

## E90 Digital Readout System Instruction Manual



## 1.0 Introduction

### 1.1 EMC and Low Voltage Compliance

The E-Series Digital Readout conforms to the relevant European standards for electromagnetic compatibility and low voltage directive as detailed below.

BS EN 50081-2: Electromagnetic compatibility.  
Generic Emission Standard - Industrial Environment

BS EN 50082-2: Electromagnetic compatibility.  
Generic Immunity Standard - Industrial Environment.

BS EN 61010-1: Safety requirements for electrical equipment for  
measurement, control and laboratory use.



### 1.2 Technical Specifications

<b>Construction:</b>	Two part system - display/keyboard separate from DSU/Inputs	
<b>Dimension</b>	<b>Display/Keyboard</b>	<b>DSU</b>
Height:	170mm (6.7in)	130mm (5.1in)
Width:	295mm (11.6in)	185mm (7.3in)
Depth:	30mm (1.2in)	60mm (2.4in)
Weight:	2.1kg (4.6lbs)	1.7kg (3.7lbs)
<b>Operating Voltage:</b>	115 or 230V (switch selection)	
<b>Supply Voltage Fluctuation:</b>	Not to exceed +/-15% of the operating voltage	
<b>Supply Frequency:</b>	50 to 60 Hz	
<b>Maximum Power Consumption:</b>	26VA	
<b>Operating Temperature:</b>	0 to 45°C (32°F to 113°F)	
<b>Storage Temperature:</b>	-20 to 60°C (-4°F to 140°F)	
<b>Inputs:</b>	Dependant on model, two or three Spherosyn/Microsyn encoders	
<b>Resolution:</b>		
Spherosyn/Microsyn 10	5µm (0.0002in) / 10µm (0.0005in) / 20µm (0.001in) / 50µm (0.002in)	
Microsyn 5	1µm (0.00005in) / 2µm (0.0001in) / 5µm (0.0002in) / 10µm (0.0005in)	
<b>Environmental Conditions:</b>	Indoor Use, IP20 (IEC 529)	
	Relative humidity - maximum 80% for temperatures up to 31°C (87.8°F), decreasing linearly to 33% at 45°C (113°F).	
	Transient overvoltage according to INSTALLATION CATEGORY II of IEC664	
	POLLUTION DEGREE 2 in accordance with IEC664	

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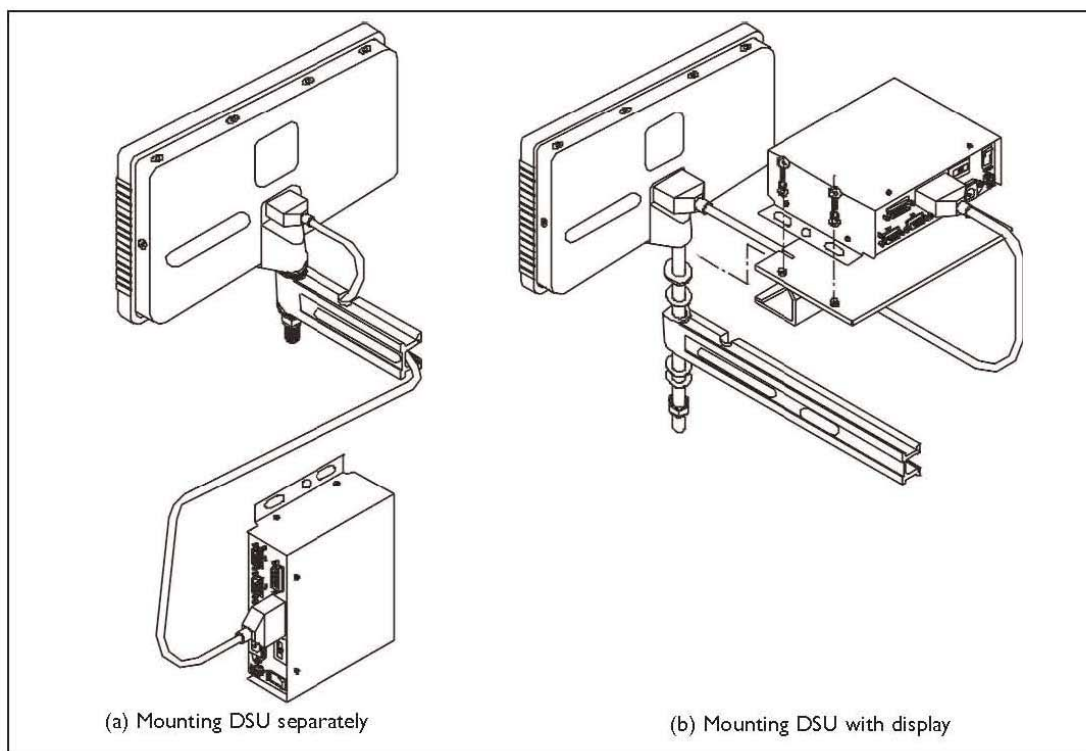
## 2.0 Installation

### 2.1 Mounting

Select the location of the E-Series with due regard of safety and ease of operation. Keep it clear of moving parts and coolant spray. Ensure that the natural ventilation around the Digital Sending Unit (DSU) is not restricted.

To ensure correct operation of the E-Series, it is recommended that the Digital Sending Unit (DSU) is grounded to the machine from the equipotential terminal. A ground strap is provided in the fitting kit. The strap should be cut to a suitable length once the DSU had been fixed to the machine. A terminal is provided for crimping to the ground strap. This operation should be conducted by a suitably qualified engineer. The machine must also be grounded to a good earth point.

The DP8 can be mounted in two basic ways as shown in Figure 2.1



#### 2.1.1 Display and Digital Sending Unit (DSU) Mounted Separately (Figure 2.1a)

The keypad/display unit incorporates an M10 tapped hole at the rear of the unit. The M10 hole can be used to mount the display in any of the standard methods as shown in Figure 2.2. The M10 stud mount is provided as standard. The swivel mount assembly (Part No. 600-80290), the E-Series mounting arm (Part No 294-40055) and the DSU mounting assembly (Part No 600-65595) are all optional items as detailed on the price list.

The DSU is normally mounted on a vertical face on the rear of the machine. The DSU facilitates the fixing in 2, 3 or 4 point location. For metric applications drill and tap an M6 hole and locate the DSU by inserting one of the M6 bolts provided. Ensure the DSU is level, mark the next location and drill and tap the second hole. Repeat this process for the required number of fixing locations. For those customers requiring imperial (Inch) fittings, repeat the above process substituting 1/4 inch UNC tapped hole and bolts.

**Note:** The fitting kit includes both the metric and imperial fittings. The metric fittings are zinc coated whereas the imperial fittings are black

The DSU is connected to the keypad/display via a 3.5 metre 9 pin "D" type cable. The cable can only be connected in one direction. Once connected, secure the cable at both ends using the slotted locking screws.

Please note, as shown in Figure 2.1, the encoder and mains leads should be positioned underneath the DSU to avoid any ingress of coolant.

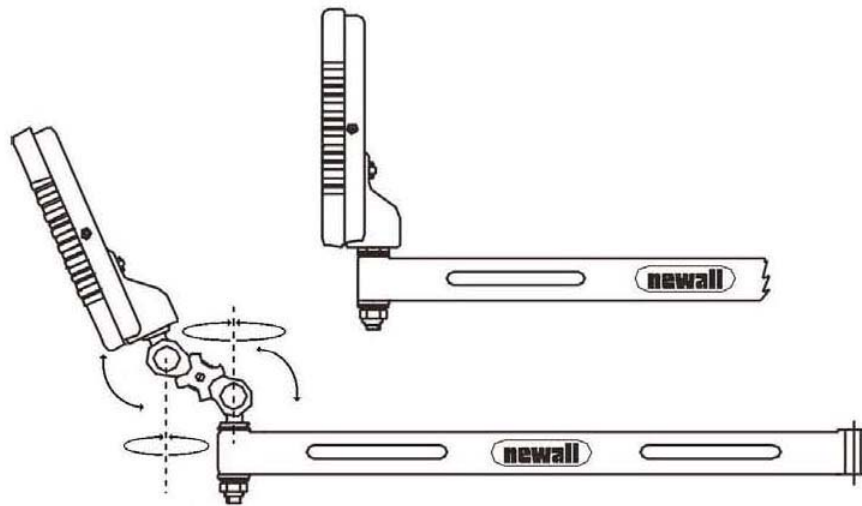


Figure 2.2 - M10, Swivel Mount and Arm .

## 2.12 Display and Digital Sending Unit mounted together (figure 2.1b)

An optional bracket (Part No 600-65595) is available to facilitate the mounting of the DSU directly to the display using four M6 bolts. These bolts are provided with the bracket kit which includes a 300mm 9pin 'D' type cable. This cable is to be used to connect the DSU to the keypad/display and the 3.5m cable is not needed in this configuration and can only be connected in one direction.

