

**RENISHAW** 

**MIH  
User's Guide**

## **CARE OF EQUIPMENT**

Renishaw probes and associated systems are precision tools used for obtaining precise measurements and must therefore be treated with care.

## **CHANGES TO EQUIPMENT**

Renishaw reserves the right to improve, change or modify its hardware or software without incurring any obligations to make changes to Renishaw equipment previously sold.

## **WARRANTY**

Renishaw plc warrants its equipment provided that it is installed exactly as defined in associated Renishaw documentation.

Prior consent must be obtained from Renishaw if non-Renishaw equipment (e.g. interfaces and/or cabling) is to be used or substituted for Renishaw equipment. Failure to comply with this will invalidate the Renishaw warranty.

Claims under warranty must be made from Authorised Service Centres only, which may be advised by the supplier or distributor.

## **PATENTS**

The features of Renishaw's Manual Indexable Head and associated products are the subject of the following patents, patent applications and registered designs.

Patents and patent applications -

EP 0142373	JP 339/1966
EP 0293036	JP 1735296
EP 0293660	JP 2,084,393
EP 0392699	JP 293602/1990
	JP 293613/1990

Registered designs -

DE M8906859.9	FR 278857	GB 1058954
US Des 327854		

**MIH**  
**User's Guide**



**FCC  
(U.S.A.)**

**Information to user (FCC Section 15.105)**

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the installation manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

**Information to user (FCC Section 15.21)**

The user is cautioned that any changes or modifications not expressly approved by Renishaw plc or authorised representative could void the user's authority to operate the equipment.

**Special accessories (FCC Section 15.27)**

The user is also cautioned that any peripheral device installed with this equipment such as a computer, must be connected via a high-quality shielded cable to insure compliance with FCC limits.

### **GB**

Beware of unexpected movement. The user should remain outside of the full working envelope of probe head/extension/probe combinations.

Handle and dispose of batteries according to the manufacturer's recommendations. Use only the recommended batteries. Do not allow the battery terminals to contact other metallic objects.

For instructions regarding the safe cleaning of Renishaw products refer to the MAINTENANCE section of the relevant product documentation.

Remove power before performing any maintenance operations.

Refer to the machine supplier's operating instructions.

### **F**

Attention aux mouvements brusques. L'utilisateur doit toujours rester en dehors de la zone de sécurité des installations multiples tête de palpeur/rallonge/palpeur.

Suivre les conseils du fabricant pour manipuler et jeter les batteries. Utiliser uniquement les batteries recommandées. Veiller à ce que les bornes de la batterie n'entrent pas en contact avec d'autres objets métalliques.

Les conseils de nettoyage en toute sécurité des produits Renishaw figurent dans la section MAINTENANCE de votre documentation.

Mettre la machine hors tension avant d'entreprendre toute opération de maintenance.

Consulter le mode d'emploi du fournisseur de la machine.

## User/Supplier information

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### D

Auf unerwartete Bewegungen achten. Der Anwender soll sich immer außerhalb des Meßtasterkopf-Arm-Meßtaster-Bereichs aufhalten.

Batterien immer gemäß den Anleitungen des Herstellers handhaben und diese vorschriftsmäßig entsorgen. Nur die empfohlenen Batterien verwenden. Die Batterieklemmen nicht in Kontakt mit metallischen Gegenständen bringen.

Anleitungen über die sichere Reinigung von Renishaw-Produkten sind in Kapitel WARTUNG (MAINTENANCE) in der Produktdokumentation enthalten.

Bevor Wartungsarbeiten begonnen werden, muß erst die Stromversorgung getrennt werden.

Beziehen Sie sich auf die Wartungsanleitungen des Lieferanten.

### I

Fare attenzione ai movimenti inaspettati. Si raccomanda all'utente di tenersi al di fuori dell'involucro operativo della testina della sonda, prolunghe e altre varianti della sonda.

Trattare e smaltire le pile in conformità alle istruzioni del fabbricante. Usare solo pile del tipo consigliato. Evitare il contatto tra i terminali delle pile e oggetti metallici.

