NEWALL

DP1200 Digital Readout

User Manual
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Specification

Electrical

BS EN 55022:1998 Class B
BS EN 55024:1998

Input to Power Supply Unit (Supplied)
100-240V (47-63Hz)
External switch-mode - Output voltage 15VDC
Input Voltage to DP1200 15-24VDC ±10%
Conforms to Low Voltage Directive

Physical

Height 215mm (8 ½“)
Width 310mm (12 ¼“)
Depth 68mm (2 ¾“)
Weight 3.5kg (7 ¾lb)

Environment

Climatic Range
Storage Temperature -20°C (-4°F) to 70°C (158°F)
Working Temperature -10°C (14°F) to 50°C (122°F)
Working Humidity 95% R.H. at 31°C (87.8°F)

IP-Ingress Protection
IP54 Panel Mount
IP40 Stand Alone

Accreditation

Disposal

At the end of its life, you should dispose of the DP1200 system in a safe manner applicable to electrical goods
Do not burn
The casework is suitable for recycling. Please consult local regulations on disposal of electrical equipment

Input & Resolutions

Encoder inputs 1, 2 & 3 can be used with Spherosyn 2G and Microsyn 2G analogue encoders.
Encoder input 4 can be used with Spherosyn 2G / Microsyn 2G or 5v TTL Quadrature, depending on the model ordered.

Note: It is possible to upgrade the DP1200 from a 2 or 3 Axis up to 4 Axes, See Page 26 - Unlock Axis.

Display Resolution Options

Spherosyn 2G or Microsyn 2G 10µm
5µm (0.0002“) 1µm (0.00005“)
10µm (0.0005“) 2µm (0.0001“)
20µm (0.001“) 5µm (0.0002“)
50µm (0.002“) 10µm (0.0005“)

Microsyn 2G 5µm

Newall Measurement Systems Limited reserves the right to make changes to this specification without notice.
Mounting Options

This section details the various mounting options for the DP1200, both the standard version and the panel mount version.

Mill Mount (Non Adjustable)

Lathe Mount (Non Adjustable)

Adjustable Mount Options

Panel Mount Option
This chapter details the cable connections for the DP1200.

**Important Information**

Encoder inputs 1, 2 & 3 can be used with Spherosyn 2G and Microsyn 2G analogue encoders. Encoder input 4 can be used with Spherosyn 2G / Microsyn 2G or 5v TTL Quadrature, depending on the model ordered.

Please ensure that:

- All cables are secured to prevent the connectors from dropping into hazardous positions (for example the floor or coolant tray) when unplugged.
- All cables are routed to prevent them from being caught on moving parts.
- Before the machine power is turned on, the DP1200 is grounded to the machine, using the braided grounding lead provided.
- The power has been disconnected, before you connect the encoder(s).

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

If the Newall encoder has a round 7 pin connector, an adaptor cable (part no. 307-80980) is required. Contact your local Newall supplier for details.

**Connections**

- Encoder input connection 1, 2, 3 or 4 according to model
- Probe connection
- Aux. / RS232 output
- External reference connection
- Cable clamp
- External PSU input
- Cabinet equipotential terminal for grounding to machine
This section explains how to interpret the display and use the keypad.

### Understanding The Display

- **Power LED**
- **Axis 1**
- **Axis 2**
- **Axis 3**
- **Axis 4**

![Image of the display and keypad](image)

### Understanding The Keypad

- **Axis Selection Key**
  - Switches between Zero and Axis Preset modes
- **Numeric Keys**
  - Switches between Absolute and Incremental modes
- **Enter Key**
  - Switches between Inch and mm display
- **Clear Numeric Entry**
  - Soft Keys (left, middle & right)
- **Centre Find**
  - Navigation Keys
- **Undo Key**
  - Sleep Key

### Invalid Key Warning

The DP1200 is equipped with a visual and audible indication to warn the user when an invalid key has been pressed.

If an invalid key has been pressed, all the displays will flash on and off twice along with a double beep tone. No operation will change until a correct key for that operation has been pressed.
Quick Navigation of Axes 1, 2, 3 & 4 (Analogue) Setup

The DP1200 supports a quick navigation feature using the LCD screen and numeric keys, enabling the user to navigate to specific areas without scrolling through each and every menu. This is particularly useful when navigating to one specific item.

Below are the quick navigation keys for the setup of Axes 1, 2, 3 or 4 dependant on model (where navigation to the main axis setup menu is completed).

<table>
<thead>
<tr>
<th>Numeric Key</th>
<th>Setup Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Legend Setup</td>
</tr>
<tr>
<td>2</td>
<td>Encoder Setup</td>
</tr>
<tr>
<td>3</td>
<td>Display Resolution Setup</td>
</tr>
<tr>
<td>4</td>
<td>Direction Setup</td>
</tr>
<tr>
<td>5</td>
<td>Radius / Diameter Setup</td>
</tr>
<tr>
<td>6</td>
<td>Zero Approach Setup</td>
</tr>
<tr>
<td>7</td>
<td>Error Compensation Setup</td>
</tr>
</tbody>
</table>
Quick Navigation of Axis 4 Setup (Digital Linear)

The quick navigation feature for the setup of axis 4 digital linear is detailed below (where navigation to the main axis setup menu is completed).