## 2.2 Power Supply

**BEFORE CONNECTING THE ELECTRICAL SUPPLY TO THE DIGITAL SENDING UNIT (DSU), CHECK THAT THE VOLTAGE SELECTOR SWITCH IS CORRECTLY SET. Figure 2.3 shows the position of this switch.**

The mains supply is connected through a detachable supply cord. The Digital Readout is supplied with a cord with a right-angle connector. If another supply cord is used, it must have fitted a IEC320, 10A, EARTHED mains connector with a cord rated for at least 10A.

The PROTECTIVE EARTH CIRCUIT of the mains supply **MUST BE CONNECTED** to the protective earth terminal of the DSU through the supply cord.

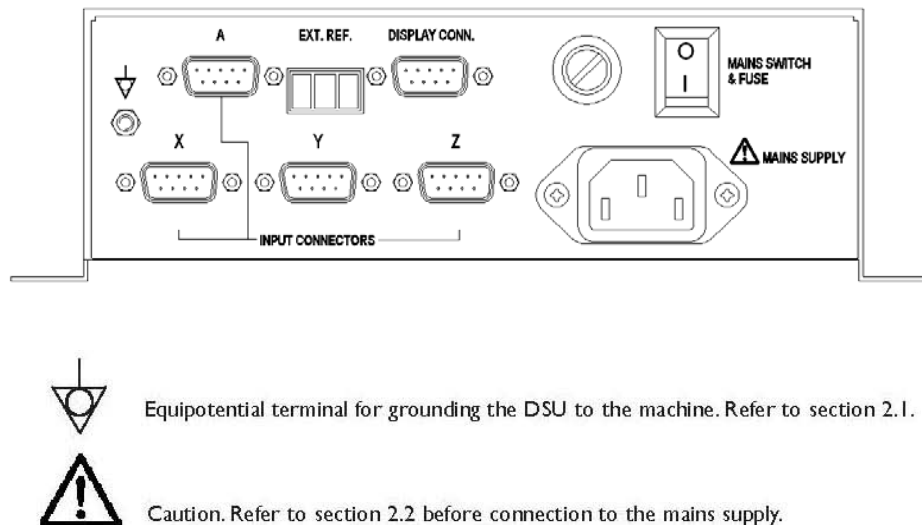
The supply cord should be secured with cable ties to ensure that it cannot drop into a hazardous position, ie. the floor or coolant tray, when disconnected from the DSU.

The supply cord must be routed away from moving parts, swarf, coolant or sources of heat.

If a mains plug is not already fitted to the supply cord or is of the wrong type, then a suitable EARTHED plug should be used which complies with the relevant specifications for plugs and socket-outlets.

The mains supply fuse is a 20x5mm, type T0.5A, 250V. It is not to be replaced by the operator. If the fuse blows it is a possible indication of some significant problem with the power source. Check the supply and wiring carefully. If the fuse is replaced, the DSU must first be disconnected from the supply by the removal of the IEC socket from the inlet. This connector is the primary disconnect device for the equipment and must be accessible at all times. Do not position the equipment so that it is difficult to operate the disconnect device.

**NOTE: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.**



**Figure 2.3 - Connection diagram for the Digital Sending Unit (DSU)**



## 2.3 Encoder Connection

Figure 2.3 shows the connection sockets on the DSU. The E-Series is designed for use with Newall Spherosyn and Microsyn encoders only. The encoders are connected to the DSU with 9-pin D Type connectors.

Switch off the E-Series before connecting or disconnecting the encoders. To fit the connectors into the appropriate socket on the back of the E-Series, first align the connector and then push firmly in place and secure with the locking bolts. To remove the connector, disengage the locking mechanism and pull the connector clear.

The encoders and the display/keyboard are connected to the DSU at a separated extra low voltage (SELV) level. Any additional interconnections must also be at SELV level.



## 2.4 Switching on

The mains supply switch for the E-Series is mounted on the side of the DSU as shown in Figure 2.3.

When you switch on the E-Series, the unit will automatically go through a brief self diagnostic routine.

During this routine, the name E70 will be shown, then the software version number will be displayed and all segments of the displays will be lit.

After this routine, the unit will display measurements and is ready for use.

The E-Series can be switched off via the mains switch on the DSU. Alternatively, the keypad/display can be switched off by pressing the  key. Please note that the DSU remains under power when the  key is pressed.

### CONVENTIONS USED IN THIS MANUAL

The direction of travel of an axis refers to the travel of the tool relative to the workpiece.

























Keys on the keypad are signified in bold print, such as **ent** for the enter key.

**SPHEROSYN AND MICROSYN ARE REGISTERED TRADEMARKS OF NEWALL MEASUREMENT SYSTEMS LTD**

## 3.0 User Instructions

### 3.1 Using the keypad

The keys are used as follows:

Standard Keys	Function	Purpose
                    	<p>ON / OFF</p> <p>[CE] Key</p> <p>[ENT] Key</p> <p>[ABS / INC] Key</p> <p>[IN / MM] Key</p> <p>[SDM] Key</p> <p>[SDM ZERO] Key</p> <p>[INS] / [DEL] Key</p>	<p>On/Off (Display only, not DSU)</p> <p>Select axis to enter dimension (preset) [X][Y][Z] Select Rotary Display or set Rotary to Zero [A]</p> <p>Set the current position for the axis to zero (reset)</p> <p>Clear entry values in preset mode</p> <p>Enter key to confirm data entry</p> <p>Switches between absolute &amp; incremental readings</p> <p>Centre find function</p> <p>Select the Digifind function</p> <p>Switches between inch and millimetre display (LED indicates choice of mode)</p> <p>Numeric keypad for data entry</p> <p>Selecting the required Sub-Datum number</p> <p>Setting the selected Sub-Datum to zero</p> <p>Insert / Delete</p> <p>Scroll Previous / Scroll Next</p>
  	<p>[msg/axis]</p> <p>[mode]</p> <p>[F] Key</p>	<p>You can press the key [msg/axis] to toggle message or rotary display on 4<sup>th</sup> display window</p> <p>In Rotary Display mode, pressing the key [mode] will toggle the DMS or DEC mode display</p> <p>To access the mill functions, press the [F]Key:</p> <p>Options: PCD ARC LINE POLAR</p>

## 4.0 Set Up

### 4.1 Set Up Introduction

The E-Series digital readout display is equipped with a Set-Up Routine. The routine enables the operator to change factory settings in order to increase efficiency and productivity. If the factory defaults are suitable, select the NORMAL option at the end of the Routine to restore the factory defaults.

Generally, the entire Set-Up Routine is performed only one time. Changing some parameters in Set-Up may alter datums, SDMs, tool compensations and Digifind.

#### **DO NOT RUN SET-UP IF YOU ARE NOT PREPARED TO LOSE THIS DATA.**

Set-Up is enabled while the unit is running its initial self-test, just after powering on. Press the **[ON/OFF]** on the face of the display as the self-test is running.

The Set-Up procedure makes use of a menu system. The main menu consists of a list of options that can be customised for your use (See Table 1). You simply press the **[<]** and **[>]** keys to scroll through this list until you reach the option you wish to change. To change the option when selected, press **[ENT]**.

To exit the Set-Up routine scroll through to the quit option and press **[ENT]**.

If the keypad/display has been switched off by pressing the **[ON/OFF]** key rather than switching off at the mains, it is possible to enter the Set-Up routine by pressing the **[ABS/INC]** key followed by the **[ON/OFF]**.

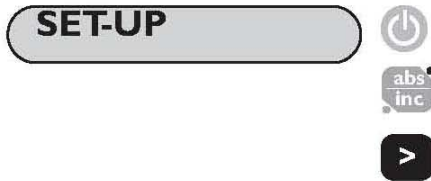


## 4.2 Set Up Defaults

FUNCTION	DESCRIPTION	DEFAULT SETTING	MENU OPTIONS
<b>LANGUAGE</b>	Selects the language to display messages	ENGLISH	English / French / German / Spanish / Italian / Danish / Czech On/Off
<b>KEY BEEP</b>	Enables the audible beep when keys are pressed on the keypad	ON	
<b>I/P TYPE</b>	Selects the type of transducer on each axis	SPHEROSYN	Spherosyn / Microsyn 5 / Microsyn 10
<b>RAD / DIA</b>	Selects radius or diameter reading for each axis	RAD	Rad / Dia
<b>RESOLUTION</b>	Selects the resolution to be displayed on each axis	5µm	1 / 2 / 5 / 10 / 20 / 50µm
<b>DIRECTION</b>	Changes the direction of count for each axis	I	0 / I
<b>ERR COMP</b>	Selects the type of error compensation for each axis	OFF	OFF / LINEAR COMP / Seg Error
<b>ERR SET</b>	Sets the error compensation	NO COMPENSATION	Sel Axis (for lin or seg error setting)
<b>SDM</b>	Enables the subdatum memory function on the keypad	ON	On / Off
<b>POS OUT</b>	Enables the position pulse output function (only available when the optional auxiliary port is included)	OFF	Off / X Axis / Y Axis / Z Axis
<b>POS SET</b>	Sets the position that triggers a pulse output (only available when the optional auxiliary port is included)	ALL ZERO	All axes Posit-1 / Posit-2 / Posit-3
<b>ZERO APPROACH</b>	Enables zero approach function on the keypad	OFF	Reset / Pulse MS On/Off
<b>ZERO SET</b>	Enables approach window to be set (selectable only if zero approach is 'on')	0.000	User definable window
<b>ROTARY SET UP</b>			
ROT-REF	Selects and sets up rotary reference	Internal	Internal / External
ROT-CAL	Selects and sets up calibration of rotary	4096	Auto / Manual
ROT-DIR	Selects and sets up rotary direction	+	+ / -
SIG-CHK	Signal checking	No	Yes / No
<b>NORMAL</b>	Sets factory settings		Quit Normal / Default
<b>QUIT</b>	Exits the Set-up routine and saves settings to memory		
<b>MILL OPTIONS</b>			
<b>ARC</b>	Enables the arc contour function on the keypad	ON	On/Off
<b>PCD</b>	Enables the bolt hole circle function on the keypad	ON	On/Off
<b>LINE</b>	Enables line hole function on keypad	ON	On/Off
<b>POLAR</b>	Enables line polar-co-ordinate function on the keypad	ON	On/Off

