

C80

Three Axis Digital Readout System



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SPECIFICATIONS

Electrical

EMC and Low Voltage Compliance

BS EN 55022:1998 Class B

BS EN 55024:1998

Power Supply Unit (supplied)

100 - 240V (47 - 63Hz)

External switch-mode

Conforms to Low Voltage Directive

EN 60 950:1992/

A1:1993/ A2:1994/ A3:1996/ A4:1997

Physical

Height

265mm (10.43")

Width

180mm (7.09")

Depth (not including connectors)

50mm (1.97")

Weight

2.9kg (6.38lb)

Environmental

Operating Temperature

0 to 45°C

Storage Temperature

-20 to 70°C

Environmental Conditions

Indoor Use, IP20 (IEC 529)

Relative Humidity

Maximum 80% for temperatures up to 31°C

decreasing linearly to 33% at 45°C

Disposal

At the end of its life, the C80 system should be disposed of in a safe manner applicable to electronic goods.



DO NOT BURN.

The casework is suitable for recycling. If you have any doubt about how to dispose of your unit, please return it to Newall and we will provide this service for you.

Input

Three Spherosyn or Microsyn encoders.

Resolutions

Spherosyn or Microsyn 10

(menu selection)

5µm (0.0002")

10µm (0.0005")

20µm (0.001")

50µm (0.002")

Microsyn 5

(menu selection)

1µm (0.00005")

2µm (0.0001")

5µm (0.0002")

10µm (0.0005")



ISO 9001

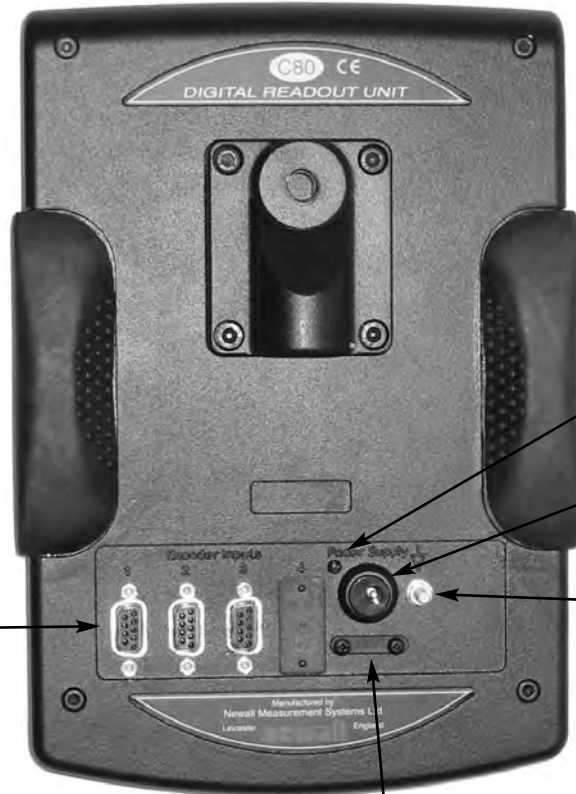


Certificate No FM36096

**NOTE: NEWALL MEASUREMENT SYSTEMS LTD
RESERVES THE RIGHT TO CHANGE SPECIFICATIONS WITHOUT NOTICE.**

CONNECTIONS

- The C80 is suitable for use only with Newall Spherosyn and Microsyn analogue encoders.
- Ensure that all cables are secured to prevent the connectors from dropping into hazardous positions when unplugged, for example the floor or coolant tray.
- Ensure that all cables are routed to prevent them from being caught on moving parts.
- Turn off the power before connecting the encoder, by disconnecting the power supply connector.
- Ensure that the C80 is grounded to the machine before turning on the machine supply.



Encoder Inputs
9-way 'D'
(All plugs should be
screwed finger tight)

**Power
Indicator
Lamp**

**2.5mm
Power Inlet**
15 – 24Vdc ±10%
@0.25A

**Equipotential
Terminal**
(Should be
grounded to
machine)

Cable Anchor
(The power cable
should be secured)