<table>
<thead>
<tr>
<th>Numeric Key</th>
<th>Setup Function</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Legend Setup</td>
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<tr>
<td>2</td>
<td>Encoder Setup</td>
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<tr>
<td>3</td>
<td>Reference Source Setup</td>
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<tr>
<td>4</td>
<td>Resolution Setup</td>
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<tr>
<td>7</td>
<td>Display Resolution Setup</td>
</tr>
<tr>
<td>8</td>
<td>Direction Setup</td>
</tr>
<tr>
<td>9</td>
<td>More Options</td>
</tr>
<tr>
<td>Press Key 9</td>
<td>Back to Previous Options</td>
</tr>
<tr>
<td>1</td>
<td>Radius / Diameter Setup</td>
</tr>
<tr>
<td>2</td>
<td>Signal Checking Setup</td>
</tr>
<tr>
<td>3</td>
<td>Zero Approach Setup</td>
</tr>
<tr>
<td>4</td>
<td>Error Compensation Setup</td>
</tr>
</tbody>
</table>
Setting Up The Unit

Setup Menu Navigation (continued)

Navigating Axis 4 Setup (Digital Rotary Angular)

Quick Navigation of Axis 4 Setup (Digital Rotary Angular)

The quick navigation feature for the setup of axis 4 digital rotary angular is detailed below (where navigation to the main axis setup menu is completed).

<table>
<thead>
<tr>
<th>Numeric Key</th>
<th>Setup Function</th>
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<tbody>
<tr>
<td>1</td>
<td>Legend Setup</td>
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<td>2</td>
<td>Encoder Setup</td>
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<td>3</td>
<td>Reference Source Setup</td>
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<tr>
<td>4</td>
<td>Resolution Setup</td>
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<tr>
<td>5</td>
<td>Angular Display Setup</td>
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<td>6</td>
<td>Angular Mode Setup</td>
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<td>7</td>
<td>Direction Setup</td>
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<tr>
<td>8</td>
<td>Error Compensation Setup</td>
</tr>
<tr>
<td>9</td>
<td>More Options</td>
</tr>
</tbody>
</table>

Press Key 9 for the options below

<table>
<thead>
<tr>
<th>Numeric Key</th>
<th>Setup Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Signal Checking Setup</td>
</tr>
<tr>
<td>3</td>
<td>Zero Approach Setup</td>
</tr>
<tr>
<td>4</td>
<td>Error Compensation Setup</td>
</tr>
<tr>
<td>9</td>
<td>Back to Previous Options</td>
</tr>
</tbody>
</table>
Setting Up The Unit

Setup Menu Navigation (continued)
Navigating Axis 4 Setup (Digital Rotary Linear)

Quick Navigation of Axis 4 Setup (Digital Rotary Linear)
The quick navigation feature for the setup of axis 4 digital rotary linear is detailed below (where navi-
gation to the main axis setup menu is completed).

<table>
<thead>
<tr>
<th>Numeric Key</th>
<th>Setup Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Legend Setup</td>
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<tr>
<td>2</td>
<td>Encoder Setup</td>
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<tr>
<td>3</td>
<td>Reference Source Setup</td>
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<tr>
<td>4</td>
<td>Resolution Setup</td>
</tr>
<tr>
<td>7</td>
<td>Display Resolution Setup</td>
</tr>
<tr>
<td>8</td>
<td>Direction Setup</td>
</tr>
<tr>
<td>9</td>
<td>More Options</td>
</tr>
</tbody>
</table>

Press Key 9 for the options below:

1. Radius / Diameter Setup
2. Signal Checking Setup
3. Zero Approach Setup
4. Error Compensation Setup
9. Back to Previous Options
Quick Navigation of General Setup

The quick navigation feature for general setup is detailed below (where navigation to the main axis setup menu is completed).

<table>
<thead>
<tr>
<th>Numeric Key</th>
<th>Setup Function</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Language Setup</td>
</tr>
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<td>2</td>
<td>Application Setup</td>
</tr>
<tr>
<td>3</td>
<td>Plane Setup</td>
</tr>
<tr>
<td>4</td>
<td>Mill Summing Setup</td>
</tr>
<tr>
<td>5</td>
<td>Functions Setup</td>
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<tr>
<td>6</td>
<td>Probe Diameter Setup</td>
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<tr>
<td>7</td>
<td>Beep Setup</td>
</tr>
<tr>
<td>8</td>
<td>LCD Brightness Setup</td>
</tr>
<tr>
<td>9</td>
<td>More Options</td>
</tr>
<tr>
<td></td>
<td>Press Key 9 for the options below</td>
</tr>
<tr>
<td>1</td>
<td>Sleep Setup</td>
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<tr>
<td>2</td>
<td>Unlock Axis</td>
</tr>
<tr>
<td>3</td>
<td>Reset Setup</td>
</tr>
<tr>
<td>9</td>
<td>Back to Previous Options</td>
</tr>
</tbody>
</table>
Setting Up The Unit

Setup Axis 1, 2, 3 & 4 (Analogue)

Legend Setup

The legend of the axis can be set to any of the options in the table below.

Use the key list to select the desired character

<table>
<thead>
<tr>
<th>Key</th>
<th>1st Press</th>
<th>2nd Press</th>
<th>3rd Press</th>
<th>4th Press</th>
<th>5th Press</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>X¹</td>
<td>Y¹</td>
<td>Z¹</td>
<td>1</td>
<td>N/A</td>
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<tr>
<td>2</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>2</td>
<td>N/A</td>
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<tr>
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<td>D</td>
<td>E</td>
<td>F</td>
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<td>W</td>
<td>X</td>
<td>Y</td>
<td>Z</td>
<td>9</td>
</tr>
</tbody>
</table>

Encoder Setup

Navigate to

> To select Spherosyn 2G as the encoder type
> To select Microsyn 2G 10µm as the encoder type
> To select Microsyn 2G 5µm as the encoder type

Note: The encoder type must match the actual encoder in use, or the DP1200 will not display correctly

Display Resolution Setup

Navigate to

> To select 5µm (0.0002”)  
> To select 10µm (0.0005”)  
> To select 20µm (0.001”)  
> To select 50µm (0.002”)  
> To select 1µm (0.00005”)  
> To select 2µm (0.0001”)  
> To select 5µm (0.0002”)  
> To select 10µm (0.0005”)  

Direction Setup

Navigate to

> To select Positive
> To select Negative

Example:

If the current setting is Positive and the measurement increases from right to left, changing the setting to Negative will cause the measurement to decrease.