### 4.3 Set-Up Menu

#### (a) Set-Up



The Set-Up procedure can only be entered by pressing the **[ON/OFF]** during the power on sequence or by turning the display off using **[ON/OFF]** and then pressing **[ABS/INC]** before pressing **[ON/OFF]** again.

When you have entered the Set-Up routine, the letters '**SET-UP**' appear in the top axis display.

Press the **[ > ]** key to move to the next menu option.

#### (b) Language

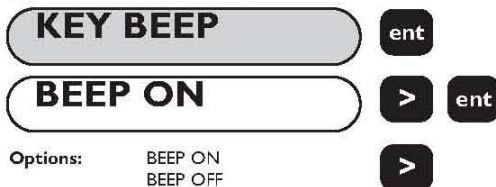


Options: ENGLISH FRANCAIS  
DEUTSCH ITALIANO  
ESPANOL DANSK  
CESKY

Scroll through the available options using the arrow keys and select the desired language mode with **[ENT]**

Press the **[ > ]** key to move to the next menu option.

#### (c) Key Beep

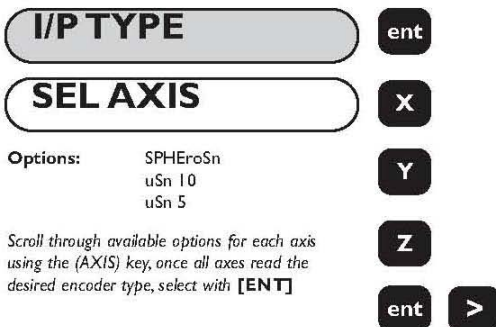


Options: BEEP ON  
BEEP OFF

Toggle between Beep On and Beep Off using the arrow keys and select desired mode with **[ENT]**

Press the **[ > ]** key to move to the next menu option.

#### (d) I/P Type



Options: SPHEroSn  
uSn 10  
uSn 5

Scroll through available options for each axis using the (AXIS) key, once all axes read the desired encoder type, select with **[ENT]**

The I/P (Input) Type function allows the operator to specify the type of transducer connected to each axis. The E Series reads Newall's Spherosyn, Microsyn 10 or Microsyn 5 Encoders

#### IMPORTANT:

The input type selected for each axis must match the transducer connected to that axis. The E Series will give incorrect readings if the I/P Type does not match the encoder installed.

Press the **[ > ]** key to move to the next menu option.

**(e) Radius / Diameter****RAD/DIA****ent****SEL.AXIS****X**Options: RAD  
DIA**Y**Toggle between Radius and Diameter using the  
(AXIS) keys and select desired mode with **[ENT]****Z****ent****>**Press the **[ > ]** key to move to the next menu option.**(f) Resolution****RESOLUTION****ent****>**

The Resolution function allows the operator to determine the resolution for each axis.

**SEL.AXIS****X**Options: 0.001mm (0.00005")  
0.002mm (0.0001")  
0.005mm (0.0002")  
0.010mm (0.0005")  
0.020mm (0.002")  
0.050mm (0.005")**Y****Z**Scroll through available options for each axis  
using the (AXIS) key, once all axes read the  
desired resolution, select with **[ENT]****ent****>**Press the **[ > ]** key to move to the next menu option.**IMPORTANT:**The Resolution available for each axis depends upon the I/P  
(Input) Type established for that axis.**(g) Direction****DIRECTION****ent****SEL.AXIS****X**Options: 0  
1**Y****Z**Toggle between 0 and 1 for each axis using the  
(AXIS) key. When all axes read the desired direc-  
tion, select with **[ENT]****ent****>**Press the **[ > ]** key to move to the next menu option.Direction allows the operator to change the direction of travel  
for each axis. Changing the setting will reverse the current direc-  
tion.**EXAMPLE:**If the current setting is 0 and the travel is positive from right to  
left, changing the setting to 1 will reverse the  
direction to measure positive from left to right.

**(h) Error Compensation****ERROR COMP**

Options: ERR. OFF  
LIN. COMP  
SEG. COMP

Scroll through the available options using the arrow keys and select desired compensation with [ENT]

ent

X

Y

Z

Errors can result from a number of sources, including installation and machine wear. Where the degree of error increases linearly along the length of travel of the encoder, Linear Error Compensation should be applied. However, where the errors are local to an area of travel, the Segmented Error Compensation should be applied.

**IMPORTANT:**

If Error Compensation is applied, it is important that it is absolutely correct. If it is not correct, errors could be increased rather than reduced.

ent

&gt;

Press the [ > ] key to move to the next menu option.

**(i) Set Error Compensation - Linear Error Compensation****ERROR SET**

ent

**SEL.AXIS**

Select the axis to be compensated using the axis keys.

The axis displays will show which axes have been selected for linear error compensation.

X

Y

Z

Linear Error Compensation allows the operator to apply a constant correction factor to all measurements displayed. Linear error may occur if the axis of the machine is not running perfectly parallel to the scale (cosine error) or if the machine is moving in an arc (Abbé errors). The causes may be:

1. Machine wear.
2. Deflection of the machine due to weight acting on an overhanging section.
3. Misalignment of the scale due to poor installation.

**ENT. COMP**

The factor may be directly entered.  
Load the required factor.

A Linear Error Compensation factor of 1.000000 is equivalent to no compensation

ent

&gt;

The further away the scale is mounted from the centre line of the workpiece, the greater is the potential for linear error. Linear Error Compensation is expressed as a multiplier; which is displayed for each axis when ENT. COMP is selected. A factor of 1.000000 indicates no compensation.

The compensation factor is:  $\frac{\text{True or standard distance moved}}{\text{Measured distance}}$

A gauge block, standard bar or laser measurement should be used as the standard against which the displayed movement is compared.

Press the [ > ] key to select another axis for compensation.

**ENT. COMP**

&gt;

Alternatively, the factor may be automatically calculated and entered. When **ENT. COMP** is displayed press the [ > ] key to enter the routine

1 . 0 0 5

## ZERO

Move the machine to the zero position of the standard against which the axis is being compared and zero the axis with the zero key.

Xo

Yo

Zo

A gauge block, standard bar or laser measurement should be used as the standard against which the displayed movement is compared

## STANDARD

Move the machine a known distance as determined by the standard and enter that value.

2

0

ent

Select another axis for compensation or press [ENT] to end.

### (j) Set Error Compensation - Segmented Error Compensation

## ERROR SET

ent

## SEL.AXIS

Select the axis to be compensated using the axis keys.

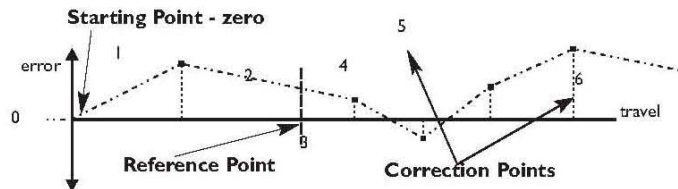
The axis displays will show which axes have been selected for segmented error compensation.

X

Y

Z

The scale travel is broken down into as many as 99 user-defined segments, each with their own correction factor, measured against a high-accuracy standard. The following parameters need to be identified:



## SET ZERO

ent

The start point must be at one end of the section that is to be error-corrected. Points must progress in sequence, i.e. there must be no reversals in direction.

Move the machine to the desired start point, press [ENT]

Each Correction Point is measured with respect to the Starting Point - zero - which is usually set close to one end of the scale. The Reference Point can be set anywhere along the scale, and does not need to coincide with either the absolute datum or any of the correction points. However, it may be convenient to make the absolute datum and the reference point the same. Always approach the Starting Point, Correction Points and Reference Point from the same direction. If you do not, then the size of the tool or probe will render the measurement inaccurate.

