NEWALL

NEWALL MEASUREMENT SYSTEMS LTD

C70 Digital Readout Display

CONTENTS

NOTES

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 **C70** system should be disposed of in a safe manner applicable to electronic goods.

⚠ **DO NOT BURN**.

The casework is suitable for recycling. Please consult local regulations on disposal of electrical equipment.

Input

Two or 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")

CE

ISO 9001

Certificate No FM36096

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

CONNECTIONS

- The **C70** 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 **C70** is grounded to the machine before turning on the machine supply.

NOTES

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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. 307-80980

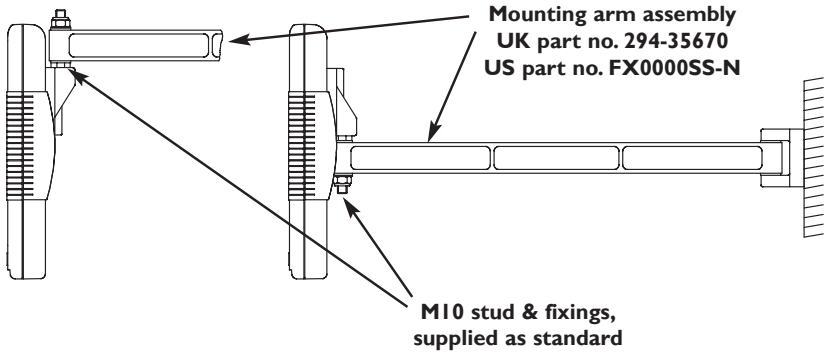
Contact your supplier for details.

NOTES

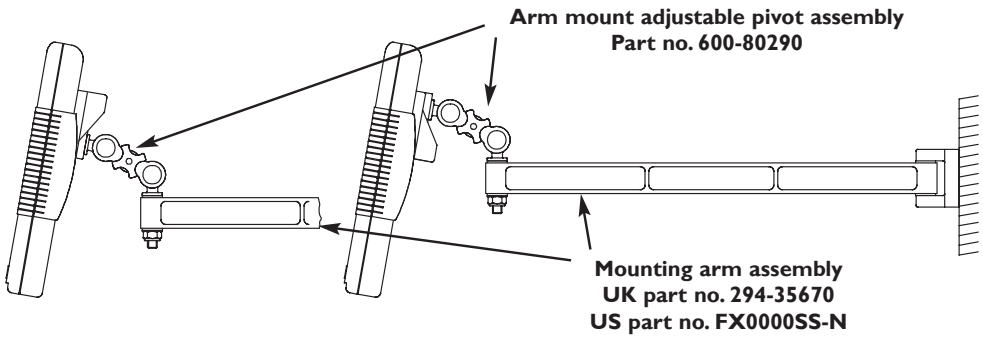
MOUNTING

- The **C70** can be mounted in a variety of ways, depending on the mounting assemblies purchased with the unit:

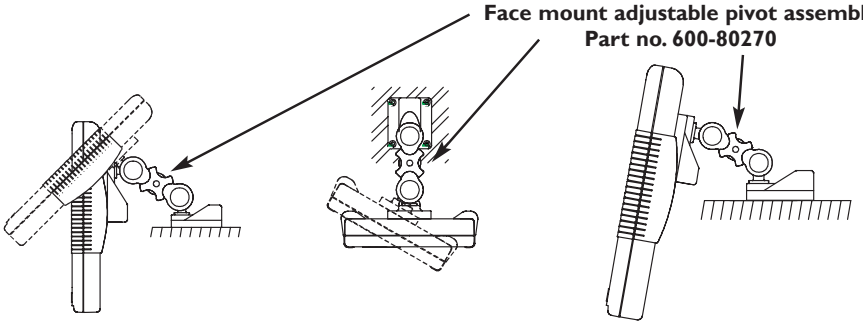
Arm Mounting (Non-adjustable)



Arm Mounting (Adjustable)

