. (0 - 99)
- Depth.
- Sel. Plane (X-Y, X-Z or Y-Z).

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.

This opens a counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. We can jump to particular number of hole by pressing {JUMP} key. Press {EXIT} key to exit this function.

8.1.5 Grid

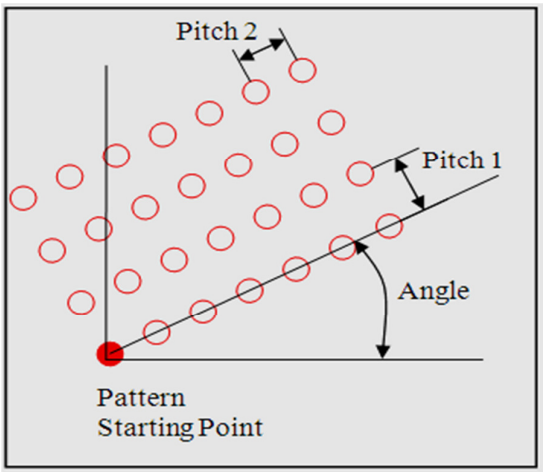
This function is used to calculate the location of holes in Grid pattern. The following parameters are required for this function:

- Start Co-ord. 1
- Start Co-ord. 2
- Angle.
- Pitch Distance in Axis '1'.
- Pitch Distance in Axis '2'
- No. of Holes in Axis '1'. (Max. 99)
- No. of Holes in Axis '2'. (Max. 99)
- Depth of the Hole.
- Sel. Plane (X-Y, X-Z or Y-Z).

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.

This opens a counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. We can jump to particular number of hole by pressing {JUMP} key. Press {EXIT} key to exit this function.

8.1.6 Frame: -

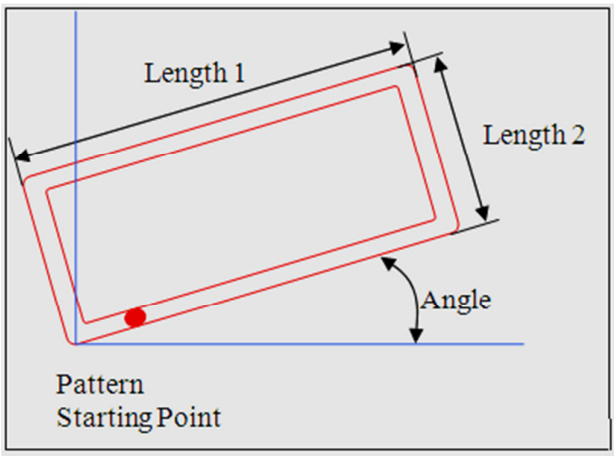
This function is used to calculate the locations of points along the line of a Rectangle. This will enable the operator to mill a rectangular Frame. The following parameters are required for this function:

- Start Co-ord. 1
- Start Co-ord. 2
- Angle.
- Pitch Distance in Axis '1'.
- Pitch Distance in Axis '2'
- Tool Diameter
- Maximum Cut
- Machined To
- Depth
- Sel. Plane. (X-Y, X-Z or Y-Z).

Above parameters are explained in below image.

When you have entered the above then press {RUN} key for executing function.

This opens a counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. Press {EXIT} key to exit this function.

8.1.7 Arc Contouring: -

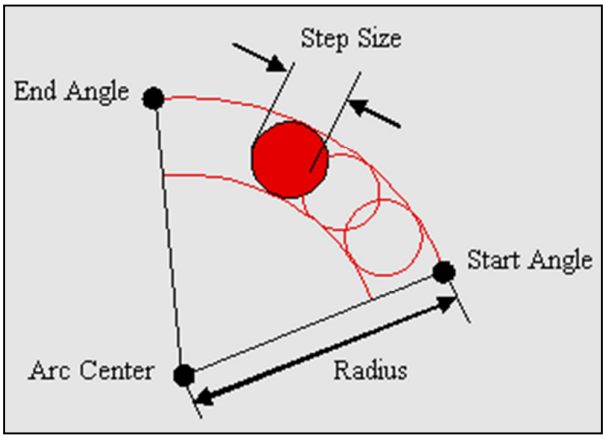
This function is used to calculate the location of points along the line of the ARC. The following parameters are required for this function:

- Co-ord. 1 of center.
- Co-ord. 2 of center.
- Radius
- Starting Angle.
- End Angle
- Maximum cut
- Tool Diameter
- Machined To
- Sel. Plane (X-Y, X-Z or Y-Z).