## GO TO I

ent

The current position relative to the new zero point is displayed in the relevant axis. Move to 1st (nth) correction point (against a standard). Press [ENT] to move on

### WARNING!

Starting this procedure deletes existing segmented error data for the axis.



**ENT. STANDARD**

5

0

ent

Enter the standard measurement.

**CORRECTION 1**

>

The correction factor is displayed for this point.

Do not worry about the direction of the standard measurement, eg. 50.0 and -50.0 are treated the same. Segmented compensation need not be over the entire scale length. It can be applied just to a length of high importance, or it can be as small as one segment.

**GOTO 2**

ent

The procedure is repeated for each point.

To complete the segmented error compensation Set-Up, press [abs/inc] after the last required point has been entered.

abs  
inc

**GO TO REFERENCE**

X

Y

Z

Switching On with Segmented Compensation Set  
When power is applied, the display for any axis that is set to use Segmented Compensation shows " rESet ".  
If the machine has not been moved since the power was turned off, simply press [ce], and the C80 will restore the last positions recorded.  
Alternatively set each axis close to the Reference Point - to within:

6.3mm (0.25") for a Spherosyn encoder or  
2.5mm (0.1") for a Microsyn encoder,

and press the axis key for the axis. The E-Series will re-establish alignment with the correction parameters

**(k) SDM (Sub Datum Memory / Stored Dimension Memory)**

**SDM**

ent

**SDM ON**

>

ent

Options: ON  
OFF

Toggle between **SDM ON** and **SDM OFF** using the arrow keys and select desired mode with [ENT]

SDM (Sub Datum Memory or Stored Dimension Memory) ON enables the **[SDM]** function key on the keypad. If SDM OFF is set, the function key on the keypad is disabled.

SDM is explained further in the Sub Datums Section, See Section 5.4 of this manual.

Press the [ > ] key to move to the next menu option.

**(l) Arc Contouring (DP8 MILL VERSION ONLY)**

**ARC**

ent

**ARC ON**

>

ent

Options: ARC ON  
ARC OFF

Toggle between **ARC ON** and **ARC OFF** using the arrow keys and select desired mode with [ENT]

Setting ARC (Arc Contouring) ON enables the **[ARC]** key on the keypad. If ARC OFF is set, the **[ARC]** function on the keypad is disabled.

ARC is explained further in the E-Series Mill Section, see Section 6.0 of this manual.

Press the [ > ] key to move to the next menu option.



(m) PCD / Bolt Hole Circle

**PCD** **ent**

**PCD ON** **>** **ent**

Options: PCD ON  
PCD OFF **>**

Toggle between **PCD ON** and **PCD OFF** using the arrow keys and select desired mode with **[ENT]**

Setting PCD (Bolt Hole Circle) ON enables the **[PCD]** function key on the keypad. If PCD OFF is set, the **[PCD]** function on the keypad is disabled.

PCD is explained further in the E-Series Mill Section See Section 6.0 of this manual.

Press the **[ > ]** key to move to the next menu option.

(n) Line Hole Tool

**LINE** **ent**

**LINE ON** **>** **ent**

Options: LINE ON  
LINE OFF **>**

Toggle between **LINE ON** and **LINE OFF** using the arrow keys and select desired mode with **[ENT]**

Setting LINE (Line Hole Tool) ON enables the **[LINE]** key on the keypad. If LINE OFF is set, the **[LINE]** function on the keypad is disabled.

Line Hole is explained further in the E-Series Mill Section, See Section 6.0 of this manual.

Press the **[ > ]** key to move to the next menu option.

(o) Polar Co-ordinates

**POLAR** **ent**

**POLAR ON** **>** **ent**

Options: POLAR ON  
POLAR OFF **>**

Toggle between **POLAR ON** and **POLAR OFF** using the arrow keys and select desired mode with **[ENT]**.

Setting POLAR (Polar Co-ordinates) ON enables the **[POLAR]** key on the keypad. If POLAR OFF is set, the **[POLAR]** function on the keypad is disabled.

Polar Co-ordinates are explained further in the E-Series Mill Section, See Section 6.0 of this manual.

Press the **[ > ]** key to move to the next menu option.

(p) Zero Approach

**ZERO APP** **ent**

**ZERO ON** **>** **ent**

Options: ZERO ON  
ZERO OFF **>**

Toggle between **ZERO ON** and **ZERO OFF** using the arrow keys and select desired mode with **[ENT]**

Zero approach function can be set ON or OFF.

When Zero Approach is ON, the leftmost character of the axis display flashes when the position is within a defined envelope. The flash rate increases as zero is approached.

Press the **[ > ]** key to move to the next menu option.

**(q) Zero Set**

**ZERO SET** **ent**

**SEL AXIS** **>** **ent**

**2.000** **X** **2** **ent**

**2.500** **Z** **2** **.** **5** **ent**

**0.000** **Z** **0** **ent**

**>**

Enter the Zero Set window by selecting the axis and entering the required value. Entering "0" omits the approach warning from that axis

If Zero Approach has been selected as ON, then Zero Set appears as the next "Set-Up" option.

The example refers to a 3 Axis Lathe. For an E-Series Mill the axis would be **[X]**, **[Y]**, **[Z]**.

The maximum envelope width is 2500mm (99").

Press the **[ > ]** key to move to the next menu option.

**(u) Rotary Set-up**

**ROT -- SET** **ent**

**ROT -- REF** **ent**

**INTERNAL** **ent**

**▶ ent**

**◀**

Options: Internal  
External

Toggle between internal and external using **[<]** or **[>]** key and select desired mode with **[ent]**, then Message Display will display the next option setting

Rotary Setting enable. Message Display will display the next option setting.

Rotary Reference Setting enable. Press the **[>]** or **[<]** to move to the next or previous option.

**ROT -- CAL** **ent**


**CAL -- AUTO** **▶ ent**

**◀**



Options: Cal Auto  
Cal Mnuu

Toggle between internal and external using **[<]** or **[>]** key and select desired mode with **[ent]**, then Message Display will display selected calibration setting


Rotary Calibration Setting enable. Press the **[>]** or **[<]** key to move to the next or previous option


**CAL AUTO** 

**TURNING**


**4096**  




Rotary Calibration Setting enable. The Message Display will display 'Turning'. After a maximum rotation of 720 degrees the E90 will catch the rotary pulses per revolution (ppr) automatically and display the value. For example, **4096**. Press the [>] or [<] key to move to the next or previous options.

**CAL MANU** 


**4096** 




Manual Rotary Resolution Setting enable. Press the number key to enter desired resolution, for example **4096**. Press the [ent] to confirm the data entry. The Message Display will display the resolution. Press the [>] or [<] key to move the next or previous options

**ROT -- DR** 


  




Select the resolution of the rotary axis display in decimal degree mode. Press the [ent] key, enable DR Setting. Press the [>] or [<] key to move the next or previous optional setting. When DR setting is enable, using [>] or [<] key to toggle through the options (0.00001 through to 0.1). Press [ent] to confirm the setting.  
Default : 0.001.

**ROT -- ANG** 

This function allows the operator to define if the display is to rollover at 360° back to zero or give a continuous measurement.  
Default: RL.

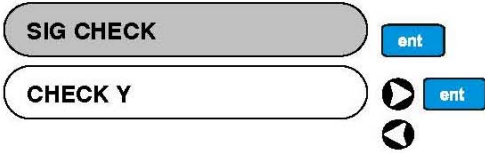
**ROT -- DIR** 

**DIR+**   

Rotary Direction Setting enable. Press the [>] or [<] key to move the next or previous option.

Options:           Dir +  
                      Dir -

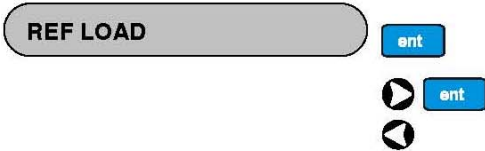
Toggle between Internal and External using [>] or [<] and select desired mode with [ent]. Message Display will display the next option setting.



Rotary Signal Check Setting enable. Press the [>] or [<] key to move the next or previous option.

Options: CHECK Y  
CHECK N

Toggle between signal **CHECK Y** or **CHECK N** using [>] or [<] key and select desired mode with [ent]. Message Display will display next option setting.



**Reference Load**  
This function allows for a pre-programmed value to be loaded into the axis counter, as user entered value either a decimal degrees or DMS that is to be applied as an offset to the reference zero position. This will allow for the table datum position to be set at an offset value from the actual physical encoder reference position.

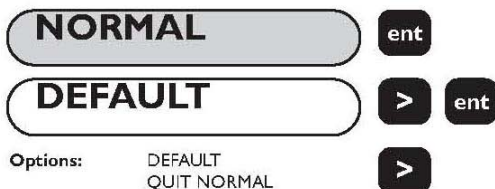
Press the [ent] key, enable Rotary Reference Load Setting . Press the [>] or [<] key to move the next or previous option.