Radius / Diameter (Measure Setup)

Navigate to

> To select Radius
> To select Diameter

The radius/diameter function allows the operator to display actual (radius) or twice-actual (diameter) measurements for each axis. This function is generally used in turning applications, such as the cross travel on a lathe displaying the diameter reading rather than the radius, is the desired result.
Setting Up The Unit

Zero Approach Setup
This setting provides a visual indication that one or more axes are approaching zero. This is done by using the far left LED segment on each axis, as the axis approaches zero, each segment of the ‘0’ lights up in quick succession. Once zero has been reached, the ‘0’ to the far left will be constantly on.

Navigate to

Enter any value using the numeric keys to provide zero approach limits. This can be entered in inches or millimeters by toggling the key.

Note: To disable the zero approach function, enter a value of 0.000.
Default is 0.000

Error Compensation
A digital readout (DRO) system helps to improve productivity. It decreases the number of scrapped parts, as the operator no longer has to be concerned about making mistakes related to counting the revolutions on the dials. The DRO system also helps to eliminate some errors related to ballscrew backlash.

The DRO system will operate to its published accuracy, provided all components are in working order and properly installed. Field calibration is not necessary.

Accuracy problems with machined parts may be caused by machine error, DRO system error, or a combination of both. The first step in determining the source of error is to check the DRO system. This is completed by comparing the movement of the Newall reader head to the position reading shown on the display. A high accuracy standard, such as a laser interferometer is required. A dial indicator can be used to check short distances, but a laser provides the best results. if a dial indicator must be used, be sure it is the highest available accuracy.

Instructions

Check the accuracy of the DRO system

1. Place the target of the laser or the needle of the dial indicator directly on the Newall reader head. It is absolutely critical to take the readings directly from the Newall reader head. If a dial indicator must be used, be sure that the needle of the indicator is perpendicular to the reader head and not angled. If readings are taken anywhere else on the machine, machine errors may distort the results.

2. When the reader head moves, the movement registers on the laser / indicator and the DRO display.

3. Set the laser / dial indicator and DRO position displays to 0.

4. Make a series of movements and compare the position readings between the laser / dial indicator and the DRO display. If the readings match within the accuracy specified, then the DRO system is operating properly. If this is the case, proceed to the next step, “Evaluate machine errors”. If the readings do not match, contact your local Newall Service Representative before proceeding with error compensation.

Evaluate machine errors

1. Put the laser target / dial indicator on the part of the machine where the machining is performed.

2. Make a series of movements and compare the position readings between the laser / dial indicator and the DRO display. The difference between the laser / dial indicator reading and the reading on the DRO display is the machine error.

3. Plot the machine error along the entire axis of travel to determine the nature of the error. If it is a linear error, you can use linear error compensation. If the error is not linear, you should use segmented error compensation.
Types of Machine Error

There are many types of machine error, including pitch, roll, yaw, flatness, straightness, and Abbé error. The diagrams below demonstrate these errors.

Way errors

Abbé error

Linear Error Compensation

In this mode, a single constant correction factor is applied for each axis to all displayed measurements. The correction factor is calculated, and specified in parts per million (ppm).

As you follow the procedure ensure that you approach each edge from opposite directions, then subtract the width of the tool from the value displayed on the DP1200. The DP1200 automatically takes into account the probe diameter as per setting (Linear Only).

(Fig 1)
Setting Up The Unit

Error Compensation Setup

Navigate to

1. To select no Compensation (None)
2. To select Linear Error Compensation
3. To select Segmented Error Compensation

Linear Error Compensation Setup

1. To select Teach mode
2. To select Program mode

Teach Mode

Teach mode is an easier way of calculating linear errors using the DP1200 to automatically calculate the error, by comparing the actual measurement and the physical movement. Follow the steps below;

Program Mode

First determine the correction factor required. To do this, use the following equation.
(In the example the standard distance is 500.000mm and the measured distance is 500.200mm)

Correction factor = error / actual x 1,000,000
Correction factor = (500 - 500.200) / 500.000 x 1,000,000
Correction factor = -400
Segmented Error Compensation

The scale travel is broken down into as many as 200 user-defined segments, each with their 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. Always approach the Starting Point, Correction Points and Reference Point from the same direction. If not, the size of the tool or probe will render the measurement inaccurate.

Segmented Error Compensation Setup

To select Teach mode

To select Program mode

Teach Mode

Enter movement using the numeric keypad

Select “Yes” to move on to point 2 (maximum 200 points). Select “No” to accept the segmented compensation.
Program Mode
The program mode enables the user to define the correction points manually and then enter them into the DP1200. The position is where the correction point occurs, and the correction point is the value to be corrected at that point.

Position 1: Enter a value using the numeric keypad for the 1st correction point (I.E 5.000)

Correction 1: Enter a value using the numeric keypad for the correction value (I.E -0.010)

Note: The correction value is limited to a minimum of 0.005mm (0.0002")

to navigate between points. A maximum of 200 points are available.

to accept the compensation at the point reached.
Setting Up The Unit

Setup Axis 4 (Digital Linear)
For models with 5v TTL quadrature 4th axis

Legend Setup

Please refer to Page 10, Legend Setup

Encoder Setup

To select Linear as the encoder type

Reference Source Setup

The DP1200 is capable of using an internal reference or an external reference source for the digital 4th axis. An internal reference is the reference mark provided by the encoder.

To select Internal referencing

To select External referencing

Encoder Resolution

Enter the resolution of the encoder for the 4th digital axis using the numerical keys. It is important the resolution of the encoder is entered exactly or inaccurate measurements will occur.

Example:
Linear encoder has a resolution of 0.001mm.

Navigate to

Note: Inch / mm function must be set to reflect entered resolution

Display Resolution

Enter the resolution that is required to be displayed using the numerical keys. The displayed resolution can only be the same or higher than the encoder resolution.

Example:
Linear Encoder has a resolution of 1µm (0.001) and is to be displayed at 5µm (0.005).