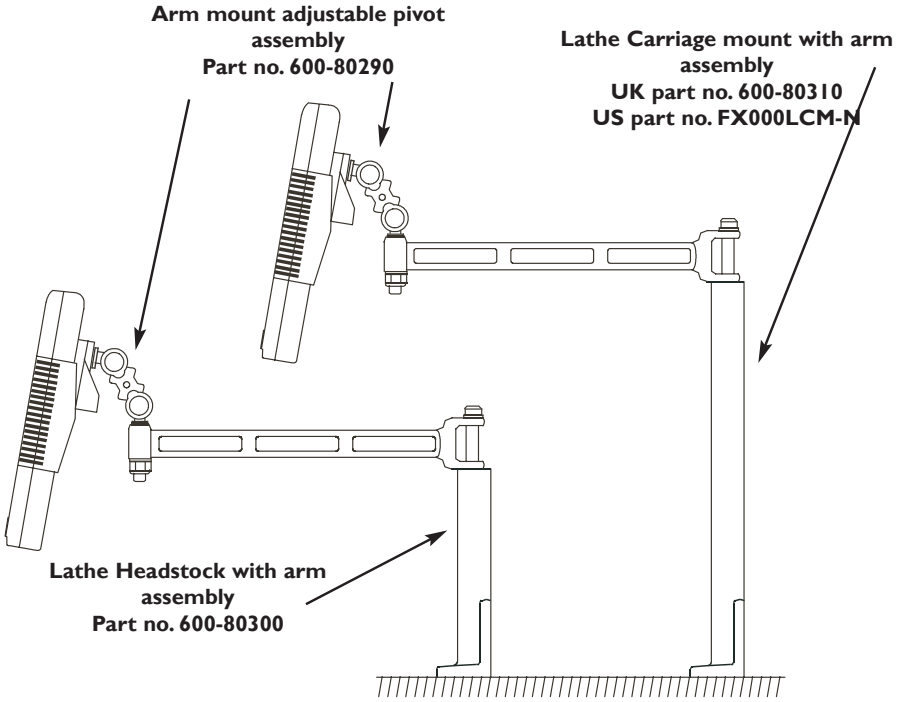


Face Mounting (Adjustable)

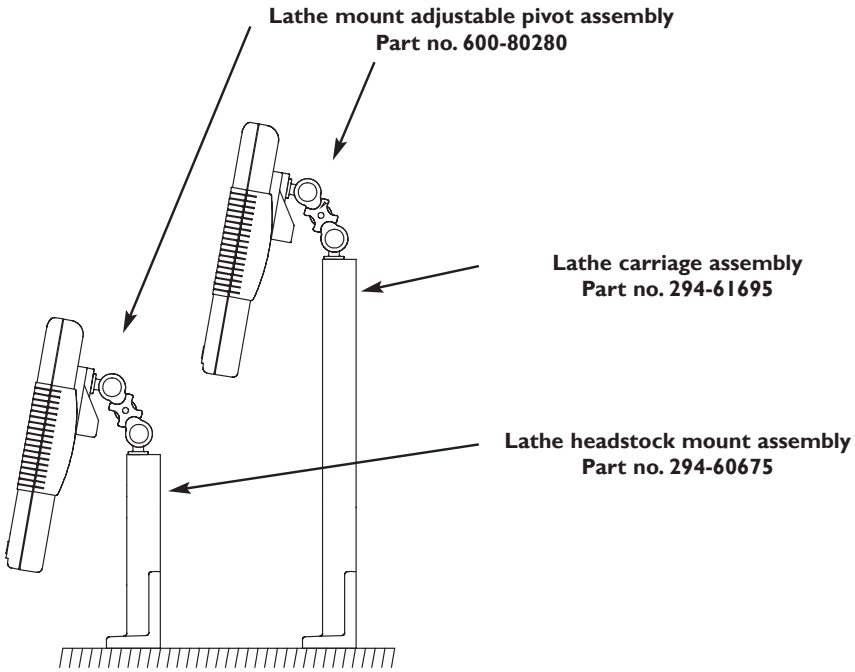


NOTES

Lathe Mounting (Adjustable) With Arm Assembly



Lathe Mounting (Adjustable)