NOTES



**DO NOT CONNECT
THIS UNIT DIRECTLY
TO THE MAINS SUPPLY.**



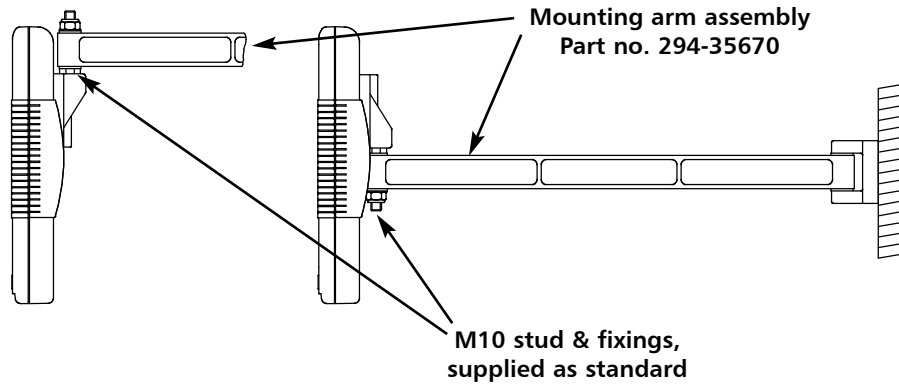
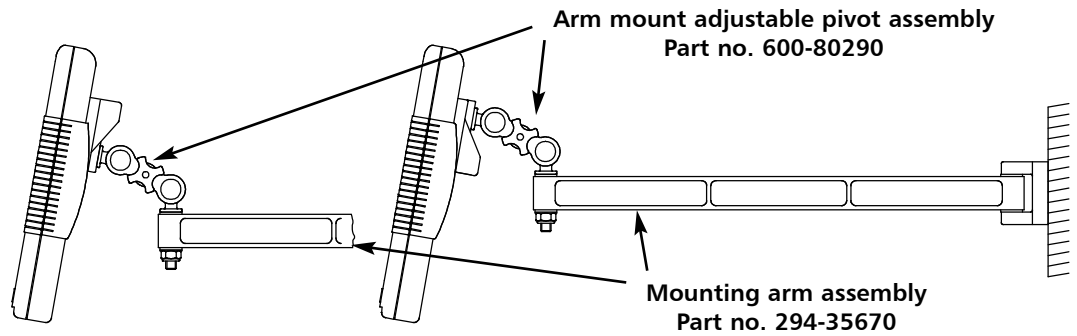
If you have a Newall encoder which is not fitted with D-type connector, an adaptor cable is available.
Part No. 307-60940

Contact your supplier for details.

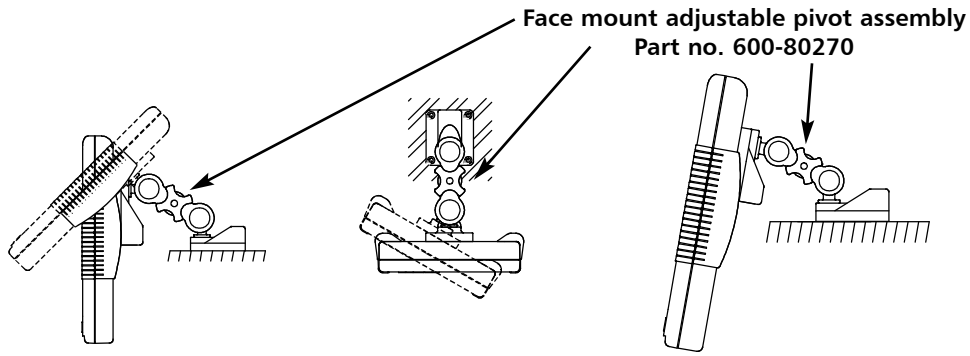
NOTES

MOUNTING

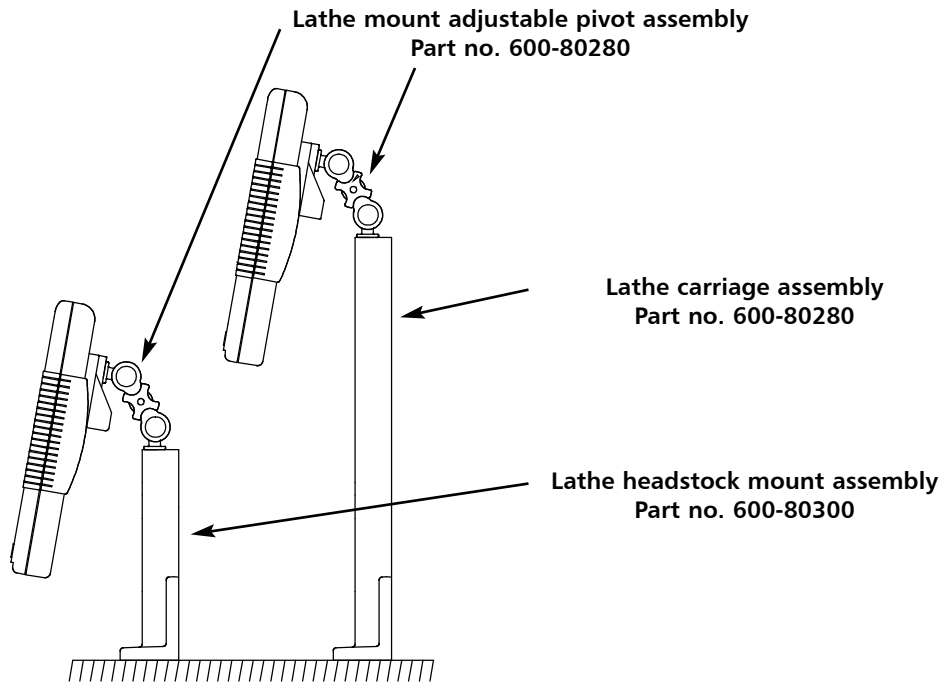
- The C80 can be mounted in a variety of ways, depending on the mounting assemblies purchased with the unit:

Arm Mounting (Non-adjustable)**Arm Mounting (Adjustable)**

Face Mounting (Adjustable)



Lathe Mounting (Adjustable)



NOTES



During **Setup** and **Special Functions**, the displays may show information other than that described on this page.