Navigate to

Note: Inch / mm function must be set to reflect entered resolution
Setting Up The Unit

Direction Setup

Please refer to Page 10, Direction Setup

Radius / Diameter (Measure Setup)

Please refer to Page 10, Radius / Diameter (Measure Setup)

Signal Checking Setup

The DP1200 has the facility to detect if the encoder attached to the 4th digital axis has become disconnected, sustained severe cable damage, or with some encoders, experienced electronic failure.

**Mode of Operation**

The detection mechanism monitors the incoming signals from the encoder to look for an illegal combination of input levels.

If the encoder becomes disconnected, then the illegal input combination is generated internally within the DP1200. The display will then show 'SIG FAIL'. If it is possible to correct the fault, press the axis zero key to reset that display. If the 'SIG FAIL' message continues to be displayed then the fault has not been corrected.

**Note:** Please check the encoder specification for information on the synchronisation of the index marker pulse. If the encoder is capable of generating the illegal condition (A low, B low and RM high), then signal checking function should be **TURNED OFF**.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>RM</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L</td>
<td>H</td>
<td>SIG FAIL</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
<td>X</td>
<td>OK</td>
</tr>
<tr>
<td>H</td>
<td>L</td>
<td>X</td>
<td>OK</td>
</tr>
<tr>
<td>X</td>
<td>X</td>
<td>L</td>
<td>OK</td>
</tr>
</tbody>
</table>

X = any state i.e can be either high (H) or low (L).

Zero Approach Setup

Please refer to Page 11, Zero Approach Setup

Error Compensation Setup

Please refer to Page 11, Error Compensation Explanation

Page 12, Type of Machine Error

Page 12, Linear Error Compensation Explanation

Page 13, Linear Compensation Setup
Setting Up The Unit

Setup Axis 4 (Digital Rotary Angular)
For models with 5v TTL quadrature 4th axis. The rotary angular option is for customers using a rotary encoder who want an angular displayed measurement

Legend Setup
Please refer to Page 10, Legend Setup

Encoder Setup

Encoder Resolution Setup

Program Resolution Setup
This setting allows the user to program the DP1200 with a rotary encoder resolution. Rotary encoder resolutions are usually expressed as PPT. This is the number of pulses output per revolution. Information on the PPT can be found in the encoder manufacturer’s specification and is also generally marked on the encoder.

Example
Rotary encoder has a PPT of 1024

Navigate to
PPT = Counts per Revolution (CPR) /4

Teach Resolution Setup

Rotate rotary encoder until a value is displayed in the LCD display.
For this example an 1800 pulse encoder is connected.
Setting Up The Unit

Angular Display Setup

To select **Decimal** (Degrees)

To select **Degrees Minutes Seconds**

Angular Mode Setup

This function allows the selection of rollover at 360° back to zero or to provide a continuous measurement.

To select **Rollover** (Rollover at 360°)

To select **Continuous**

Direction Setup

Please refer to Page 10, Direction Setup

Signal Checking Setup

Please refer to Page 16, Signal Checking Setup

Zero Approach Setup

This setting provides a visual indication that one or more axes are approaching zero. It does this by using the far left LED segment on each axis, as the axis approaches zero, each segment of the '0' lights up in quick succession. Once zero has been reached, the '0' to the far left will be constantly on.

Enter any value using the numeric keys to provide zero approach limits. This can be entered in degrees or degrees minutes seconds, dependant on the Angular Display Setting.

**Note:** To disable the zero approach function, enter a value of 0.000.

Default is 0.000
Setting Up The Unit

Setup Axis 4 (Digital Rotary Linear)

For models with 5v TTL quadrature 4th axis. The rotary linear option is for customers using a rotary encoder who want linear displayed measurement.

Legend Setup

Please refer to Page 10, Legend Setup

Encoder Setup

To select Rotary (Linear) as the encoder type

Reference Source Setup

Please refer to Page 16, Reference Source Setup

Encoder Resolution Setup

Enter the linear resolution via the numeric keypad.

Example: 10mm linear movement required from 1 revolution of an 1800 pulse rotary encoder

$$\frac{10}{1800} / 4 = 0.0013888$$

Teach Resolution Setup

Move the rotary encoder to a known start point

Move the rotary encoder to a known end point

The resolution is calculated by the DRO and displayed
## Setting Up The Unit

<table>
<thead>
<tr>
<th>Setting</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Resolution Setup</td>
<td>Please refer to Page 15, Display Resolution Setup</td>
</tr>
<tr>
<td>Direction Setup</td>
<td>Please refer to Page 10, Direction Setup</td>
</tr>
<tr>
<td>Radius / Diameter (Measure Setup)</td>
<td>Please refer to Page 10, Radius / Diameter (Measure Setup)</td>
</tr>
<tr>
<td>Signal Checking Setup</td>
<td>Please refer to Page 16, Signal Checking Setup</td>
</tr>
<tr>
<td>Zero Approach Setup</td>
<td>Please refer to Page 11, Zero Approach Setup</td>
</tr>
</tbody>
</table>
| Error Compensation Setup | Please refer to Page 11, Error Compensation Explanation  
                          | Page 12, Type of Machine Error                  |
|                        | Page 12, Linear Error Compensation Explanation  |
|                        | Page 13, Linear Compensation Setup             |
Setting Up The Unit

General Setup

Language Setup

Choose the required language the unit is to display. If the language required is not in the 1st menu press “7” to display more languages.

Application Setup

To select Mill
To select Lathe
To select Generic

Note: When set to Lathe, Axis 1 (top) changes to diameter measurement
Note: When set to Lathe or Mill, some functions are automatically turned off

Plane Setup

This setting defines the machining face of the work piece, for example; on a turret mill it would typically be the X Axis and the Y Axis. This setting is used by the mill functions.
This setting refers to the legend that has been set for Axes 1, 2 & 3. In the example Axis 1 has a legend of ‘X’, Axis 2 has a legend of ‘Y’, and Axis 3 has a legend of ‘Z’.