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.

This opens a counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. Press {EXIT} key to exit this function.

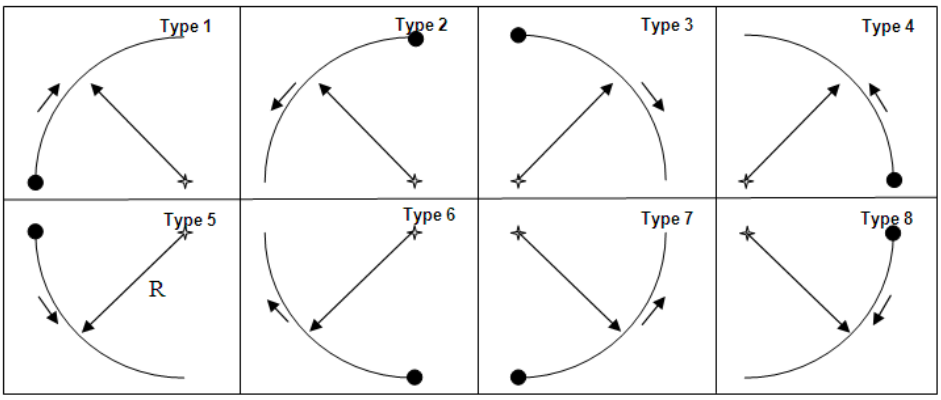
8.1.8 R- Function

The R-Functions is basically a pre defined ARC function. The following Parameters are required:

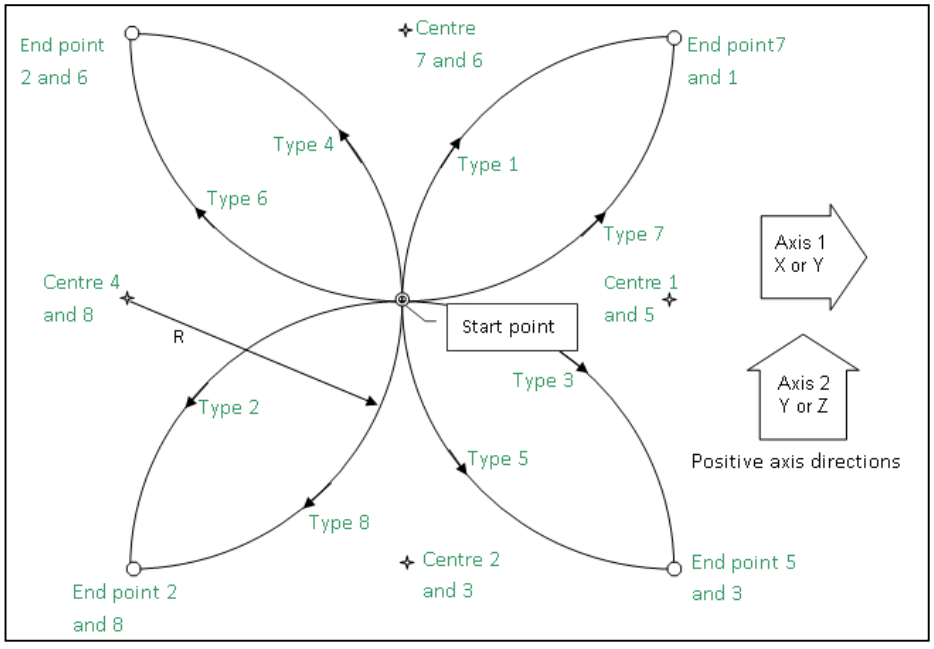
- Arc Type.
- Radius
- Tool Diameter
- Maximum cut
- Machined To
- Depth
- Sel. Plane (X-Y, X-Z or Y-Z).

Above parameters are explained in below image.

There are 8 types of arc as below:



This function assumes the current tool position as the start point for all the ARC type. Depending on the ARC type it decides the other parameters of ARC. The following diagram describes the 8 ARC types:



When you have entered the above parameters then press {RUN} key for executing function.

You can use [] and [] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. Press {EXIT} key to exit this function.