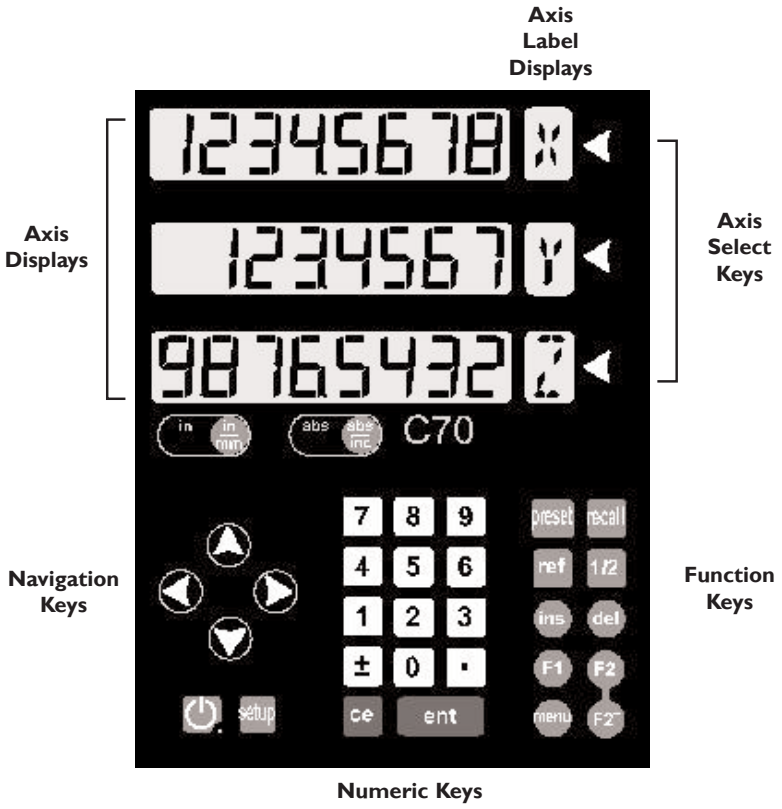


NOTES

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 .



Using the Keypad

In normal operation, the keys are used as follows:

- Press in/mm to toggle the displays between in **inches** and mm **millimetres**.
- Press abs/inc to toggle the **C70** between abs **absolute mode** and inc **incremental mode**.

Absolute Mode

- *In this mode, the* **C70** *will display the positions of the three axes relative to a fixed datum.*

Incremental Mode

- *In this mode, the* **C70** *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 dISPLACd, and if any of the keys are touched, the centre display will show touchEd.

tip

At the beginning of each working session, set the datum in **Absolute Mode**, then switch the **C70** to **Incremental Mode**.

By using the **C70** 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**.

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.

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

Preset

- *To preset one display to a known fixed value:*

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

  For Example: Press [preset] ◀ [±] [1] [9] [·] [6] [ent] to enter the value -19600. All readings will now be relative to this new value.

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

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

Recall

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

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

tip

Do not move the machine when the **C70's** power is off.

When the power is switched back on again, the **C70** uses **Digifind** automatically to re-establish the datum for each axis.

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 **C70** to **Absolute** mode.
- Press [ref], then the **Select Key** ◀ for the axis to be restored. The display will update to show the exact distance from the datum.

Digifind works only in **Absolute** Mode.

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 0.000
- Set the tool to the other edge of the workpiece. The display shows 100.000.
- Press [1/2] ◀. The display shows '0' in all axes. Press the **Select Key** for the axis to be centered.

  The display shows 50.000.
- Move the tool until the display shows 0.000. This is the center of the workpiece.

tip

Set the **C70** 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 will be suitable and will not require change.

- 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 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
Encoder Type	all axes: Spherosyn	SPHEroSn
Encoder Resolution	all axes: 0.005mm	0.005
Radius / Diameter	all axes: Radius	rAd
Direction	all axes: 1	dir. 1
Error Compensation	all axes: Off	Err OFF
Linear Compensation	see note 1	
Segmented Compensation	see note 1	
Zero Approach On / Off	all axes: Off	ZEr0 OFF
Zero Approach Limit	see note 1	
Reset		rESEt
Store		StOrE

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.

- When you have finished setting all the options, select StOrE.
  Press ent to store any changes made.
  The middle display shows StOrEd for a few seconds, as your settings are stored.
  The **C70** exits from **Setup Mode**.
- Alternatively, pressing setup at any time will exit from **Setup Mode** and abandon any changes.

NOTES

Encoder Type

There are three possible settings for each axis:

Spherosyn	SPHEroSn
Microsyn 10	uSn 10
Microsyn 5	uSn 5

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

Encoder Resolution

*The **Resolution** settings available for each axis will depend on the encoder type, and also on the* in/mm *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 X, Y or Z to cycle between the four available settings for each axis.

The **Encoder** settings must match the actual encoder in use, or the C70 will not display correctly.

NOTES

Radius / Diameter

*Selecting the **Diameter** setting causes the **C70** 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 X, Y or Z to cycle between the two settings for each axis.

tip

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

Direction

*The **Direction** setting allows you to match the **C70** to the actual direction of travel of any axis.*

There are two possible settings for each axis:

dir. 1

dir. 0

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

tip

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

NB, Direction is dependent on where the scale is mounted

Error Compensation

Errors can result from a number of sources, including machine wear. Where the degree of error increases linearly along the length of travel of the scale, 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

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

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

If one or more axes are set to **Segmented Error Compensation**, or **Linear Error 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.