Per le istruzioni relative alla pulizia dei prodotti Renishaw, fare riferimento alla sezione MANUTENZIONE (MAINTENANCE) della documentazione del prodotto.

Prima di effettuare qualsiasi intervento di manutenzione, isolare dall'alimentazione di rete.

Consultare le istruzioni d'uso del fabbricante della macchina.

### **E**

Tener cuidado con los movimientos inesperados. El usuario debe quedarse fuera del grupo operativo completo compuesto por la cabeza de sonda/ extensión/sonda o cualquier combinación de las mismas.

Las baterías deben ser manejadas y tiradas según las recomendaciones del fabricante. Usar sólo las baterías recomendadas. No permitir que los terminales de las mismas entren en contacto con otros objetos metálicos.

Para instrucciones sobre seguridad a la hora de limpiar los productos Renishaw, remitirse a la sección titulada MANTENIMIENTO (MAINTENANCE) en la documentación sobre el producto.

Quitar la corriente antes de emprender cualquier operación de mantenimiento.

Remitirse a las instrucciones de manejo del proveedor de la máquina.

### **P**

Tomar cuidado com movimento inesperado. O utilizador deve permanecer fora do perímetro da área de trabalho das combinações Cabeça da Sonda/ Extensão/ Sonda.

Manusear e descartar baterias de acordo com as recomendações do fabricante. Utilizar apenas as baterias recomendadas. Não permitir que os terminais da bateria entrem em contacto com outros objectos metálicos.

Para instruções relativas à limpeza segura de produtos Renishaw, consultar a secção MANUTENÇÃO (MAINTENANCE) da documentação do produto.

Desligar a alimentação antes de efectuar qualquer operação de manutenção.

Consultar as instruções de funcionamento do fornecedor da máquina.

## User/Supplier information

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### DK

Pas på uventede bevægelser. Brugeren bør holde sig uden for hele sondehovedets/forlængerens/sondens arbejdsområde.

Håndtér og bortskaf batterier i henhold til producentens anbefalinger. Anvend kun de anbefalede batterier. Lad ikke batteriterminalerne komme i kontakt med andre genstande af metal.

Se afsnittet VEDLIGEHOLDELSE (MAINTENANCE) i produkt-dokumentationen for at få instruktioner til sikker rengøring af Renishaw-produkter.

Afbryd strømforsyningen, før der foretages vedligeholdelse.

Se maskinleverandørens brugervejledning.

### NL

Oppassen voor onverwachte beweging. De gebruiker dient buiten het werkende signaalveld van de Sondekop/Extensie/Sonde combinaties te blijven.

De batterijen volgens de aanwijzingen van de fabrikant hanteren en wegdoen. Gebruik uitsluitend de aanbevolen batterijen. Zorg ervoor dat de poolklemmen niet in contact komen met andere metaal-houdende voorwerpen.

Voor het veilig reinigen van Renishaw producten wordt verwezen naar het hoofdstuk ONDERHOUD (MAINTENANCE) in de produktendocumentatie.

Voordat u enig onderhoud verricht dient u de stroom uit te schakelen.

De bedieningsinstructies van de machineleverancier raadplegen.



### SW

Se upp för plötsliga rörelser. Användaren bör befinna sig utanför arbetsområdet för sondhuvudet/förlängningen/sond-kombinationerna.

Hantera och avyttra batterier i enlighet med tillverkarens rekommendationer. Använd endast de batterier som rekommenderas. Låt ej batteriuttagen komma i kontakt med andra metallföremål.

För instruktioner angående säker rengöring av Renishaws produkter, se avsnittet UNDERHÅLL (MAINTENANCE) i produktokumentationen.

Koppla bort strömmen innan underhåll utförs.

Se maskintillverkarens bruksanvisning.

### FIN

Varo äkillistä liikettä. Käyttäjän tulee pysytellä täysin anturin pään/jatkeen/anturin yhdistelmiä suojaavan toimivan kotelon ulkopuolella.

Käytä paristoja ja hävitä ne valmistajan ohjeiden mukaisesti. Käytä ainoastaan suositeltuja paristoja. Älä anna paristonapojen koskettaa muita metalliesineitä.