Axis Coupling Setup

This feature enables the permanent summing of Axis 4 with one of the other axes. It is most commonly used for mills. The axes selected in the plane setting parameter will not be summed.
Example: The plane has been set to the X and Y Axes, then the fourth axis is summed with Z, (3rd Axis.)

Note: When this feature is active, the 4th Axis display will be blank.
Setting Up The Unit

Functions Setup
Allows the user to enable or disable Mill / Lathe functions. Functions in white text are enabled. Functions in grey text are disabled.

Note: Some functions may already be disabled if the DP1200 is set as a Mill or Lathe at application setup, and dependant on the number of axes available.

<table>
<thead>
<tr>
<th>Numeric Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tool Offsets</td>
</tr>
<tr>
<td>2</td>
<td>Vector</td>
</tr>
<tr>
<td>3</td>
<td>Taper Angle</td>
</tr>
<tr>
<td>4</td>
<td>Axis Summing</td>
</tr>
<tr>
<td>5</td>
<td>PCD</td>
</tr>
<tr>
<td>6</td>
<td>Line Hole</td>
</tr>
<tr>
<td>7</td>
<td>More</td>
</tr>
</tbody>
</table>

Press Key 7 for the options below

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Arc Contouring</td>
</tr>
<tr>
<td>2</td>
<td>Polar Co-ordinates</td>
</tr>
<tr>
<td>3</td>
<td>Skew</td>
</tr>
<tr>
<td>4</td>
<td>Data Logging</td>
</tr>
<tr>
<td>5</td>
<td>Sub Datums</td>
</tr>
</tbody>
</table>

Probe Diameter Setup
Allows the user to enter a probe diameter to be used with the DP1200. The probe diameter information can be found in the probe specification.

Example: The probe diameter is 5mm.

Beep Setup

Note: Default is Beep On

LCD Brightness Setup
The DP1200 allows the user to adjust the brightness of the LCD screen for user preference.

Note: Default is 60% brightness
Setting Up The Unit

**Sleep Setup**

Allows the user to select a time period where the unit will automatically go into Sleep Mode. If no movement is made or keys pressed for the time period set, the sleep mode will be activated.

**Example:** The sleep time is required after 5 minutes

![General Setup](image)

**Note:** To deactivate this feature, enter a value of “0” (default)

**Unlock Axis**

Allows the unit to be upgraded from a 2 or 3 Axis unit up to 4 Axes. Please contact your local authorised Newall distributor to purchase this option.

![General Setup](image)

Contact Newall to progress further

**Reset Setup**

Allows the user to reset the unit back to factory defaults.

There are three factory default settings according to the application.

**Example:** The unit is being reset as a **Lathe**.

![General Setup](image)

**Note:** When the DP1200 is setup as a Lathe, the ‘X‘ (top) Axis default setting is DIA, therefore the ‘X’ (top) Axis will display double.

**OEM Defaults:** The DP1200 may have OEM default settings specific to a machine. In this case, the DP1200 will only display one reset option. This reset will default all the parameters to match the OEM defaults set for the machine when the DRO was originally installed.
This Section details the standard functions of the DP1200.

**Absolute / Incremental**

Press \( \text{Abs/Inc} \) to toggle between absolute and incremental mode

The DP1200 has a dedicated key to switch the positional displays between absolute (abs) and incremental (inc) measurements. The current display mode is indicated by a red LED either above or below the key as shown on the right.

**Using Incremental Mode**

In Incremental Mode the DRO displays the position relative to the last position. This is also known as point-to-point use. In this mode you can set the value for each axis or zero it to create an Incremental Datum. This does not effect the machine’s Absolute Datum that you configure in Absolute Mode.

**Using Absolute Mode**

In Absolute Mode the DRO displays the positions of all the axes with respect to a fixed datum. The datum is set by entering an axis position when in Absolute Mode.

**Example of Absolute and Incremental use**

<table>
<thead>
<tr>
<th>Set absolute zero at lower left corner of the part</th>
<th>Move to first position in ABS (Hole A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000 0.000</td>
<td>30.000 30.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Move to second position in ABS (Hole B)</th>
<th>Switch to incremental mode and zero the display</th>
</tr>
</thead>
<tbody>
<tr>
<td>150.000 100.000</td>
<td>0.000 0.000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Make an incremental move to Hole C</th>
<th>Switch to absolute mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000 50.000</td>
<td>150.000 150.000</td>
</tr>
</tbody>
</table>

**Inch and mm**

Press \( \text{inch/mm} \) to toggle between Inch and mm mode

The DP1200 has a dedicated key to switch the positional displays between imperial (inch) and metric (mm) measurements. The current display mode is indicated by a red LED either above or below the key as shown on the right.
Standard Functions

Zero and Preset an Axis
Press \( \text{Set Mode} \) to toggle between ‘Set’ and ‘Zero’ Mode

The DP1200 has a dedicated key to switch the operation of the axis selection key between Zero Mode and Set Mode. The selected mode is indicated by an LED either above or below the key as shown on the right.

Using Set Mode
With Set Mode selected, this enables the select axis keys to prompt a numeric entry into the desired axis. Once the correct value has been selected, it can be set into the axis by pressing \( \text{ent} \). This can be seen in the example on the right.

Zeroing an Axis in Set Mode
With Set Mode selected, it is possible to zero the axis conveniently by double pressing the relevant select axis key. This can make use of the DP1200 Zeroing and Set Modes quicker and easier. This is shown in the example on the right.

Using Zero Mode
With Zero Mode selected, this enables the select axis keys to zero each axis independently. This can be seen in the example on the right.

Undo Function
The DP1200 stores the last 10 positions/numeric inputs, which can be accessed using the undo feature.