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 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 **C70** 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 CE, and the **C70** 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 X, Y or Z. The **C70** will re-establish alignment with the correction parameters.

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.

Linear Error Compensation

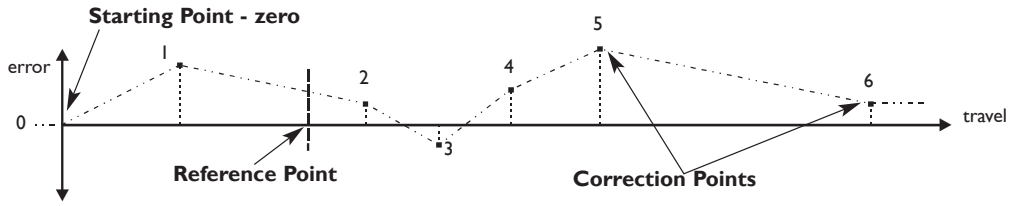
In this mode, a single constant correction factor for each axis can be applied to all displayed measurements. The correction factor is calculated by the user, and specified in parts per million (ppm). Values between -9999 and +9999 are allowed.

Segmented Error Compensation

If one or more axes are set to **Segmented Error 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** ◀ next to the X, Y or Z to enter the setup procedure for each axis to be configured.

  The display changes to `SEt 2Er0`.

1 Set the machine to the point you have chosen to the **Starting Point**, and zero the high-accuracy standard at this point. Press **ent**.

2 The display changes to `9o to 1`.

Set the machine to the point you have chosen to be **Correction Point 1**. Press **ent**.

3 The display changes to `EntSd 1`.

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 **C70** will calculate and display the correction factor for this point.

- Press ▼ 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 `9oto 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** ◀ next to X, Y or Z to enter the setup procedure for another axis.

NOTES

Up to 99 segments can be defined per axis

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** ◀ 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

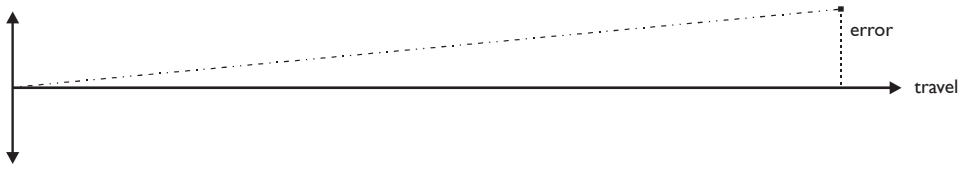
Pressing **ce** will clear an entry one character at a time.

After an entry has been completed by pressing **ent**, pressing **ce** will take you back one step at a time.

NOTES

Linear Error Compensation

A single constant correction factor for each axis is applied to all displayed measurements.



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

Calculating the Correction Factor

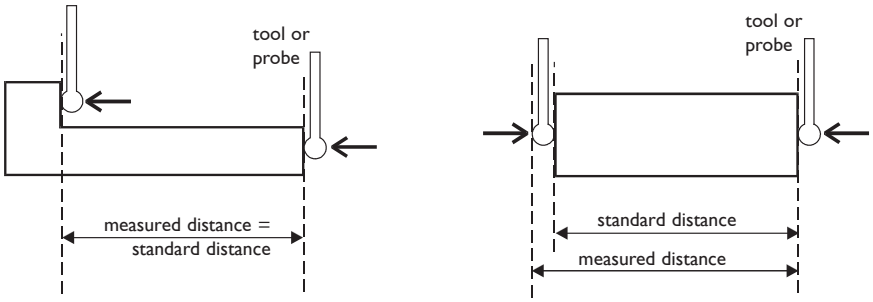
The **Correction Factor** cannot be established while in **Setup Mode**.

Carry out the measurements in **Normal Operating Mode**, then enter **Setup Mode** to set the **Correction Factor**.

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

Either: Use a stepped standard, and approach each edge from the same direction.