Selected reference load setting, the current reference value will be displayed. Press [mode] key will change the display mode between DMS and Decimal. Press the number key to enter desired number, for example **90**. Press [ent] to confirm, and the entered value will be displayed. Press [ent] key again, Message Display will back to REF LOAD. Default: 0.



Rotary Setting . Press the [>] or [<] key to move the next or previous option.

#### (s) Reset to Original Factory Settings



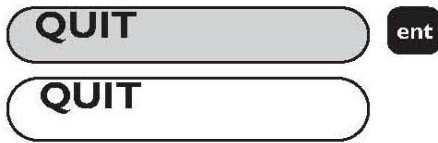
Options: DEFAULT  
QUIT NORMAL

Toggle between Default and Quit Normal using the arrow keys and select desired mode with [ENT]

Normal returns all the Set-Up Options to the original factory settings (Except language setting).

#### **WARNING!**

Selecting DEFAULT will cancel all changes made during set-up. The E-Series will return to the original factory settings. Select QUIT NORMAL to leave the settings unchanged.

(t) **Quit Set-Up**

Quit exits the Set-Up procedure and returns the E-Series to operational use.

Returns to normal operating mode.

**Quit**

This feature allows you to save your designed setting or select manufactory default setting and go back to normal operation. Press [ent] key, save setting enable.

Options: QUIT SET  
DEFAULT

Toggle between signal QUIT SET or DEFAULT using [>] or [<]. Press **enter** key to confirm your selection. Then it will finish your setting.

Note:

1. Selected QUIT SET, it will save your designed setting.
2. Selected DEFAULT, it will cancel your setting, the manufactory default setting will be set.

**Message / Rotary (4<sup>th</sup> Axis) Display [msg/axis]**

You can press the key [msg/axis] to toggle message or rotary display on 4<sup>th</sup> display window.

**Mode [mode]**

In Rotary Display mode, pressing the key [mode] will toggle the DMS or DEC mode display.

**4<sup>th</sup> Axis [A]**

In Rotary Display mode, pressing the key [A] will allow you to set current rotary position to any designed datum.

1. Pressing [A] or [CE] following [A], it will conceal this operation.
2. Pressing [ent] following [A], it will set current position to zero.
3. Following the numeric keypad for data entry. The key [CE] clears one last pressed number, sign or point. Pressing [ent] to confirm the datum entry.

## 5.0 Functions

### 5.1 Absolute / Incremental

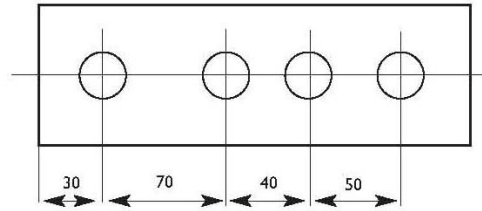
#### 5.1.1 Using Incremental

When the E-Series is set to incremental mode, it can be used to display each new position relative to the last position. This is also known as point-to-point use.

On setting to incremental you can reset each axis by pressing [**Xo**] [**Yo**] or [**Zo**].

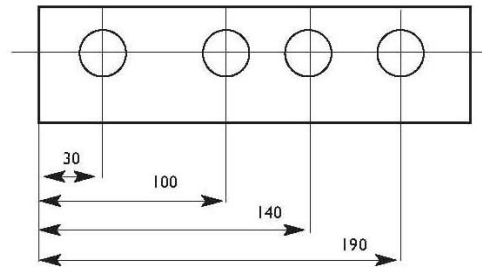
As an alternative to resetting the axes, you can enter the coordinates relative to the current incremental position. If done in a negative sense, the operator can move to "0.000" which may save a great deal of machining time.

Each time you switch to incremental mode, the E-Series will display the position relative to the last reset position while in the incremental mode.



#### 5.1.2 Using Absolute

When the E-Series is set to absolute mode it will display the position relative to an established datum point.

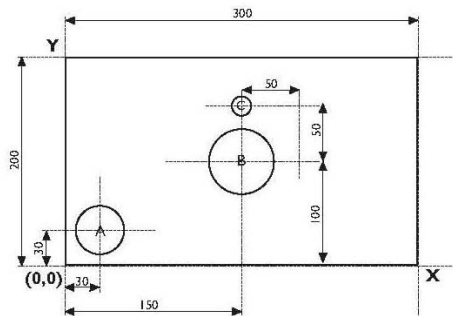


#### 5.1.3 Establishing the Datum









When you reset the display in absolute mode, you are setting the current position of your machine as your datum point. All absolute positions will be measured relative to this datum.

To set the datum, position the machine at the point you intend to establish the datum and then reset any or all axes, while in the absolute mode.

The diagram below is used in the following example to show Absolute and Incremental modes.





ABS		Set absolute zero at the lower left corner of the part
0.0000		
0.0000		
ABS		Move to the first position in ABS (Hole A).
30.000	X	
30.000	Y	
ABS		Move to the second position in ABS (Hole B).
150.000	X	
100.000	Y	
INC		Switch to Incremental and Zero the display
0.000	X	
0.000	Y	
INC		Make an Incremental move to Hole C.
0.000	X	
50.000	Y	
ABS		Press the <b>[ABS/INC]</b> key to return the ABS mode.
150.000	X	
150.000	Y	

**NOTE:** Using the E-Series display in the manner given above can save considerable time as the operator can avoid time consuming math calculations.

## 5.2 Centre Find

Centre Find halves the dimension displayed for any or all axes selected. You can use Centre Find in either absolute or incremental mode. The keystrokes are the same in either case.

**1/2 AX?**

Locate to your first position (one edge of your workpiece) and zero the axis.

**0.000**

Locate/move to the second position (the other edge of the workpiece)

**100.000**

Use Centre Find to locate the centre point.

**50.000**

Move until display reads 0.000. At that point you will locate the center of the part

X<sub>0</sub>

X 1/2

or

1/2 X

In the following example, Centre Find is being used on the X axis to find the centre point of a workpiece that is 100mm wide.

In either absolute mode or incremental mode, once you have used Centre Find you can locate to the centre point by moving until the display is at 0.000.

**NOTE: If you are in absolute mode, remember that using centre find will set the datum to the centre point.**

## 5.3 Digifind

The E-Series comes equipped with Digifind, a feature unique to Newall digital readout products. Digifind eliminates the risk of losing your position and datum Set-Up. With Digifind, precise Set-Up of a workpiece is carried out only one time.

When the E-Series is powered on, it displays the position at power off, compensated for any movement of a Spherosyn transducer up to 0.2500" (6mm) and a Microsyn encoder up to 0.1000" (2.5mm) in either direction since the unit was last used. This applies whether the E-Series was switched off intentionally or accidentally, i.e., a power failure. If the machine has moved beyond 0.2500" (6mm) - Spherosyn [0.1000" (2.5mm) - Microsyn], Digifind allows a quick means to find the datum if lost. The E-Series will maintain the position for at least 30 days, the life of the battery back-up.

There are two ways to use Digifind:

1. In conjunction with a machine or workpiece marker;
2. To find the last datum (absolute zero).

### 5.3.1 Using a Machine or Workpiece Marker

A mark must be made on both a stationary part and moving part of the machine. The marks must be aligned and will serve as the machine "home" position. For example, the mark could be on the reader head and mill table, or a scribed line on the lathe way and a corresponding line on the carriage. The mark must be indelible, and it must allow the operator to move the machine to within a 0.2500" (6 mm) -Spherosyn [0.1000" (2.5mm) - Microsyn ] band around the mark at any time.

Alternatively, you can use a convenient reference point on the workpiece. This could be the datum position itself or any other convenient point. The point can be highlighted with a marker for ease. The reference point must allow the operator to position the machine to within a 0.2500" (6 mm) -Spherosyn [0.1000" (2.5mm) - Microsyn] band around the mark.

FIND 0

Options: FIND 0  
FIND REF  
SET REF

ref

< ent

Once absolute zero has been established for the workpiece, move to the machine mark. The machine does not need to be positioned accurately, only within the band around the mark i.e. 6mm (0.2500") for Spherosyn and 2.5mm (0.1000") for Microsyn.

SET REF

Select **SET REF** by pressing the arrow right key.  
Select current position with **[ENT]**

Set the current position as the reference.

Repeat the procedures as desired for each axis.

SEL.AXIS

Select the axis using the axis Pre-Set or Re-Set key.

X

or

Xo

FIND 0

Options: FIND 0  
FIND REF  
SET REF

ref

>

If datum is lost at anytime, either because the machine had been moved with the power off, or the incorrect keys were selected, it is possible to "Find" the datum again.

Position the machine to within the 6mm (0.2500") band for Spherosyn and 2.5mm (0.1000") band for Microsyn.  
"Find" the reference.

FIND REF

Find reference position by pressing the arrow right key twice. Confirm with **[ENT]**.

ent

The position displayed indicates the correct distance to the absolute zero for that axis.

SEL.AXIS

Select the axis using the axis Pre-Set or Re-Set key.

X

or

Xo

The original datum is reset.