See the sections on **Setup** and **Special Functions**, later in this guide.



For more information about the use of the **Navigation Keys** and the **Function Keys**, see the sections on **Setup** and **Special Functions**, later in this guide.



During **Setup** and **Special Functions**, the keys may be used for functions other than those described on this page.

See the sections on **Setup** and **Special Functions**, later in this guide.

tip

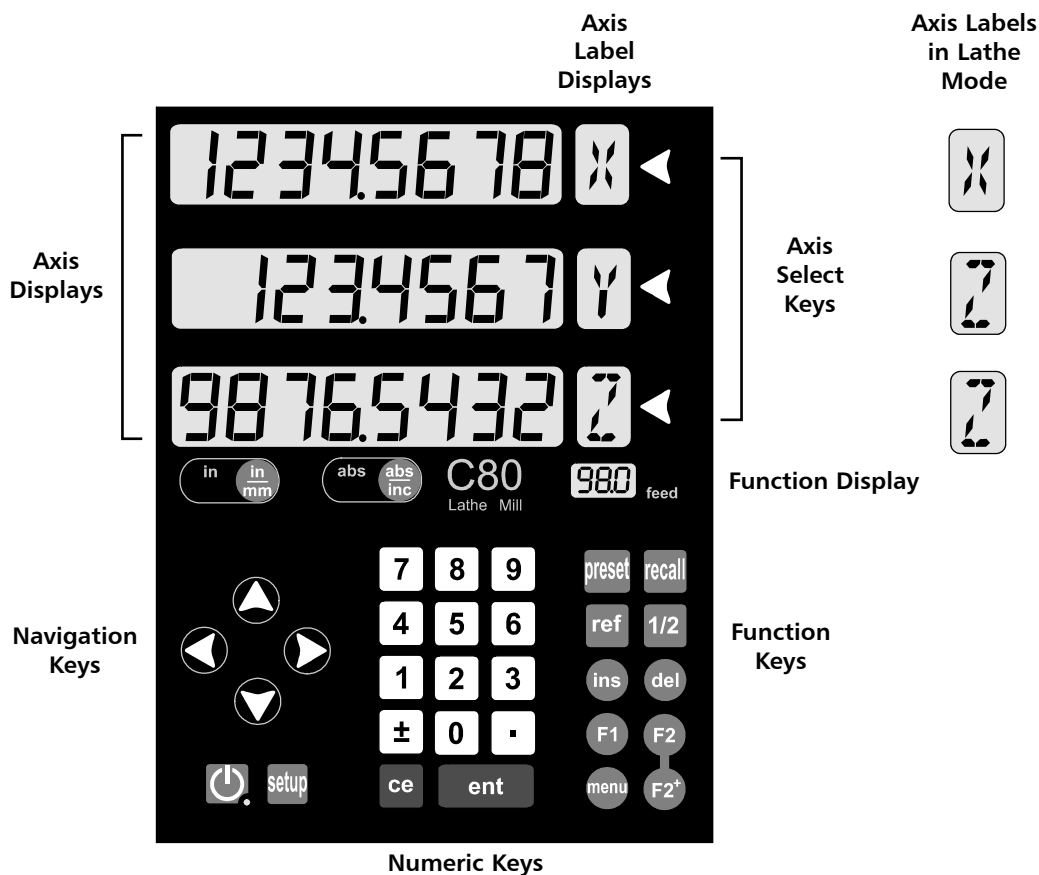
At the beginning of each working session, set the datum in **Absolute Mode**, then switch the C80 to **Incremental Mode**.

By using the C80 in this way, you will be able to return the machine to its absolute datum at any time, simply by switching back to **Absolute Mode**.

OPERATION

Understanding the Displays

- The three **Axis** displays normally show the positions of the X, Y and Z axes.
- The three **Axis Label** displays normally show X, Y and Z, (in Lathe Mode X, Z and Z').
- While any axis is moving, the **Function** display shows the **Feedrate** of the fastest moving axis, and the **feed** indicator next to the display will illuminate.
Feedrate is displayed in mm/sec or inches/min, to a resolution on 0.1.
- The **lathe** and **mill** indicators will be illuminated depending on whether the lathe or mill functions or both, are available.



Using the Keypad

In normal operation, the keys are used as follows:

- Press to toggle the displays between inches and millimetres.
- Press to toggle the C80 between absolute mode and incremental mode.

Absolute Mode

- In this mode, the C80 will display the positions of the three axes relative to a fixed datum.