Or: If you must approach each edge from opposite directions, then subtract the width of the tool or measuring probe from the value displayed on the **C70.**



Only values between -9999 and 9999 are allowed.

tip

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

For Example: *To check the scale against a standard which is exactly 500mm wide:*

- Set the tool or proble to one edge of the standard, and press the **Select Key** for the axis to be corrected.
  The display shows 0000.
- Set the tool or probe to the other edge of the standard.
  The display shows , 499800.
- Calculate the correction factor:
  error = 500.000 - 499.8 = 0.2mm

  $$\text{Correction Factor} = \frac{\text{error}}{\text{standard}} = \frac{0.2}{500} \times 1{,}000{,}000 = +400 \text{ ppm (parts per million)}$$

  This value displayed on the C80 needs to be increased to match the standard, so this is a positive correction factor. If the display had shown 500.2 for the same standard, the correction factor would be negative -400 ppm.

Setting the Correction Factor

- Set one or more axes to **Linear Error Compensation** as described on page 10
  The display should show, Err SEt.
- Press the **Select Key** next to the X, Y or Z to enter the setup procedure for each axis to be configured.
  The display shows LC 0, or a previously entered value.
- ***For Example:*** Press 4 0 0 ± ent to enter a **Correction Factor** of -400 ppm.
- Press ent again.
  The display returns to Err SEt.
  If required, press the **Select Key** next to the X, Y or Z to enter the setup procedure for another axis.

NOTES

Zero Approach

*This setting provides a visual indication that one or more axes are approaching zero, by flashing the **Axis Label** display.*

For Example: If **Zero Approach** is turned on for the X axis, with a **Zero Approach Limit** of 1.25, then the axis label display will flash for values

from [-1250] X to [1250] X

- When the axis is within:
  0.05mm (0.002") for a Spherosyn encoder or
  0.025mm (0.001") for a Microsyn encoder
  the display will stop flashing.

Zero Approach On / Off

There are two possible settings for each axis:

Zero Approach On [2Er0 On]

Zero Approach Off [2Er0 OFF]

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

Zero Approach Limit

This setting allows you to choose how close to zero the axis needs to be for the display to flash.

- Press ▼ after setting **Zero Approach On / Off**.
  The displays for the selected axes change to [0000] or a previously entered value.
- Press the **Select Key** ◀ next to the X, Y or Z to choose which axis to edit.
- ***For Example:*** Press [1] [.] [2] [5] [ent] to enter a limit of 1.25.
- If required, press the **Select Key** ◀ next to the X, Y or Z to enter the limit for another axis.

NOTES

Reset

This will restore all settings to their factory defaults, and should, therefore, be used only if absolutely necessary.

The middle display shows: rESEt

- Press ent or the **select key** next to the r to select the **Reset** function.
- While all the stored settings are being erased, the top display shows: CLEAr InG, and the middle display shows 0, 00 etc.
- When **Rese**t has finished the middle display returns to: rESEt
  The **C80** remains in **Setup Mode**.

USE RESET WITH CAUTION.
ALL STORED SETTINGS WILL BE LOST IF THIS FUNCTION IS USED

Store

*This will store all settings and exit to **Normal Operating Mode**.*

The middle display shows StOrE

- Press ent or the **select key** next to the S to select the **Store** function.
- The middle display shows StOrEd for a few seconds, as your settings are stored.
  The **C70** exits from **Setup Mode**.
- Alternatively, pressing setup at any time will exit from **Setup Mode** and abandon any changes.

ALL RESTORE CHANGES ARE SAVED IMMEDIATELY

Reset will take approximately15 seconds

TROUBLESHOOTING

Symptom	Solutions
The display is blank.	• The **C70** 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 15Vdc ±10%. • Disconnect all encoder cables. A defective encoder can prevent the **C70** from working. • Check power supply lead on rear of C70 display to ensure that is it illuminated
The display works, but resets from time to time without any keys being pressed.	• 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 15Vdc ±10%. • 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.	• This suggests that there may be a poor earth (ground) connection. • Both the **C70** , 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).
no SIG or SIG FAIL **appears in the display.**	• 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 **C70** off and back on again. • Swap the encoder to another axis to confirm whether the encoder or the **C70** is at fault (see **tip**).
The unit will not respond to any key presses.	• Disconnect the **C70** from it's power supply, wait 15 seconds and then reconnect.
Readings are incorrect	• 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 **C70** 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 Spherosyn / Microsyn Installation 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.

NOTES

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 does not follow with the encoder the C70 is at fault

CLEANING

- Disconnect the power supply from the **C70** 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.

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FOLLOW THESE INSTRUCTIONS CAREFULLY TO AVOID DAMAGE TO THE **C70.**

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