### 5.3.2 Find Absolute Zero

As a fail-safe, Digifind can "find" the last datum or absolute zero set, i.e. the position the last time the **[Xo]**, **[Yo]**, **[Zo]**, or **[Z'o]** key was used.

FIND 0

SEL.AXIS

Select **FIND 0** by pressing **[ENT]**. Select the axis by using the axis Pre-Set or Re-Set key.

ref

ent

X

or

Xo

If datum is lost at anytime, either because the machine had been moved with the power off, or the incorrect keys were selected, it is possible to "Find" the datum again.

Position the machine to within 6mm (0.2500") for Spherosyn and 2.5mm (0.1000") for Microsyn, of the datum. "Find" the reference.

The original datum is reset.

### 5.3.3 Reference Operation

This function is for rotary only. It only works for **absolute reading**.

During rotary set up, if you have already loaded the reference value, for example 90.000 for decimal mode. This feature allows the rotary display to be referenced to the pre-loaded reference value. The default reference value is zero.

## REF

Options:

- FIND 0
- FIND REF
- SET REF
- ROT REF

Press [ $\leftarrow$ ] or [ $\rightarrow$ ] to select ROT REF option. Press [ent], the message display will show 'REF...' Turning the rotary, the message display window will continue to show this until a reference marker is found. Absolute rotary value will be loaded and displayed with the value assigned to REF\_LOAD during SET-UP. This value may be positive, negative or zero. Pressing the [CE] or [REF] Key during the operation, the reference function will be terminated.

## 5.4 Sub Datums

The E-Series can store up to 199 SDM (Sub-Datum) positions, or machining steps, in non-volatile memory. The positions remain in memory even if the power has been turned off.

Using SDM allows the operator to work to zero by calling up stored dimensions, instead of "working up" to print dimensions. This eliminates the need to constantly refer to the print, and reduces the possibility of scrapping parts due to mis-read dimensions. It also speeds up positioning because the operator works to zero.

The SDMs are stored as co-ordinates relative to the absolute datum position. If the absolute datum position changes, the SDMs will "shift" to the new datum.

SDMs provide the operator increased productivity in batch machining of parts. Once a repetitive sequence of co-ordinates is entered into SDM, the co-ordinates can be recalled at any time. The positions remain in memory until altered by the operator. Simply assign any SDM number 1 - 199 to each machining step. When machining, call up each step (SDM) number and work to zero.

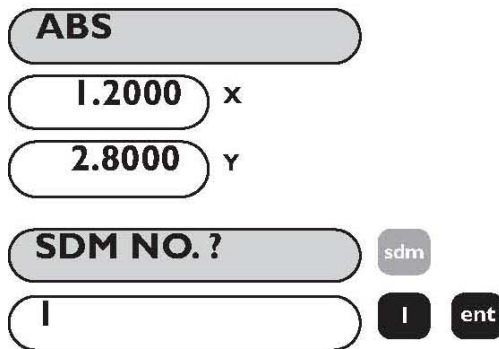
SDMs also reduce time for tool changes by giving the operator a fast and accurate method of returning to locations for other operations.

SDMs also simplify machining parts with more than one datum point. The absolute zero or datum position is determined and set. Then the secondary datum positions are entered into SDM. Once the SDM co-ordinates are stored, the operator can display co-ordinates relative to the SDM, as well as to the absolute datum position.

SDMs are stored by using one of the following two methods:

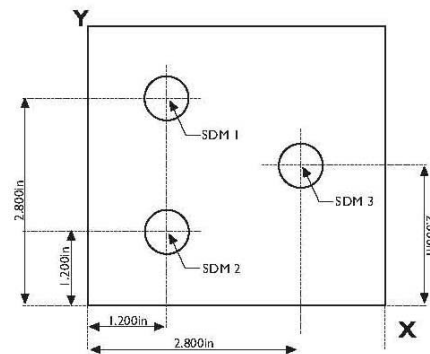
### 5.4.1 Method 1 (Teach Mode)

Using this method, move the machine to the position to be stored as the SDM. Use this method to avoid entering print dimensions via the keypad. The operator "works up" to the dimensions on the print the first time. Each position is stored in SDM by pressing the Teach key [SDM ZERO], once an SDM number has been selected.



#### EXAMPLE:

Keystrokes for entering the following part dimension into SDM are shown.



**SDM 1** sdm zero

**0.0000** X

**0.0000** Y

Establish absolute zero at the lower corner of the part. Move to the first position and change to SDM 1. Press **[SDM ZERO]**. This will store the current machine position in the selected SDM and will zero all axes. The current position is now stored as SDM 1.

**ABS** abs inc

**1.2000** X

**1.2000** Y

The next move is Absolute. Select the **[ABS/INC]** key and move to the position. Select a new SDM number and store the position with **[SDM ZERO]**.

sdm

**2** 2 ent

**SDM 2** sdm zero

**0.0000** X

**0.0000** Y

### IMPORTANT:

The dimensions in the display may change after you select the SDM number even though the machine has not moved. The numbers are the last dimensions stored in that particular SDM and should be ignored. Pressing **[SDM ZERO]** will store the actual current position in the SDM block.

**SDM 3** < >

Scroll to the next SDM by using the arrow keys. Alternatively, use the **SDM** key to select a new SDM.

Repeat this procedure to store SDM #3 into memory.

**SDM 3** sdm zero

**0.0000**

**0.0000** abs inc

**NOTE:** If the next move is Incremental, move to the position, select a new SDM number, and store the position with **[SDM ZERO]**

To exit SDM function, select **[ABS/INC]**.



### 5.4.2 Method 2 (Manual Mode)

In this example, known SDM co-ordinates are entered via the keypad without moving the machine. SDM co-ordinates must be entered relative to the absolute datum position. In other words each axis should be set to zero prior to programming sub-datums

**SDM NO. ?** **sdm**

**1** **ent**

Select the first SDM number using the **SDM** or arrow keys.

**SDM 1**

**1.2000** **X** **1** **.** **2** **sdm**

**2.8000** **Y** **2** **.** **8** **sdm**

Select the desired AXIS, enter the dimension and confirm with SDM.

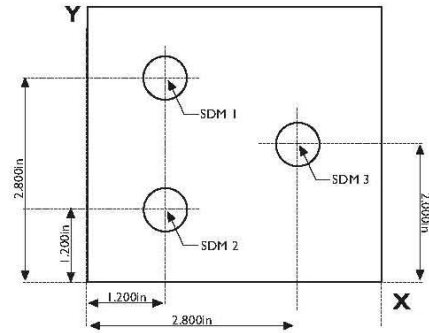
Scroll through the next SDM by using the arrow keys. Alternatively, use the SDM key to select a new SDM. Enter the new coordinates via the keypad.

Repeat procedure for SDM2 and SDM 3.



#### EXAMPLE:

Keystrokes for entering the following part dimension into SDM are shown.



**NOTE:** The axis displays will change to show the current position relative to the SDM.

To exit SDM function, select **[ABS/INC]**

### 5.4.3 Job Numbers

This function enables a group of sub datums to be identified by a number at the beginning of the group, and an end marker at the end of the group.

Once a series of sub datums has been entered it is possible to enter the Job Number and End Marker. From a selected Sub Datum proceed as follows in the example below:

#### (a) To insert a Job Number

**SDM NO?** **sdm**

**10** **1** **0**

**SDM 10** **ent**

Select the first Sub Datum in the sequence to be grouped e.g. SDM10

**INS SDM** **ins.**

Press **INS** key.

**INS JOB?** **>**

Press the arrow key to display Insert Job.  
Confirm with **[ENT]**. **ent**

**JOB NO?**Enter a job number.  
Confirm with Enter

1 2 3 4 ent

Job numbers can be entered up to 4 digits eg: 1234

**JOB 1234**

X

Y

Z

The message screen displays JOB 1234 and the axes displays become blank



All the higher numbered Sub Datums are shifted by one place. i.e. The sub datum figures from SDM10 become SDM11, SDM11 become SDM12 etc.

**NOTE:** If SDM199 contains data, then that data will be lost

The Sub Datum containing the job number has no axes data.

Pressing **[ABS/INC]** will exit the function.**(b) To add a Job End statement**

The procedure is similar to entering a Job Number, except as follows:

**SDM NO?**

sdm

15

1 5

**SDM 15**

ent

Select the Sub Datum immediately following the last Sub Datum in the sequence to be grouped e.g. SDM15

**INS SDM**

ins.

Press **[INS]** key. Use the arrow keys to scroll through the message screen to 'Insert Job'

&lt; &gt;

**JOB END**

ent

After INS END is displayed pressing the **[ENT]** key will inset the statement

All the higher numbered Sub Datums are shifted by one place. i.e. The Sub Datum figures from SDM15 become SDM16, SDM16 become SDM17 etc.