Incremental Mode

- In this mode, the C80 can be used to display each position relative to the last position. This is also known as **point-to-point** use.

Sleep Mode

- Press to temporarily turn off the displays and the keypad.

While the unit is in **sleep mode**, all settings are preserved, but the positions of the three axes are updated. If any of the axes are moved while in **Sleep Mode**, the centre display will show and if any of the keys are touched, the centre display will show .


STANDARD FUNCTIONS

NOTES

Setting the Datum for Each Axis



Zero










- To zero one display at the current position:


Press the **Select Key**  for the axis to be zeroed. All readings will now be relative to this new zero point.

Preset

- To preset one display to a known fixed value:



Press , then the **Select Key**  for the axis to be preset, then enter the value.

For Example: Press         to enter the value . All readings will now be relative to this new value.

- If you make a mistake while entering a number, pressing  will clear the entry one character at a time.

Recall



- To quickly recall the last preset value for an axis:

Press , then the **Select Key**  for the axis to be preset. All readings will now be relative to this new value.

Using Digifind

In the event that a datum is lost, either due to movement following a power failure, or after a fixed point has been entered by mistake, it can easily be re-established, using **Digifind**.







In order to use **Digifind**, the absolute datum for each axis should be marked permanently on the machine.

- Set the axis close to the marked datum - to within:
6.3mm (0.25") for a Spherosyn encoder or
2.5mm (0.1") for a Microsyn encoder.
- Switch the **C80** to **Absolute** mode.
- Press , then the **Select Key**  for the axis to be restored. The display will update to show the exact distance from the datum.

Using Centerfind

Centerfind works by halving the distance displayed on the selected axis. It works in either **Absolute** or **Incremental Mode**.

For Example: to find the center of a workpiece that is 100mm wide:

- Set the tool to one edge of the workpiece, and press the **Select Key**  for the axis to be centered.
The display shows .
- Set the tool to the other edge of the workpiece. The display shows .
- Press . The display shows .
- Move the tool until the display shows . This is the center of the workpiece.



Using **Zero** redefines the datum, so it will not be possible to restore the old datum.

Using **Preset**, **Recall** or **Centerfind** will change the datum - but in absolute mode, **Digifind** can still be used to return to the old datum.

tip

Do not move the machine when the **C80's** power is off.

When the power is switched back on again, the **C80** uses **Digifind** automatically to re-establish the datum for each axis.



Digifind works only in **Absolute** mode.

tip

Set the **C80** to **incremental** before using **Centerfind**.

By doing this, you will be able to return the machine to its absolute datum afterwards, simply by switching back to **Absolute Mode**.

NOTES

SETUP

Using Setup Mode



Normally, **Setup** needs to be done only once, and it is possible that the factory default settings are suitable for your needs without change.

- To enter **Setup Mode**, first exit from any **Special Function** that is running, then press . The centre display shows .
- Press or to cycle up and down the list of options.

The options are listed below, and each is described in detail on the following pages.

| Option | Default | Display |
|------------------------|---------------------|---------|
| Machine Type | Generic | |
| Encoder Type | all axes: Spherosyn | |
| Encoder Resolution | all axes: 0.005mm | |
| Radius / Diameter | all axes: Radius | |
| Direction | all axes: 1 | |
| Error Compensation | all axes: Off | |
| Linear Compensation | see note 1 | |
| Segmented Compensation | see note 1 | |
| Axis Summing | X and Z' axes | |
| Zero Approach On / Off | all axes: Off | |
| Zero Approach Limit | see note 1 | |
| Taper Display Axis | X axis | |
| Add Function | see note 2 | |
| Delete Function | see note 2 | |
| Reset | | |
| Store | | |

- When you have finished setting all the options, select . Press to store any changes made. The middle display shows: for a few seconds, as your settings are stored. The **C80** exits from **Setup Mode**.
- Alternatively, pressing at any time will exit from **Setup Mode** and abandon any changes.

➔ 1

Not all options will be present, depending on the setting of other options.

For example, the **Zero Approach Limit** option will not be present if **Zero Approach** is turned off.

➔ 2

The **Add Function** and **Delete Function** options allow you to download programmable functions from a PC, connected to the **C80** via a serial lead connected to axis 1. This process is covered in a separate guide, which can be obtained from Newall.

Machine Type

NOTES

This setting allows you to choose whether the special functions for **Mill** or **Lathe** are available.

There are three possible settings:

- Generic Mode all functions available
- Mill Mode mill functions only
- Lathe Mode lathe functions only

- Press the **Select Key**  next to the to cycle between the three settings.

Encoder


Encoder Type

There are three possible settings for each axis:


- Spherosyn
- Microsyn 10
- Microsyn 5


- Press the **Select Key**  next to the , or to cycle between the three settings for each axis.