Example 1 - non movement
Display shows \(-145.230\) input a value \(95.520\)

An incorrect figure has been entered and you want to get back to the dimension displayed before

Press \( \text{undo} \), display now shows \(-145.230\)

Example 2 - movement
Input a value \(5.000\) move to that point, display now shows \(0.000\)

Input a value \(10.000\) move to that point, display now shows \(0.000\)

Press \( \text{undo} \) once, display now shows \(-10.000\) this is the position of your second point

Press \( \text{undo} \) again, display now shows \(-15.000\) this is the position of your starting point

The DP1200 stores the last 10 positions/numeric inputs, which can be accessed using the undo feature.
Standard Functions

Half Function / Centre Find

Press $\frac{1}{2}$ key to initiate the half function.

The DP1200 has a dedicated key to halve the value of any axis. This is done by initiating the half mode and selecting the required axis. This can be seen in the example on the right.

Digifind / Reference Function

The DP1200 comes equipped with Digifind, a feature unique to Newall Digital Readouts. Digifind eliminates the risk of losing your position and datum setup. Digifinds precise setup of a workpiece is carried out only one time. When the unit is powered on, it displays the position at power off, compensated for any movement of a Spherosyn Encoder up to 0.2500" (6mm) and a Microsyn Encoder up to 0.1000" (2.5mm) in either direction since the unit was last used. If the machine has moved beyond 0.2500" (6mm) for Spherosyn or 0.1000" (2.5mm) for Microsyn, Digifind allows a quick means to find the datum if lost. Follow the steps below;

Make a mark on both a stationary part and moving part of the machine. The marks must be aligned and will serve as the machine "home" position. (The mark must be indelible and must allow the operator to move the machine to within a 0.2500" (6 mm) for Spherosyn or 0.1000" (2.5mm) for Microsyn around the mark at any time.) Alternatively, you can use a convenient reference point on the workpiece.

Setting the reference

Finding the reference

If datum is lost at anytime, it is possible to “Find” the datum again. Position the machine within a 6mm (0.2500") band for Spherosyn or a 2.5mm (0.1000") band for Microsyn.

Finding zero

As a fail safe, Digifind can “Find” the last datum or absolute zero set. Position the machine within a 6mm (0.2500") band for Spherosyn or a 2.5mm (0.1000") band for Microsyn.
Standard Functions

Sub Datums / Memory

The DP1200 can store up to 200 SDM (Sub-Datum) positions, or machining steps, into the memory. Using SDM allows the operator to work to zero by calling up stored dimensions, instead of "working up" to drawing dimensions. This eliminates the need to constantly refer to the drawing and reduces the possibility of scrapping parts due to misread dimensions. It also speeds up positioning as the operator is working to zero.

The SDM's 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.

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 - 200 to each machining step. When machining, call up each step (SDM) number and work to zero. Sub Datums can be used for any or all axes. There are two ways to store Sub Datums; Teach Mode and Program Mode.

See examples below.

How to navigate to the Sub Datum Function

How to use Sub Datum Teach Mode

Select Teach Datums to reach the screen below

How to use Sub Datum Program Mode

Select Program Datums to reach the screen below
Standard Functions

Sub Datums / Memory (Continued)

How to use Sub Datums

Select Use Datums to reach the screen below

The DRO will display the distance needed to move to the sub datum point. The sub datum point destination is 0 for each respective axis.

To scroll through sub datums or use the numeric keypad to input the sub datum required

Back to return to the Sub Datums Menu or Exit to return to normal operation

Example of Sub Datums

Sleep Mode

The DP1200 offers two different ways to put the DRO into sleep mode; using the sleep key or automatically after a set period of time (See Page 24 - Sleep Setup).

Entering Sleep Mode using the sleep key

Pressing the sleep key will turn all displays off apart from the Power LED. Any key presses or movement will not bring it out of this mode. To return to normal operation, the unit will boot up to the start screen. Once any key is pressed, the DP1200 will return to normal operation.

Entering Sleep Mode automatically

Once setup, apply no movement or any key presses for the period of time set and the DP1200 will turn off all displays apart from the power LED. Any key presses or movement will bring it out of this mode.
RS232 (Data Logging) / Data Acquisition

The DP1200 can offer basic serial communication via a dedicated RS232 compatible port, which is used for data logging purposes.

RS232 Connections

The RS232 is connected to the DP1200 via a 15-pin D-type connector at the rear of the display. The required connection details are shown below.

- Pin 5 - RS232 GND
- Pin 2 - RS232 RXD
- Pin 3 - RS232 TXD
- Pin 1
- Pin 15

The RS232 port allows position data from the DRO to be sent to a computer.

Applications:
- Quality Control – Save dimensional data from finished parts
- Test and measurement
- Length gauges

RS232 Setup

Menu
1. Tool Offsets
2. Vector
3. I/O
4. Line Hole
5. Arc Crossing
6. Show
7. Sub Screens
8. Data Logging
9. Setup

To select Data Logging
Standard Functions

RS232 Setup (Continued)

1. To turn Data Logging off
2. To use Enter Key to trigger Data Logging
3. To select Data Logging periodically

If **off** is selected to return to the main menu and disable Data Logging

If **Enter Key** or **Periodic** are selected

Select the Baud Rate to match the baud rate supported at the PC

1. To select **None** (disable Parity)
2. To select **Even** Parity
3. To select **Odd** Parity

**Note:** Period will only be shown if the **Periodic** output was selected

Enter, using the numeric keypad, the number of seconds between each communication

The RS232 is now live and functioning
RS232 Output Data Format

The output data from the RS232 is as follows;

The current axis data for the axes available on the system is transmitted.

For two axes systems, only two axes of data will be transmitted.

The data packet structure of 12 characters is defined as follows:

```
A : 0 0 0 0 0 0 0 0 CR LF
```

The Axis ID is the representation of the axis at the time of printing. This will be shown by the legend set for the axis at that time. Please see example below;

Example:

The example below shows an RS232 output from a 4 axes DP1200, with the legend set as “X” (1st axis) “Y” (2nd axis), “Z” (3rd axis) and “W” (4th axis).