8.1.9 Pocket: -

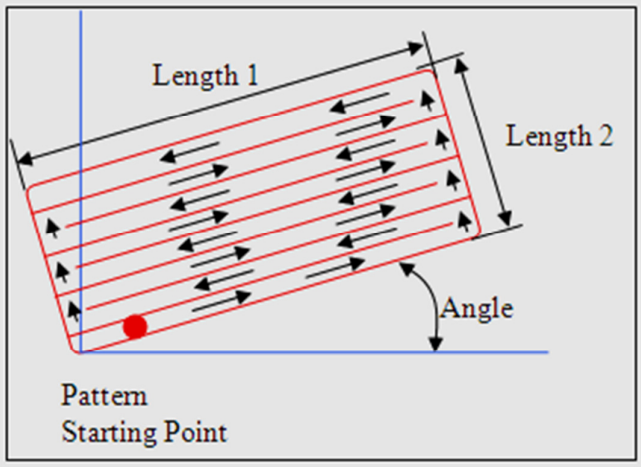
This function is similar to Frame function, only the middle portion of the Frame is also milled. The following parameters are required for this function:

- Start Co-ord. 1
- Start Co-ord. 2
- Angle.
- Side 1 Length.
- Side 2 Length.
- Tool Diameter
- Maximum Cut
- Machined To
- Depth
- Sel. Plane. (X-Y, X-Z or Y-Z).

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.

This opens counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. Press {EXIT} key to exit this function.

8.1.10 Slot

Slotting is a simple milling function similar to the Arc functions only in a straight line. The following parameters are required for this function:

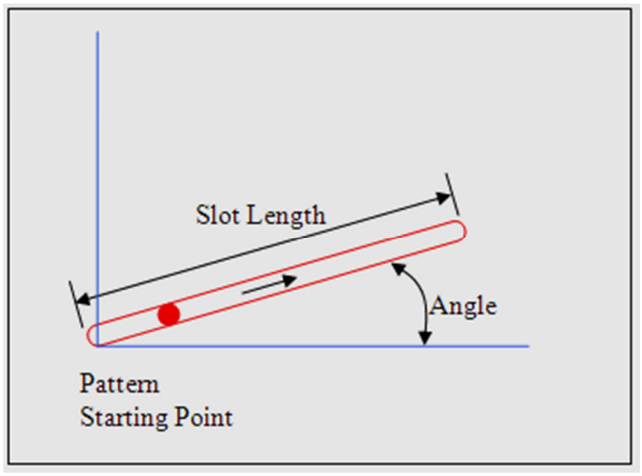
- Start Co-ord. 1
- Start Co-ord. 2

- Angle.
- Slot Length.
- Tool Diameter
- Maximum Cut
- Depth
- Sel. Plane. (X-Y, X-Z or Y-Z).

Above parameters are explained in below image.

When you have entered the above parameters then press {RUN} key for executing function.

This opens a counting mode for showing the arrangement of the holes.



You can use [ ] and [ ] keys to move around the holes. You can edit the saved parameter by entering in edit menu by pressing {OPEN} key. Press {EXIT} key to exit this function.

- ✓ **NOTE: -** For All the functions Co-ord1 refers to the first axis coordinate and Co-ord2 refers to second axis coordinate in the selected plane. Axis 1 refers to first axis and Axis 2 refers to second axis in selected plane.

8.1.11 Polar Coordinates

This function will convert the position of the two selected axes in to Polar coordinates. To activate this function, first select the plane (X-Y or X-Z or Y-Z) and then press {RUN} key. Press{EXIT} is used to exit from polar function.

8.1.12 Axis Summing

The summing is to allow for the position of the Mill table relative to the Tool to be shown for machines fitted with both a Knee (U) and Quill (Z) axis-scale. Essentially the axes are added to form a single compound axes S. This option is only visible in case of a 4 axis DRO. Following options are available for this mode:

To access Mill functions go to {Fn} scroll to “summing” option.

- {ON} Turns this mode ON. This will switch the DRO to 3 Axes display and the third axis will show addition of ‘Z’ axis and ‘U’ axis.
- {OFF} Turns this mode OFF. This switches the DRO back to the 4 Axes display.
- { } Applies the selected option and exits from the function list.