Encoder Resolution

The **Resolution** settings available for each axis will depend on the encoder, and also on the  setting.

| | Display | | Spherosyn | Microsyn 10 | Microsyn 5 |
|------|---------|---------|-----------|-------------|------------|
| | mm | in | | | |
| 1µm | 0.001 | 0.00005 | | |✓ |
| 2µm | 0.002 | 0.0001 | | |✓ |
| 5µm | 0.005 | 0.0002 |✓ |✓ |✓ |
| 10µm | 0.01 | 0.0005 |✓ |✓ |✓ |
| 20µm | 0.02 | 0.001 |✓ |✓ | |
| 50µm | 0.05 | 0.002 |✓ |✓ | |

- Press the **Select Key**  next to the , or to cycle between the four available settings for each axis.

 The **Encoder** settings must match the actual encoder in use, or the C80 will not display correctly.

NOTES

tip

The **Diameter** setting is useful for lathes, and other turning applications, to display diameter, rather than radius.

tip

The **Direction** setting is quite arbitrary. Set it to whichever makes most sense to the job.



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

tip

After setting up the **Error Compensation**, it is advisable to check its effect in normal operation.



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.

Radius / Diameter

Selecting the **Diameter** setting causes the C80 to display double the actual movement on any axis.

There are two possible settings for each axis:

Radius rAd

Diameter dIA

- Press the **Select Key** next to the , or to cycle between the two settings for each axis.

Direction

The **Direction** setting allows you to match the C80 to the actual direction of travel of any axis.

There are two possible settings for each axis:

dir. I

dir. 0

- Press the **Select Key** next to the , or to cycle between the two settings for each axis.

Error Compensation

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.

There are three possible settings for each axis:

Off Err OFF

Segmented compensation SEG Err

Linear compensation Lin Err

- Press the **Select Key** next to the , or to cycle between the three settings for each axis.

See pages 11 and 12 for details on using Linear and Segmented Error Compensation

If one or more axes are set to **Segmented Compensation**, or **Linear Compensation**, then the next setup option will be to configure the compensation for each of those axes.

- Press .

The middle display changes to Err SET.

Segmented Error Compensation

In this mode, the scale travel for each axis can be broken down into as many as 99 user-defined segments, with each segment having its own correction factor. The correction factors are calculated by the C80, by comparison against known, user-supplied standards.

- 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 , 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 **Select Key** next to the , or . The C80 will re-establish alignment with the correction parameters.

Linear Error Compensation

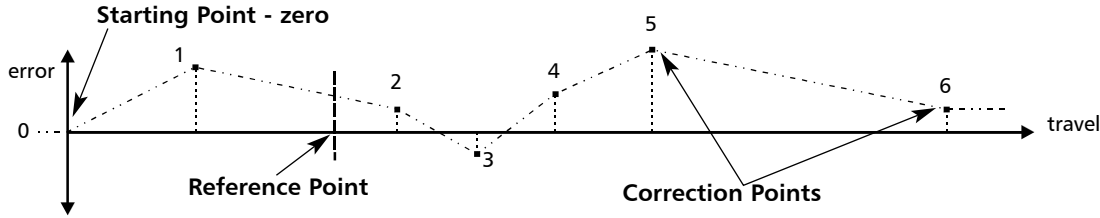
In this mode, a single constant correction factor for each axis can be applied to all displayed measurements. The correction factor is calculated by the user, and specified in parts per million (ppm). Values between -9999 and +9999 are allowed.

Segmented Error Compensation

If one or more axes are set to **Segmented Compensation**, then the following procedure should be followed to configure the compensation for each of those axes.

Identification of Correction Parameters

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



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.

Setting the Correction Points

As you follow the steps below, it is essential to take the following precaution:

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.

- Set one or more axes to **Segmented Compensation** as described on page 10.
The display should show, `Err SET`.
- Press the **select key** (left arrow) next to the `X`, `Y` or `Z` to enter the setup procedure for each axis to be configured.
The display changes to `SET ZERO`.
- 1 Set the machine to the point you have chosen to be **Starting Point**, and zero the high-accuracy standard at this point. Press `ent`.
- 2 The display changes to `Go To`.
Set the machine to the point you have chosen to be **Correction Point 1**. Press `ent`.
- 3 The display changes to `Entsd`.
Enter the distance from the **Starting Point**, as measured by the standard.
For Example: Press `6` `7` `8` `.` `9` `ent` to enter a Correction Point of 678.9.
The C80 will calculate and display the correction factor for this point.
- Press (right arrow) to go to the next point.
Repeat steps 2 and 3 for each Correction Point.
When all correction points have been entered, press `abs inc`.
- 4 The display changes to `GoTo REF`.
Set the machine to the point you have chosen as the **Reference Point**. Press `ent`.
- 5 The display returns to `Err SET`.
If required, press the **Select Key** (left arrow) next to `X`, `Y` or `Z` to enter the setup procedure for another axis.

NOTES

➔ Up to 99 segments can be defined.

➔ To take advantage of **Segmented Error Compensation**, you will need access to a high accuracy standard, such as a laser measuring system.