X: 531.420
Y: 497.615
Z: 15.006
W: 131.295
Mill Functions

PCD / Bolt Hole Circle

The DP1200 calculates positions for a series of equally spaced holes around the circumference of a circle. Once the parameter data is entered, the DP1200 displays the distance to the next hole. The operator works to zero for each hole location. See example (Fig 1).

Note: This function only operates in the axes that have been setup in the plane (See Page 24 - Plane Setup).

Example

Enter 1st centre coordinate

Enter 2nd centre coordinate

Enter the diameter dimension

Enter the number of holes required

Enter start angle required

Note: The PCD will be calculated from the 3 o'clock position, counter-clockwise. Enter the angle as a negative value if it is given as clockwise from 3 o'clock.

Enter end angle required

Note: End angle must equal start angle for a full circle PCD routine.
Mill Functions

PCD / Bolt Hole Circle (Continued)

Note: At this point you can use the  ⬅️  ⬆️  keys to navigate back and forth through the menus.

To start the PCD / Bolt Hole Circle Routine;

Navigate through the sequence of holes by using  ⬅️  ⬆️  keys.

![Diagram of PCD / Bolt Hole Circle](image)

Fig 1

- Circle centre
- 150mm diameter
- X axis starting angle
- Y axis
- Starting hole
- 18° starting angle
- 99.7mm datum
- 125.25mm

(-196.580, -122.880)
Mill Functions

Line Hole
The DP1200 calculates positions for a series of equally spaced holes on a line. Once the parameter data is entered, the DP1200 displays the distance to the next hole. The operator works to zero for each hole location. See example (Fig 2).

Note: This function only operates in the axes that have been setup in the plane (See Page 24 - Plane Setup).

Example

Enter 1st start coordinate

Enter 2nd start coordinate

Enter the line hole length dimension

Note: Length = total length of line hole sequence, not distance between adjacent holes.

Enter the number of holes required

Enter angle required in degrees

Note: At this point you can use the keys to navigate back and forth through the menus.
Line Hole (Continued)

To start the line hole circle routine:

- Navigate through the sequence of holes by using keys.

Fig 2

350mm line length
9 holes
20° line angle

Starting point

Y axis

Datum

X axis

200mm

180.5mm
Mill Functions

Arc Contouring
The DP1200 calculates positions for rough machining of an arc or radius. The message display prompts the user for parameters needed to complete the calculations.

Once parameters are entered, the DP1200 shows the co-ordinates, which are point to point positions along the arc. The operator works to zero for each hole location. See example below.

The arc feature is dependant on the Plane setting for the axes it will operate in (See Page 24 - Plane Setup).

Menu

5 To select Arc Contouring

Note: Use the keys to navigate through the parameters.

Enter coordinates for the center of the arc.

Enter the radius dimension.

Enter coordinates for starting point of arc.
Arc Contouring (Continued)

Enter coordinates for ending point of arc.

Enter the tool diameter to be used.

Select the appropriate arc type. For this example, we will select internal.

Enter the maximum cut required.

To start the arc feature;

Navigate through the sequence of points using the keys.
Polar Co-ordinates

The Polar Coordinate function enables the operator to convert the displayed data from the conventional Cartesian Coordinates ("X" & "Y") to polar coordinates (radius length + angle).

The two axes used for polar coordinates are defined in the parameter setting for plane (See Page 24 - Plane Setup). The fourth axis cannot be used for polar coordinates.

The example below demonstrates its operation.

Move from the starting point to the ending point.

The message display will show the angle and the radius length.
Skew

The Skew Feature provides capability for the DRO to find the skew angle of a part. It is very useful for the machine operator to know if the part is square to the bed.

It can also be used to find other angles on the workpiece.

The plane setting parameter defines which axes are used for this feature.

Note: Use the ▲ ▼ keys to navigate through the parameters.

Note that positions 1 and 2 are points on the first plane (Angle 1). Positions 3 and 4 are points along the second plane (Angle 2).

Touch the probe to any position along the ("X") first plane.
Or
Touch the tool to any position along the first plane

Touch the probe to a second point along the ("X") first plane.
Or
Touch the tool to a second point along the first plane

Touch the probe to any position along the ("Y") second plane.
Or
Touch the tool to any position along the second plane
Skew (Continued)

Touch the probe to a second point along the ("Y") second plane.  
Or  
Touch the tool to a second point along the second plane ➔ → 

The angle for ("X") plane 1 and ("Y") plane 2 are shown on the DRO.
Tool Offsets

The Tool Offset function allows the operator to enter and store offsets for a range of tools. This enables the operator to change tools without resetting absolute zero or datum. Using Tool Offsets ensures that diameter and length measurements will remain consistent after tool changes. This speeds up tool changes and increases productivity as it eliminates the need for the operator to stop and manually measure the diameter.

The number of Tool Offsets available is 50. This large number allows tools to be grouped where more than one set is used. For convenience, it is highly recommended that tools are physically marked with their corresponding tool number.

There are two ways to set Tool Offsets, Teach Mode and Program Mode.

The DP1200 provides capability for Tool Offsets for up to 3-axes. A 3 or 4 axes DP1200 is required to use 3-axes of Tool Offsets.

DP1200 Tool Offsets are all in reference to the datum.

Teach Offsets

Enter the tool dimensions one axis at a time. In this example, the “X” axis of Tool 1 is entered.

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- - - - - - -
- - - - - - -
9.900

Take a skim cut if “X” is selected. Take a face cut if “Z” is selected.

The axis window shows the size of the tool with respect to the datum.