8.1.13 Zero Approach

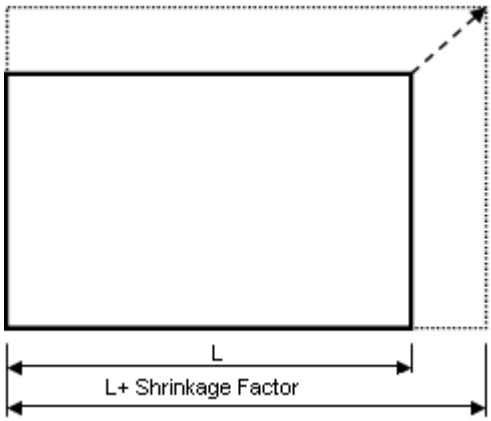
This function Enables or Disable the zero approach beep sound while performing the machine functions. Select {ON} to turns this mode ON. Or select {OFF} to turns this mode OFF.

8.1.14 Shrinkage Factor

This function is useful when manufacturing moulds/ Dies. While designing/manufacturing the moulds the material shrinkage has to be considered. EL750 has a facility to enter this shrinkage factor. Once this function is enabled the axis readings are multiplied by this factor to compensate the material Shrinkage.

Follow the steps to apply shrinkage factor.

- Navigate to Shrinkage Factor in Mill functions
- Select { SET } to enter shrinkage factor value using keypad.
- Select { YES , NO } to apply the shrinkage factor.
- Press [Enter] to save the changes.



8.1.15 Tools

Mill mode

In Mill mode, you use this function to program the different tool parameters, such as Diameter, Length. These parameters can then be referred to in different machining functions, such as Arc contouring and Grid.

When you press {TOOL}, the DRO shows the list of previously saved tools. It has the following soft keys:

- {NEW} creates a new tool setup. Maximum 99 new tools can be created. The Data Entry screen is displayed so you can enter a tool name. A maximum of 16 characters is allowed for a tool name.
- {ON} Applies the selected tool. The information stored under that tool can then be used by the other functions. When you apply a specific tool, its tool number is displayed on the main screen, for example "TOOL-".This number also appears next to the tool name and tool number display at top side. TOOL 2/5 means total 5 tool are present and 2 is currently selected tool.
- {OFF} Exits from the tool list to the main screen.
- {DELET} Deletes the selected tool from the list. You are prompted to confirm this before the tool is deleted. By using this last tool will be deleted.
- {OPEN} Edits the tool parameters under the selected tool.

Creating a new tool

- Press {NEW} key to create a new tool with "TOOL" label.
- Select the parameter that you want to set using the [ ] [ ] navigation keys.
- Enter the required value using the numeric keys and press {SAVE} key.
- Press {ON} key to apply the parameters of this new tool and save the tool settings against the tool name.

Editing a tool

Here you can edit an existing tool or view its settings.

- Press {OPEN} key to open the saved tool. Enter the desired parameter values.
- Select the parameter that you want to set using the [ ] [ ] navigation keys.
- Enter the required value using the numeric keys and press {SAVE} key.

- Press { ON } key to apply the parameters of this tool and save the tool settings against the tool name.

8.2 Lathe Machine Specific Functions:-

The following functions are available on { Fn } when you select Lathe Machine:

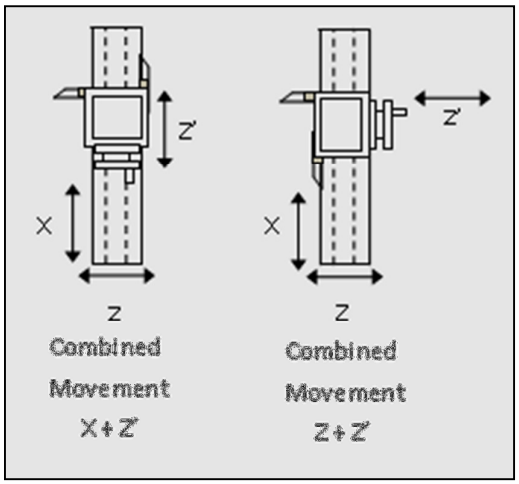
- Summing [Available for 3 axis DRO Only]
- Vectoring [Available for 3 axis DRO Only]
- Taper
- Zero Approach(Refer section 8.1.12 From Mill Functions)
- Shrinkage Factor (Refer section 8.1.14 From Mill Functions)

Below function is available on Tool offset function, Press { TOOL } key and { ON } key .