➔ **Error Compensation** initially defaults to **off**, with no points set.

If **Error Compensation** is set to **Off** after Correction Points have been set, the data is retained, but not applied. When **Segmented Error Compensation** is set to **On** again, the data will be re-applied.

➔ This procedure must be carried out in strict sequence, and in full, to be valid. There must be no reversals in direction.

tip
Pressing **Select Key** (left arrow) at steps 1, 2 or 3, will display the current uncorrected position relative to the Starting Point.

tip
Do not worry about the direction of the standard measurement. eg. 678.9 and -678.9 are treated the same.

tip
Pressing `ce` will clear an entry one character at a time.
After an entry has been completed by pressing `ent`, pressing `ce` will take you back one step at a time.

NOTES

MILL FUNCTIONS

The Functions described here are available when the C80 is in Mill Mode, and also when in Generic Mode.

Bolt Hole Circle

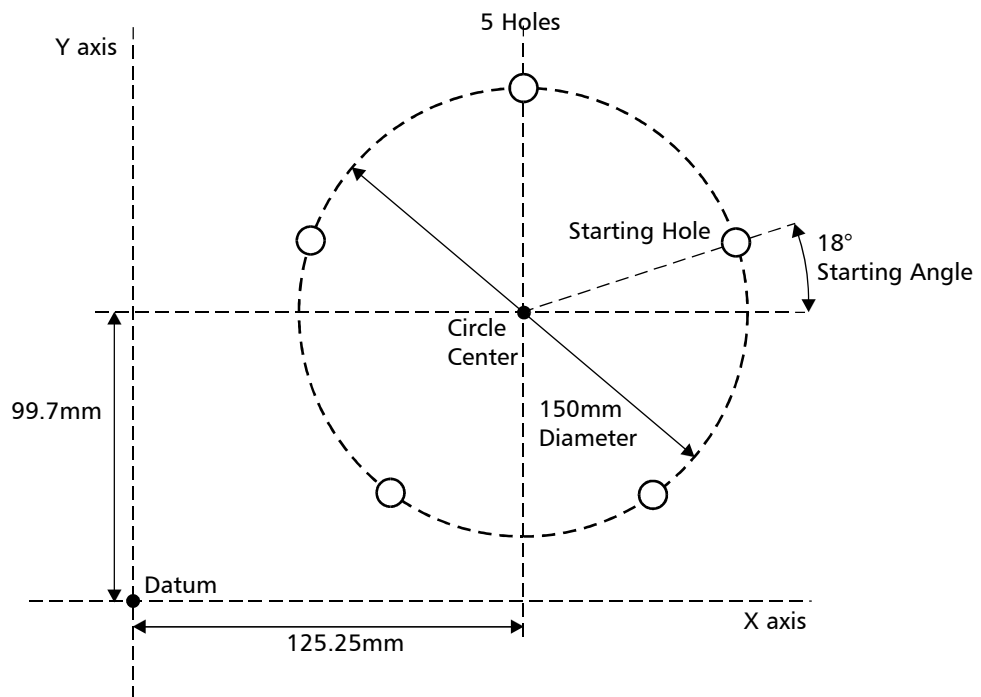


This function is also known as **Pitch Circle Diameter**.

This function will calculate the locations of the holes, given the following parameters:

- 1 Plane (X,Y X,Z or Y,Z)
- 2 Circle Center location
- 3 Circle Diameter
- 4 Number of Holes (up to 99)
- 5 Starting Angle (measured anti-clockwise from 3 o'clock)

Example

**tip**

If you make a mistake while entering a number, pressing **ce** will clear the entry one character at a time.

After an entry has been completed by pressing

ent, pressing the

Select Keys and

will take you backwards and forwards one step at a time.

To turn the function off, finish making any entry, then press the function key again

To Set the Function Parameters:

- Press **F1** or **F2** to turn the function on.
- The function display shows **P**, and the axis displays show in which **Plane** the holes are to be machined.
Press or to cycle between the three settings X,Y X,Z or Y,Z.
Press to move to the next step.
- The function display shows **C**, and the axis displays show the coordinates of the **Circle Center**.
Press the **Select Key** next to the **X**, **Y** or **Z**, to edit each value as required.
For Example: Press **Y** **9** **9** **.** **7** **ent**.
Press to move to the next step.

continued

Bolt Hole Circle continued

- The function display shows d , and the top axis display shows the **Circle Diameter**.
Enter a new value if required.
For Example: Press 1 5 0 **ent**.
Press \blacktriangleright to move to the next step.
- The function display shows n , and the top display shows the **Number of Holes**.
Enter a new value if required.
For Example: Press 5 **ent**.
Press \blacktriangleright to move to the next step.
- The function display shows A , and the top display shows the **Starting Angle**.
Enter a new value if required.
For Example: Press 1 8 **ent**.
Press \blacktriangleright to finish setting the parameters.
- The function display shows $0!$.