**NOTE:** If SDM 199 contains data, then that data will be lost. The Sub Datum containing the job end marker has no axes data.Pressing **[ABS/INC]** will exit the function.**(c) Searching for a Job Number**

The procedure is similar to finding a Sub Datum, except as follows:

**SDM NO?**

sdm

Enter the Sub Datum function by pressing the **[SDM]** key. The message screen prompts for the Sub Datum number.

Pressing the right arrow key changes the message screen to 'JOB NO?'

&gt;

**JOB NO?**

Enter the required job number. Confirm with Enter

1 2 3 4 ent

**JOB 1234****1234?**

Alternatively, the right arrow key will display all the available job numbers.

&gt;

Pressing the **[ENT]** key will make the selected job number active.

ent

abs  
inc

The Sub Datums are searched to find the Job Number.  
If the number is not found the first number will be displayed.

Pressing **[ABS/INC]** at any time will exit the function.

#### 5.4.4 Editing Sub Datums and Job Numbers

To edit the Sub Datums and Job Numbers the **[INS]** and **[DEL]** keys are used. From a selected Sub Datum proceed as follows:

##### (a) To delete a Sub Datum

**SDM NO?**

sdm

2 0

**20**

ent

**SDM 20****DEL SDM?**

del.

Pressing the **[DEL]** key causes the message screen to ask for confirmation if the Sub Datum is to be deleted.

Pressing the **[ENT]** key confirms the deletion.

ent

**NOTE:** Pressing **[CE]** clears the selection, and the **SDM** is retained.

ce

##### EXAMPLE:

Select the Sub Datum to be deleted eg. SDM 20



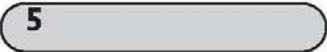








All the higher numbered Sub-Datums are shifted down one place. i.e. The Sub Datum figures from SDM21 becomes the new SDM20, SDM22 becomes SDM21 etc.

##### (b) To delete a Job Number

Follow the above sequence except scroll the message screen, using the arrow keys, to display the Job Number to be deleted instead of the Sub Datum number.

(c) **To insert a SubDatum**

The process for inserting a Sub Datum is similar to inserting a Job Number (Section 5.4.3 (a)) except when the Sub Datum is selected do not press [ > ] to access the Insert Job mode '**INS JOB?**'.

		Select the Sub Datum Function [ <b>SDM</b> ].
		
		
		Select [ <b>INS</b> ] to enter insert mode.
		Again, all the higher numbered Sub Datums will be shifted one place up and any stored data in SDM 199 will be lost.
		Proceed to enter the sub datum as described in Sections 5.4.1 or 5.4.2
		Pressing [ <b>ABS/INC</b> ] will exit the function.

## 5.5 Inch / Millimetres

To change between display in millimetres and in inches, press [**IN/MM**]. The displays will be converted instantly. A light beside the key reminds you which measurement you are using.


Selecting inch or millimetre display applies to all dimensions. For example, if you are in millimetre display, whenever you enter dimensions you should also use millimeters.


When you switch on the E-Series , it will display in the same unit of measurement that you set when you last used the unit.

## 5.6 Datahold (Display Off)

Datahold allows you to disable the E-Series display/keypad but retain power to the measurement transducers and memory circuits. You can use datahold to prevent unauthorised or accidental use of the E-Series whilst unattended.

To select datahold, press  key.

To return to normal use, press the  key.

**NOTE:** If the [**ABS/INC**] key is pressed prior to the second  the E-Series will go into Set-Up mode.

## 5.7 Zero Approach

Zero approach is an indicator to the operator that the machine position is approaching a user definable position on the component. Section 3.3 (r) details the procedure for setting the approach warning window.

When ever any axis display is less than (or equal to) the defined window, then a flashing '0' appears at the left of that axis display. As the axis moves closer to the zero position the flash rate increases. When the axis is closer than 0.05mm (0.002") to zero the "0" stops flashing and remains lit.

## 6.0 Mill Functions

Access to the following mill functions is via the [F] Function Key. Press [<] or [>] to scroll through PCD, ARC, LINE or POLAR options. Press [ent] to select the desired function.

Note:

1. During any stage of these functions, press the key [F] to terminate the current procedure of function, then back to normal display mode
2. During any stage of these functions, press the key [msg/axis] or [A] to change the Message Display mode to Rotary Display mode. This will not terminate the current Mill function. Press [msg/axis] again for the display to return to original procedure of Mull function display.

### Rotary Preset

In the incremental reading, press the [A ] key, E90 can be preset any value using number keys for both DMS and Decimal mode.

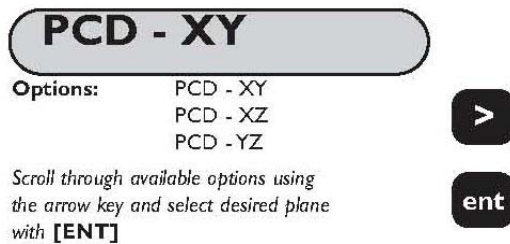
1. Pressing [A] or [CE] key following [A] key, will cancel preset operation.
2. Pressing [ent] key following [A] key, will set current rotary position to zero.
3. Pressing any number key following [A] key and finish with the [ent] key, will entry a new value for current rotary incremental position (preset).

[A] key is only work for **incremental reading** function.

### 6.1 PCD / Bolt Hole Circle

#### Access via the [F] Function key.

The E-Series Mill calculates positions for a series of equally spaced holes around the circumference of a circle or an arc. The message display prompts the user for various parameters it needs to do the calculations. Once the E Series Mill completes the calculations, the axis displays show the distance to each hole. The operator works to Zero for each hole location.





**CENTRE?**

50.0000

X

5

0

ent

50.0000

Z

5

0

ent

&gt;

**DIA?**

40.0000

4

0

ent

&gt;

**NO HOLES**

3

3

ent

&gt;

**ST ANG?**

90.000

9

0

ent

&gt;

**END ANG?**

270.000

2

7

0

ent

&gt;

**HOLE 1**

-50.000

-70.000

Position the X and Y axes until both displays read Zero. This is the first hole location.

**HOLE 2**

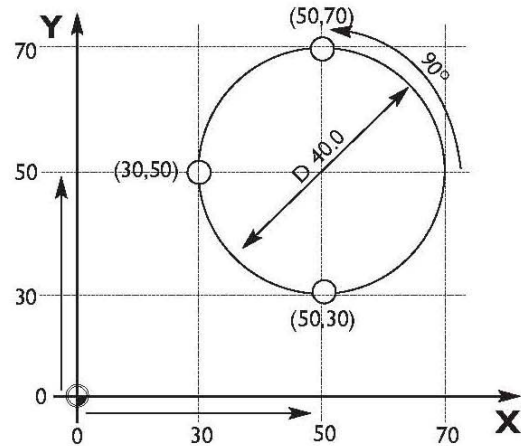
&lt;

&gt;

**EXAMPLE:**

The keystrokes for entering the following bolt hole circle are shown. X and Y axes are assumed at Absolute Zero.

**NOTE:** The 2 axes mill operations are similar to the 3 axes version except that the PCD is not plane selectable.



The bolt pattern will be calculated from the 3 o'clock position, counter-clockwise. The starting angle is the angle from the 3 o'clock position to the first hole. Enter the angle as a negative value if it is given as clockwise from 3 o'clock.

The ending angle is calculated from the 3 o'clock position counter-clockwise to the last hole. If the pattern is a complete circle, enter the same ending angle as starting angle.

**NOTE:**

The numbers appear as negative numbers because the operator works to 0,0. According to the above drawing, the first hole is in a positive position for both X and Y. Therefore, the display will count up to zero when the axes are moved. If these numbers do not appear, exit the PCD function and check the axes readings in X and Y. You will find that the Hole 1 dimensions are the sum of the absolute positions plus the calculated positions. The hole locations will always reference 0,0.

Use the arrow keys to display co-ordinates for subsequent holes in the routine. Work to zero for each hole location.



## 6.2 Arc Contouring

### Access via the [F] Function key.

The E-Series calculates positions for rough machining an arc or radius. The message display prompts the user for various parameters needed to do the calculations. Once the calculations are complete, the axis displays show the co-ordinates, which are point-to-point positions along the arc. The operator moves to Zero for each point position.

It is possible to machine along the inside or outside of the arc. Arc Contouring can be used in three planes: XY, XZ or YZ. The vertical planes (XZ, YZ) are only available if using a 3-axes E-Series Mill.

#### ARC -- XY

Options: ARC - XY  
ARC - XZ  
ARC - YZ



Scroll through available options using the arrow key and select desired plane with [ENT].



#### CENTRE?

2.3700



2

.

3

7



1.4900



1

.

4

9



#### RADIUS?

4.0000

4



#### ST. PT?



1.3200



1

.

3

2



5.3700



5

.

3

7



#### END. PT?



6.2200



6

.

2

2



2.5100



2

.

5

1



#### TOOL DIA



0.5000

.

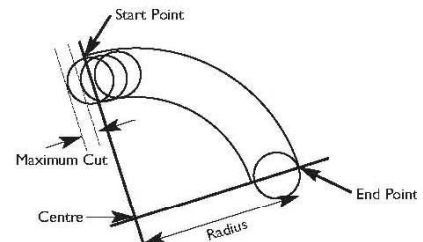
5



### EXAMPLE:

The keystrokes for entering the following arc are shown.