- Tools

8.2.1 Summing

Axes Summing function is used to display combined movement of either X – Z' axes pair or Z – Z' axes pair. The summing axis pair can be displayed either on X axis or Z axis. Summing pair axis configuration setting is available in { Fn } menu.



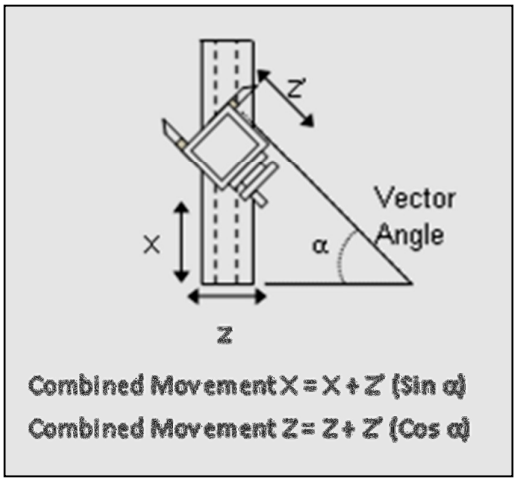
To access Lathe functions go to { Fn } scroll to "summing" press { ENTER } key.

- This will show selection of axis
- { X+Z' } You can select this option for the X-axis.
- { Z+Z' } You can select this option for the Z-axis.
- { EXIT } Exits to the main screen without saving the changes.

When you set a particular axis to sum mode, its axis legend changes to 'S' and the summing pair is shown below the axis legend.

8.2.2 Vectoring

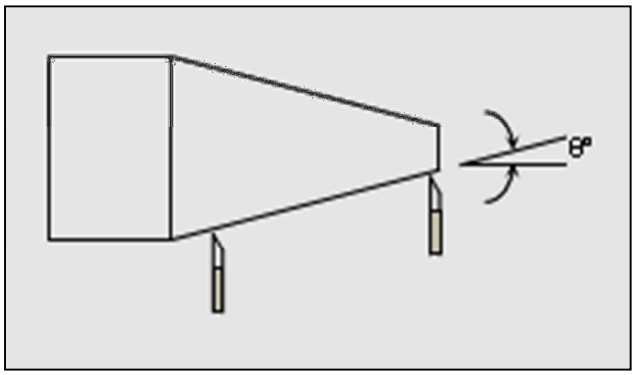
Vectoring function is used for displaying combined movement of either X – Z' axis pair or Z – Z' axis pair taking into consideration angle between Z and Z' i.e. α. The resulting combined movement is displayed on X and Z axis.



- {ON} Turns the function on. When you apply the function, "Vect" is shown below the axis legends to show the vectoring angle. The DRO switches back to normal counting mode and the X and Z axes show the combined vectored position. You can perform other functions on these new vectored positions.
- {OFF} Turns the function off.
- {<θ} Changes the vector angle if required.
- {ENTER} Sets the changes done and exits to the main screen.
- {EXIT} Exits from the vector angle screen to the functions list.
- {EXIT} Exits from the function list to the main screen.

8.2.3 Taper

Taper function allows user to calculate taper of the job. Measurements carried out in Taper function are Radius of taper and Angle θ° of taper. Taper on axis setting is available in DRO setup menu. This will select where to display taper angle.



Following soft keys are available:

- {ENTER} This key can be used to start the Taper function. The operator can select the datum by pressing {DATUM} key. The display shows taper distance (R) and taper angle (θ) with reference to the selected datum position.
- {OFF} Exits from the function list to the main screen.

8.2.4 Tools

Lathe mode

In Lathe mode, you use this function to program the different tool parameters, such as Diameter, Length.These parameters can then be referred to in different machining functions, such as Arc contouring and Grid.

When you press {TOOL} key, the DRO shows the list of previously saved tools. It has the following soft keys:

- {NEW} creates a new tool setup. Maximum 99 new tools can be created. The Data Entry screen is displayed so you can enter a tool name. A maximum of 16 characters is allowed for a tool name.
- {ON} Applies the selected tool. The information stored under that tool can then be used by the other functions. When you apply a specific tool, its tool number is displayed on the main screen, for example T01.This number also appears next to the tool name.
- {OFF} Exits from the tool list to the main screen.
- {DELET} Deletes the selected tool from the list. You are prompted to confirm this before the tool is deleted. By using this last tool will be deleted.