To Machine the Holes:

The two axis displays for the selected plane now show the distance to the first hole.

- To position the tool ready for machining the hole, move the axes until both displays read zero.

*The **function display** shows the number of the hole to be machined.*

- Press the **Navigation Keys** \blacktriangleleft or \blacktriangleright to move between the holes, or enter the hole number.
For Example: Press 4 **ent** to move directly to hole 4.
- When all holes have been machined, press $F1$ or $F2$ to turn the function off.



The axis that is **not** involved in the **pitch circle diameter** function will read as normal.

NOTES

Axis Summing



The conventional way to set up a lathe is:

X Axis – cross travel

Z Axis – longitudinal travel

Z' Axis – compound travel.

If the **Machine Type** is set to **Generic**, then the axes will be labelled:

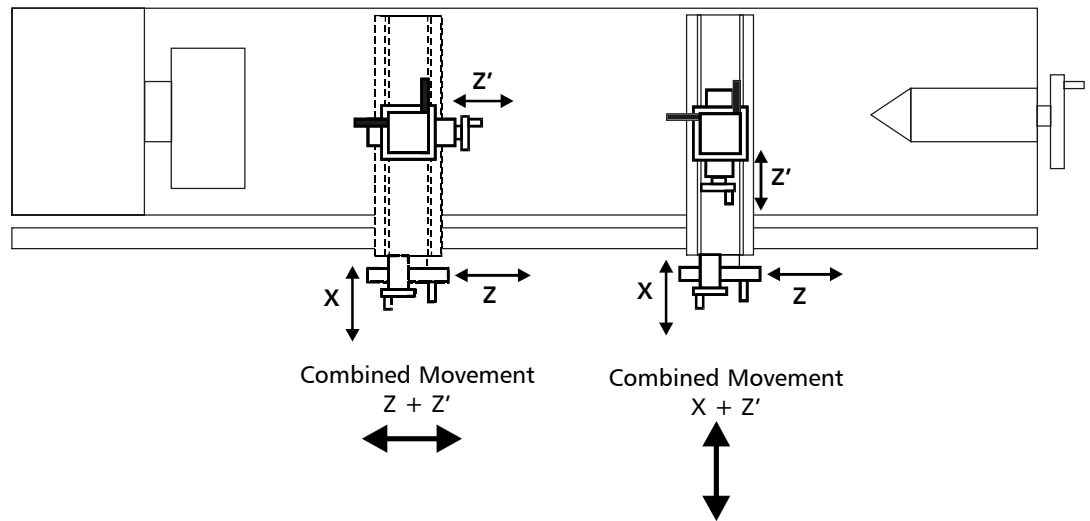
Axis 1 – X

Axis 2 – Y

Axis 3 – Z

This function allows the movement of the Z' axis to be added to the movement of either the X axis or the Z axis.

The **Summing** Function is useful when the compound is set to align with either of those two axes. If the compound is set at an angle, see the next section on the **Vectoring** Function.



To Set the Function Parameters:

The selection of which axes are to be added together is carried out in **Setup Mode**.

- To enter Setup Mode, first exit from any **Special Function** that is running, then press **setup**.
The centre display shows **SET UP**.
- Press **▲** or **▼** to choose **Add it ion**.
Press **▲** or **▼** to choose which axes are to be added: **X+Z'** or **Z+Z'**.
- If necessary, change the **Direction** of the Z' axis, so that the axes do add, rather than subtract. (See the section on Setup, Direction, earlier in this guide.)
- Press **▲** or **▼** to choose **STOR E**, then press **ent** to store the change.

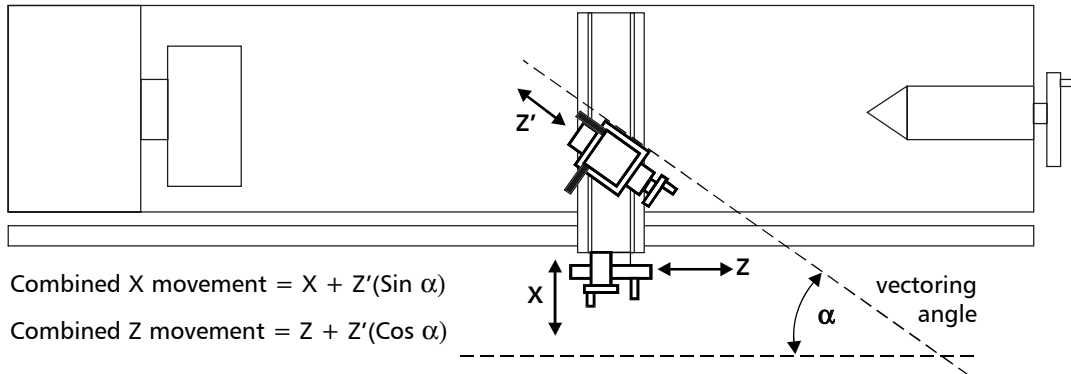
To Use the Function:

- Press **F1** or **F2** to turn the function on.
- The X display shows the X axis as normal.
The Z display shows the Z axis as normal.
The Z' display shows the **Sum** of the two selected axes.
Any of the axes can be zeroed or preset in the usual way. The **Sum** display will be altered to take account of the new value.
- Press **F1** or **F2** to turn the function off.