Centre:	X2.370"	Y1.490"
Radius:	4.0"	
Start Point:	X1.320"	Y5.370"
End Point:	X6.220"	Y2.510"
Tool Diameter:	0.5"	
Internal/External:	Internal (RAD-TOOL)	
Maximum Cut:	0.1"	



The ARC function assumes an arc of 180° or less. For a 180° arc, the routine will calculate the arc in a counter-clockwise direction, assuming standard XYZ movement.

### IMPORTANT!

If the parameters entered in START POINT and END POINT are inconsistent, the CENTRE and RADIUS figures override the inconsistent parameters.

**RAD - TOOL** >

Options: RAD - TOOL  
RAD + TOOL > ent

Scroll through available options using the arrow key and select internal or external with [ENT].

The RADIUS + TOOL calculates a toolpath which is compensated to the outside of the Arc. RADIUS - TOOL calculates a toolpath which is compensated to the inside of the Arc.

**MAX CUT?**

0.1000 . I ent

MAXIMUM CUT refers to the distance between machining points. The smaller the increment, the smoother the arc and the more points calculated. The larger the increment, the rougher the arc and the fewer points calculated.

**PT I** >

-1.3904 x

-5.1098 y

The E-Series displays the distance to Point I. The example assumes the operator is at absolute zero. If not, the numbers displayed will be the calculated axes values, plus the values of the current X,Y position relative to 0,0.

**PT 65** <

-5.9950 x

-2.4504 y

Use the arrow key to display co-ordinates for the last point in the arc. This also displays the number of points to be worked in the arc.

**PT 2** < >

Use the arrow keys to display sequential co-ordinates for each point along the arc. Move the work to Zero at each point.

### 6.3 Line Hole Function

Access via the [F] Function key.

Line Hole Function can be accessed in either the Absolute, Incremental or Sub-Datum modes.

To enter the Line Hole function press the key.

Three axes versions will display the message LINE - XY, or XZ or YZ.

**LINE**

**LINE -XY** >

Options: LINE - XY  
LINE - XY  
LINE - YZ ent

Scroll through available options using the arrow key and select your option with [ENT].

**NOTE:** Two axes versions will not offer the axes selection and will directly prompt 'START'. The rest of the sequence is identical.

**START**

10.000 X I 0 ent

10.000 Y I 0 ent

**LENGTH** >

30.000 3 0 ent

**NO. HOLES** >

4 4 ent

**ANGLE?** >

45.000 4 5 ent

**HOLE 1** >

-10.000

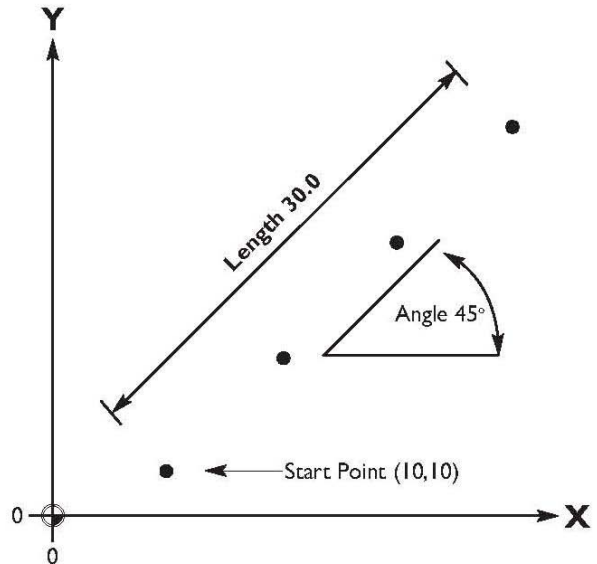
-10.000

Position the X and Y axes until both displays read Zero. This is the first hole location

**HOLE 2** < >

**EXAMPLE:**

The keystrokes for entering the following Line Holes are shown. X and Y axes are assumed at Absolute Zero.





**NOTE:** Length is the total length of the line hole sequence, not the distance between adjacent holes.

## 6.4 Polar Co-ordinates

### Access via the [F] Function key.

The Polar co-ordinate function enables the operator to convert the displayed data from the conventional Cartesian co-ordinates (X,Y,Z) to Polar (Length + Angle) co-ordinates for any plane XY, XZ or YZ.

Pressing the  switches between the two displays.

The  can be selected from the Absolute, Incremental or Sub Datum modes.

-10.0000

20.0000

15.0000

Assume the adjacent Cartesian (X,Y,Z) co-ordinates are displayed

**POLAR- XY**

Options: POLAR-XY  
POLAR-XZ  
POLAR-YZ

Press the **[POLAR]** key to switch to Polar mode.  
Use the arrow keys to scroll between the available planes.

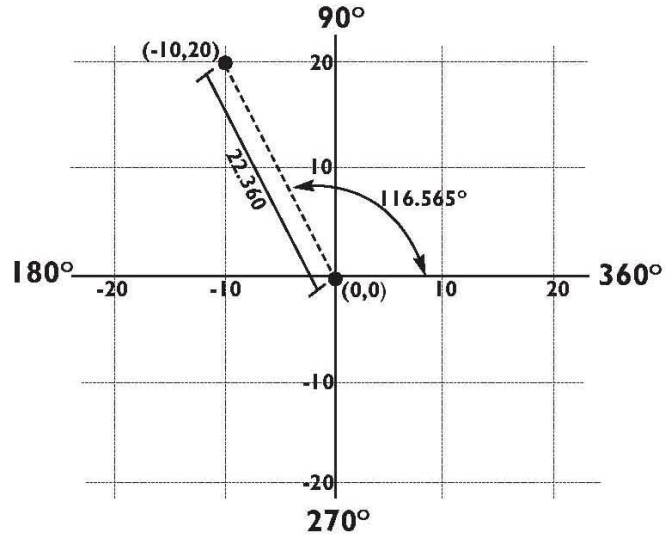
Note: Only (X,Y) is available on the 2 axis version.



Pressing the **[POLAR]** key converts the display from Cartesian into Polar mode.

**EXAMPLE:**

Diagram showing both Cartesian and Polar Plot



**P 22.360**

**A 116.565**

**-15.000**

The letter P appears in the left most display segment. This is the argument or length of the vector. See the diagram for clarification.

The letter A appears in the second axis display. This refers to the angle of the co-ordinates. The angle is displayed to three decimal places.

As the plane X,Y was selected the Z display remains unchanged.

Pressing the **[POLAR]** key again returns the display to Cartesian co-ordinates.

**NOTE:** Pressing the **[Xo]** key in Polar mode will reset the argument to zero, i.e. X and Y both to zero in cartesian co-ordinates.

## 7.0 Troubleshooting

Symptom	Solutions
1 Nothing happens when the unit is switched on. Even the switch lamp is off.	<p>Check that the unit is correctly connected to a working power source. Check the power lead is not damaged.</p> <p>Check the selector switch on the E-Series DSU is set to accept the correct power supply voltage.</p> <p>Check the fuse. Note that if the fuse has blown, this suggests a fault with the power source which must be corrected before the fuse is replaced. (See Section 2.2)</p>
2 The switch lamp is on but nothing happens	Check the cable and connections between the DSU and Display/Keypad.
3 When the unit is switched on the displays are frozen.	<p>This suggests that voltage of the power is too low.</p> <p>Check that the power source is within the limits accepted by the unit. (See Section 2.2)</p>
4 The displays work, but reset from time to time without the keys being pressed.	<p>This suggests either that the voltage of the power source is too low, or that the power source has an intermittent fault.</p> <p>Check the power source as above.</p> <p>Check that all connections are sound.</p>
5 The displays work, but give erratic readings, the last digit jitters or the measurements jump to new figures unexpectedly.	This suggests that there is a poor earth (ground) connection. Both the E-Series unit itself, and the machine on which it is installed, must have proper earth (ground) connections. (See Section 2.1) See also solutions to 6.
6 "SIG FAIL" appears in the display.	<p>Check that the encoder connection is good.</p> <p>Check that there is no damage to the connectors or to the transducer lead. If only one axis is displaying this message, connect the encoder from a working axis into the faulty axis. If the same message appears, the fault is likely to be in the E-Series unit and you should contact your local dealer. N.B. The unit must be switched off then on again to remove the "SIG FAIL" message.</p>
7 The unit will not respond to keys.	Switch the unit off and back on. Check the cable and connections between the DSU and Display/Keypad.
8 Readings are incorrect	<p>Check encoder type to ensure correct selection</p> <p>Check error compensation factors</p> <p>If using segmented error, verify datum position</p>

## 8.0 Cleaning

Disconnect the DSU from the power supply before cleaning.

It is recommended that the DSU and Display/Keypad be wiped over with a lint-free cloth with a non corrosive, non abrasive cleaning fluid.

Do not use compressed air.



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