- {OPEN} Edits the tool parameters under the selected tool.

Creating a new tool

- Press {NEW} key to create a new empty tool.
- Select the parameter that you want to set using the [] [] navigation keys.
- Enter the required value using the numeric keys,
- Press {SAVE} key to apply the parameters of this new tool and save the tool settings against the tool name.

Editing a tool

Here you can edit an existing tool or view its settings.

- Press {OPEN} key to open the saved tool. Enter the desired parameter values.
- Select the parameter that you want to set using the [] [] navigation keys.
- Enter the required value using the numeric keys,
- Press {ON} key to apply the parameters of this tool and save the tool settings against the tool name.

9. Auxiliary Functions

9.1 Input

We can configure 6 inputs. Each input can be configured as probe input or any key input. Default option is OFF.

To configure inputs Scroll to “Auxiliary settings” in User setup. Select {INPUT} from soft key. Configure the input as Probe input by selecting the {PROBE} key, or Set any key from the keypad by selecting {SEL} key, or press {OFF} key.

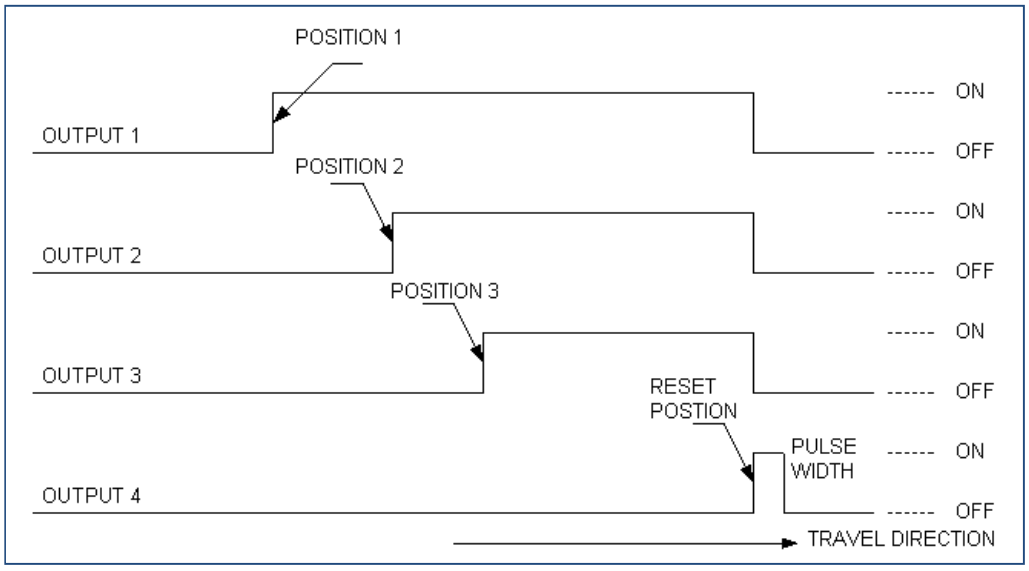
9.2 Output

There are two modes in which the output can be configured. You can Set {OFF}, {SINGLE} {MULTI } output by selecting soft keys.

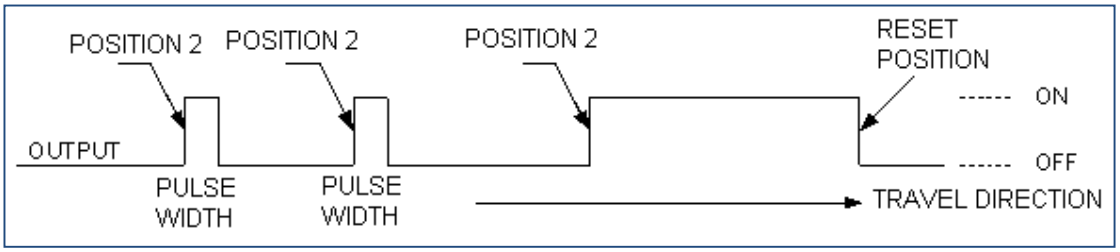
To configure inputs Scroll to “Auxiliary settings” in User setup. Select {OUTPUT} from soft key.