Vectoring

This function allows the movement of the X and Z axes to be combined with the angle of the compound. This function is available only on 3-axis units.

The **Vectoring** Function is useful when the compound is set at an angle. If the compound is set to align with either the X or the Z axes, see the previous section on the **Summing** Function.



To Set the Function Parameters:

- Press **F1** or **F2** to turn the function on.
- The top display shows **ANGLE**, and the middle display shows the **Vectoring Angle**. Enter a new value if required.
For Example: Press **3** **5** **ent**, or just press **ent** to accept keep the existing setting.

To Use the Function:

- The X display shows the combined X axis movement.
 The Z display shows the combined Z axis movement.
 The Z' display shows the Z' axis as normal.
 Any of the axes can be zeroed or preset in the usual way. The **Vectoring** displays will be altered to take account of the new value.
- Press **F1** or **F2** to turn the function off.

NOTES



The conventional way to set up a lathe is:

- X Axis – cross travel
- Z Axis – longitudinal travel
- Z' Axis – compound travel.

If the **Machine Type** is set to **Generic**, then the axes will be labelled:

- Axis 1 – X
- Axis 2 – Y
- Axis 3 – Z


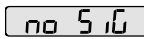
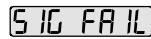
tip

If you make a mistake while entering a number, pressing **ce** will clear the entry one character at a time.

To turn the function off, finish making any entry, then press the function key again

TROUBLESHOOTING

NOTES

| Symptom | Solutions |
|---|---|
| The display is blank. | <ul style="list-style-type: none"> The C80 may be in Sleep Mode. Press . Check that the power supply is correctly connected to a working mains outlet. Check that the power supply cables are not damaged. Check that the power supply voltage is 15-24Vdc \pm10%. Disconnect all encoder cables. A defective encoder can prevent the C80 from working. |
| The display works, but resets from time to time without any keys being pressed. | <ul style="list-style-type: none"> This suggests either that the supply voltage is too low, or that the power supply or mains supply has an intermittent fault. Check that the power supply voltage is 15-24Vdc \pm10%. Check that all connections are sound. |
| The display works, but gives erratic readings, the last digit jitters or the measurements jump to new figures unexpectedly. | <ul style="list-style-type: none"> This suggests that there may be a poor earth (ground) connection. Both the C80, and the machine on which it is installed, must have proper earth (ground) connections. (see page 3) There may be a problem with the encoder (see below). |
|  or  appears in the display. | <ul style="list-style-type: none"> This indicates that the unit is not receiving a proper signal from the encoder. Check that the encoder connections are sound. Check that there is no damage to the connectors or to the encoder. Switch the C80 off and back on again. Swap the encoder to another axis to confirm whether the encoder or the C80 is at fault (see tip). |
| The unit will not respond to any key presses. | <ul style="list-style-type: none"> Disconnect the C80 from its power supply, wait 15 seconds then reconnect. |
| Readings are incorrect | <ul style="list-style-type: none"> Check Encoder Type to ensure correct selection. Check the Radius / Diameter setting. The Diameter setting will cause the axis to read double. Check Error Compensation factors. If using Segmented Error Compensation, verify the datum position. Swap the encoder to another axis to confirm whether the encoder or the C80 is at fault (see tip). Check that there is no damage to the encoder or its cable. Check that the encoder is fixed firmly and aligned correctly, as described in the encoder manual. Check that there is no binding on the scale. With the scale brackets slightly loosened, you should be able to slide the scale back and forth with minimal resistance. If you have a Spherosyn scale, check that the scale is not bent, by removing it and rolling it on a flat surface. |

If the solutions suggested above do not solve your problem, contact Newall for further instruction.

CLEANING

- Disconnect the power supply from the C80 before cleaning.
- Do not use corrosive or abrasive cleaning materials.
- Do not use compressed air.
- Apply a small amount of mild soap to a lint-free cloth. Use this to wipe over the case and keypad, taking care not to allow fluid into the connectors.

tip

Providing the machine has not been moved more than:
 6.3mm (0.25") for a Spherosyn encoder or
 2.5mm (0.1") for a Microsyn encoder
 the datum position will not be lost by switching the power off and back on again.

tip

When swapping encoders to trace a fault:

1

Check that two axes are set to the correct encoder types.

2

Move the encoder from the malfunctioning axis to a working axis.

If the fault stays with the same encoder, then the encoder is at fault. If the fault stays with the same axis, the C80 is at fault.



FOLLOW THESE INSTRUCTIONS CAREFULLY TO AVOID DAMAGE TO THE C80.