Note: The tool can now be moved away from the part.
Pre教偏置（继续）

测量零件，使用精确的量具并输入此值。

重复此步骤，对所需所有工具进行。
**注意：** 使用键来浏览工具。

程序偏置

输入工具尺寸，每次一个轴。

输入所要求轴的位置值。

重复此步骤，对所有工具进行。

完成：

**注意：** 使用键来浏览工具。
Vector

Vectoring combines the movement of the “X” and “Z” axes with the angle of the compound. **Note:** Vector is only available on 3 and 4 axes units.

If the compound is set at an angle, vector is very useful. If the compound is aligned with the “X” or “Z” axis, the summing function should be used.

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**Menu**

1. Tool Offsets
2. Vector
3. PEP
4. Line Hole
5. Arc Contouring
6. Skew
7. Slot Rasters
8. Data Logging
9. Setup

![2](To select **Vector**)

Enter the desired vector angle.

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**Example**

![3](0)

![4](ent) ![5](Go)

To start:

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**Note:** Changing of the angle is always done through the Vector Setup Screen. The angle cannot be changed while the vector function is running.

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**Vector**

![6](25.000)

![7](43.300)

![8](50.000)

Axis 1 shows combined “X” axis movement
Axis 2 shows combined “Z” axis movement
Axis 3 shows normal position display

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**Combined X movement = X + Z’(Sin α)**

**Combined Z movement = Z + Z’(Cos α)**

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To exit:

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![9](Done)
**Taper Angle**

The Taper Function shows the angular displacement of the displayed position. Axis 1 and 2 are used for this function. The taper function ignores the parameter setting for the plane.

The example below demonstrates its operation.

Touch the tool to one end of the taper and zero both axes, then touch the tool at the other end of the taper. The message window will now display the taper angle, as shown below;
Axis Summing

The Summing Function allows the sum of the two selected axes to be displayed. Axis 4 is not used with this function. See Axis Coupling Setup (Page 24) for details on using Axis 4.

Select the required plane

The un-summed position data will be shown in the axis window. The summed position will be shown in the LCD display.
The DP1200 has a dedicated information screen which provides useful information when contacting Newall or troubleshooting the unit. This is especially useful when a panel mount unit is in use.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>The display is blank</td>
<td>• The DP1200 maybe in sleep mode. Press any key to exit sleep mode</td>
</tr>
<tr>
<td></td>
<td>• Check that the power supply is correctly connected to a working mains outlet</td>
</tr>
<tr>
<td></td>
<td>• Check that the power supply cables are not damaged</td>
</tr>
<tr>
<td></td>
<td>• Check that the power supply voltage is 15 - 24Vdc ±10%</td>
</tr>
<tr>
<td></td>
<td>• Check the power supply indicator is illuminated on the front of the DP1200.</td>
</tr>
<tr>
<td>The display works, but resets from time to time without any keys being pressed.</td>
<td>Either the supply voltage is too low, or the power supply or mains supply has an intermittent fault.</td>
</tr>
<tr>
<td></td>
<td>• Check that the power supply voltage is 15 - 24Vdc ±10%.</td>
</tr>
<tr>
<td></td>
<td>• Check that all the connections are secure.</td>
</tr>
<tr>
<td>The display works, but gives erratic readings, the last digit jitters or the measurements jump to new figures unexpectedly.</td>
<td>There may be a poor earth (ground) connection. Both the DP1200, and the machine on which it is installed, must have proper earth (ground) connections.</td>
</tr>
<tr>
<td></td>
<td>There may be a problem with the encoder.</td>
</tr>
<tr>
<td>The unit does not respond to any key presses.</td>
<td>Disconnect the DP1200 from its power supply, wait 15 seconds and then reconnect.</td>
</tr>
<tr>
<td>‘no Sig’ or ‘SIG FAIL’ appears in the display.</td>
<td>This indicates that the unit is not receiving a proper signal from the encoder.</td>
</tr>
<tr>
<td></td>
<td>• Check that the encoder connections are secure.</td>
</tr>
<tr>
<td></td>
<td>• Check that there is no damage to the connectors or to the encoder.</td>
</tr>
<tr>
<td></td>
<td>• Switch the DP1200 off and back on again.</td>
</tr>
<tr>
<td></td>
<td>• Swap the encoder to another axis to confirm whether the encoder or the DP1200 is at fault.</td>
</tr>
<tr>
<td>Readings are incorrect.</td>
<td>• Check the Encoder Type to ensure it is correct.</td>
</tr>
<tr>
<td></td>
<td>• Check the Radius / Diameter setting. The Diameter setting causes the axis to read double.</td>
</tr>
<tr>
<td></td>
<td>• Check the Error Compensation factors.</td>
</tr>
<tr>
<td></td>
<td>• If using the Segmented Error Compensation, verify the datum position.</td>
</tr>
<tr>
<td></td>
<td>• Swap the encoder to another axis to confirm whether the encoder or the DP1200 is at fault.</td>
</tr>
<tr>
<td></td>
<td>• Check that there is no damage to the encoder or its cable.</td>
</tr>
<tr>
<td></td>
<td>• Check that the encoder is fixed firmly and aligned correctly, as described in the Spherosyn / Microsyn Installation manual.</td>
</tr>
<tr>
<td></td>
<td>• 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.</td>
</tr>
<tr>
<td></td>
<td>• If you have a Spherosyn scale, check that the scale is not bent, by removing it and rolling it on a flat surface.</td>
</tr>
</tbody>
</table>

If the solutions suggested above do not solve your problem, contact Newall's Technical Support Department for further instruction.

Swapping encoders to trace a fault:
1. Check that the two axes are set to the correct encoder types.
2. Disconnect the DP1200 power supply.
3. Disconnect the encoder from the malfunctioning axis and move to a working axis.
4. Reconnect the DP1200 power supply and turn on.

If the fault stays with the same encoder, then the encoder is at fault. If the fault does not follow with the encoder the DP1200 is at fault.

Providing you have not moved the machine more than 6.3mm (0.25") for a Spherosyn Encoder or 2.5mm (0.1") for a Microsyn Encoder, switching the power off and back on again does not lose the datum position.