Single Axis Operation:

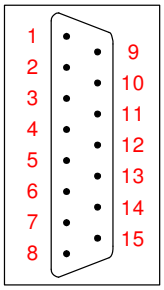
In this mode all outputs are used by the positions set for a selected axis. So in Single axis operation, any one axis can be configured for this operation. Using {POS.}, a particular axis can be set to operate as a single output mode. The following diagram will explain in detail its operation.



Multiple axis operation: In this mode, the each output line is assigned to individual axis means Output 1 is for X axis, Output 2 for Y axis etc. A pulse is issued whenever an axis passes a set position. The following diagram will explain in detail its operation:



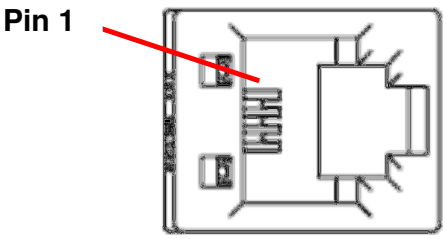
The Following table shows the pin connection for Auxiliary operation.



Pin Number	Output Signal
1	Input 1
2	Input 3
3	NC
4	External Supply
5	Output 1
6	Output 3
7	GND
8	RXD
9	Input 2
10	Input 4
11	Shield
12	External Ground
13	Output 2
14	Output 4
15	TXD

9.3 Serial Communication

EL750 allows two modes of serial communication continuous mode and on request transfer. Following diagram shows RS232 communication port.



Pin No.	Description
1	TXD
2	GND
3	RXD
4	GND

The Following results are shown on Terminal screen.

10.050 ARMX 11.250 ARMY 5.560 ARMZ 8.850 ARMU

Symbol	Meaning
A	Absolute readings
I	Incremental
R	Radial
D	Diametric
X/Y/Z/U	Axes
M	MM
N	Inch

The Terminal Settings should be as under

Setting options	Values
Baud rate /Bits Per second	9600 / 19200 / 38400 / 57600 / 115200
Data Bits	7 / 8
Parity	None / Even / Odd
Stop bits	1 / 2
Transmission mode	OFF / Continuous / Key press
Transmission Interval (sec)	0.1 / 0.2 / 0.5 / 1 / 2 / 3 / 4 / 5 / 6 / 8 / 10

Continuous mode: - In continuous mode the current displayed counts are transmitted to PC and can be viewed on Terminal Software. Transmission interval for continuous mode is programmable and following options are available 0.1 / 0.2 / 0.5 / 1 / 2 / 3 / 4 / 5 / 6 / 8 / 10 seconds.

Request mode: - In this mode DRO will transfer current count only on receiving request from terminal. Request can be generated by pressing ‘X’,’ Y’, ‘Z’ and ‘U’ keys on PC keyboard for viewing respective axis reading. Press A key on keyboard for all axis reading.

10. Troubleshooting

10.1 Self Diagnostics Mode

EL750 DRO features self diagnostics mode which checks for following areas.

- Keyboard functioning
- Encoder diagnostics
- Probe Function

Self diagnostics mode is enabled by pressing Selection of Diagnostic option in User Setup Mode.

Keyboard Diagnostic:- In Keyboard functioning relevant keys will be display with help of message one by one as per the sequence entered by the user. Respective messge of key ensures working of the key. Press [C] to exit the diagnostic mode.

Probe Diagnostic:- Press probe button for probe diagnostic, Probe will touch the surface after pressing the probe button. Press [C] to exit the diagnostic mode.

Before

After

Encoder Diagnostic:- Encoder diagnostics will display the axis count. Press [C] to exit the diagnostic mode.

11. DRO Models

Product Description	Product Code	Number of axis			Interface	Machine Model		Options		
		2	3	4	RS422	Mill	Lathe	RS232	6 O/P	PROBE
EL752-C	EL6C-21-1000	√			√	√	√			√
EL753-C	EL6C-31-1000		√		√	√	√			√
EL754-C	EL6C-41-1000			√	√	√	√			√
EL762-C	EL6C-21-1110	√			√	√	√	√	√	√
EL763-C	EL6C-31-1110		√		√	√	√	√	√	√
EL764-C	EL6C-41-1110			√	√	√	√	√	√	√

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