Renishaw-tuotteiden turvalliset puhdistusohjeet löytyvät tuoteselosteen HUOLTOA (MAINTENANCE) koskevasta osasta.

Kytke pois sähköverkosta ennen huoltotoimenpiteitä.

Katso koneen toimittajalle tarkoitettuja käyttöohjeita.

### GR

Προσοχή - κίνδυνος απροσδόκητων κινήσεων. Οι χρήστες πρέπει να παραμένουν εκτός του χώρου που επηρεάζεται από όλους τους συνδυασμούς λειτουργίας της κεφαλής του ανιχνευτή, της προέκτασης και του ανιχνευτή.

Ο χειρισμός και η απόρριψη των μπαταριών πρέπει να γίνεται σύμφωνα με τις συστάσεις του κατασκευαστή. Να χρησιμοποιούνται μόνο οι συνιστώμενες μπαταρίες. Δεν πρέπει οι αποδέκτες να έρχονται σε επαφή με άλλα μεταλλικά αντικείμενα.

Για οδηγίες που αφορούν τον ασφαλή καθαρισμό των προϊόντων Renishaw, βλέπετε το κεφάλαιο MAINTENANCE (ΣΥΝΤΗΡΗΣΗ) στο διαφωτιστικό υλικό του προϊόντος.

Αποσυνδέστε το μηχάνημα από το ηλεκτρικό ρεύμα προτού επιχειρήσετε τυχόν εργασίες συντήρησης.

Βλέπετε τις οδηγίες λειτουργίας του προμηθευτή του μηχανήματος.

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# 1.0 INTRODUCTION

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## 1.1 The MIH

The Renishaw Manual Indexable Head (MIH) is a compact manual probe head which offers the flexibility and time saving normally associated with direct computer controlled (DCC) machines and motorised probe heads.

The MIH is adjustable in two axes, both of which can be unlocked by a single thumbwheel operation. A probe/stylus combination can be orientated to 720 different positions and, once the head is locked, each position will be repeatable to  $1\mu\text{m}^*$  (0.00004in) ( $2\sigma$ ). Hence the user can return to any chosen position without having to requalify the probe/stylus tip.

The current position is shown on the integral liquid crystal display (LCD) and is constantly updated during moves.

The programmable memory facility allows pre-datumed positions to be stored in a memory within the head. Direction arrows shown on the LCD lead the user back to any one of 20 memorised positions. Memorised head positions can be arranged in any order to suit a particular sequence of inspection. The sequence can be re-edited as required and the direction arrows will lead the user, step-by-step, through the sequence.

Probes are attached to the MIH by means of a Renishaw Autojoint, allowing the user to easily exchange probes whilst maintaining repeatability to  $0.5\mu\text{m}^*$  (0.00002in) ( $2\sigma$ ). The Autojoint is recessed into the head, thus maximising the valuable working volume of the machine.

---

## 1.2 Features

- Manually indexable in 2 axes
- Positionally repeatable to  $1\mu\text{m}^*$  (0.00004in) ( $2\sigma$ )
- 720 selectable positions
- Head mounted LCD display
- Programmable memory function
- Simple operation
- Compact size
- Renishaw Autojoint probe mounting
- No special installation required

\* Measured at 67mm (2.64in) from Autojoint (TP6A probe with 21mm (0.83in) stylus).

## 2.0 DOS AND DON'TS

**DO** mount the head as rigidly as possible in the CMM quill

**DO** ensure that the head is properly locked before attempting to use the probe to take points

**DO** support probe/extension set-ups of longer than 150mm by hand when locking or unlocking the head

**DO** disarm the head during moves if possible

**DO** change the battery when low battery indicator is ON

**DO** reposition the head by moving only one axis at a time

**DO** unlock and relock the head after a probe change

**DO NOT** rotate the head axes by holding the probe stylus

**DO NOT** move the CMM by holding the head

**DO NOT** attempt to use a probe whilst the head is unlocked

**DO NOT** leave the head unlocked for long periods

**DO NOT** attempt to use probe extensions over 300mm long

**DO NOT** attempt to lock the head in an overtravel position

**DO NOT** move the axes beyond overtravel positions

### 3.0 MAJOR COMPONENTS

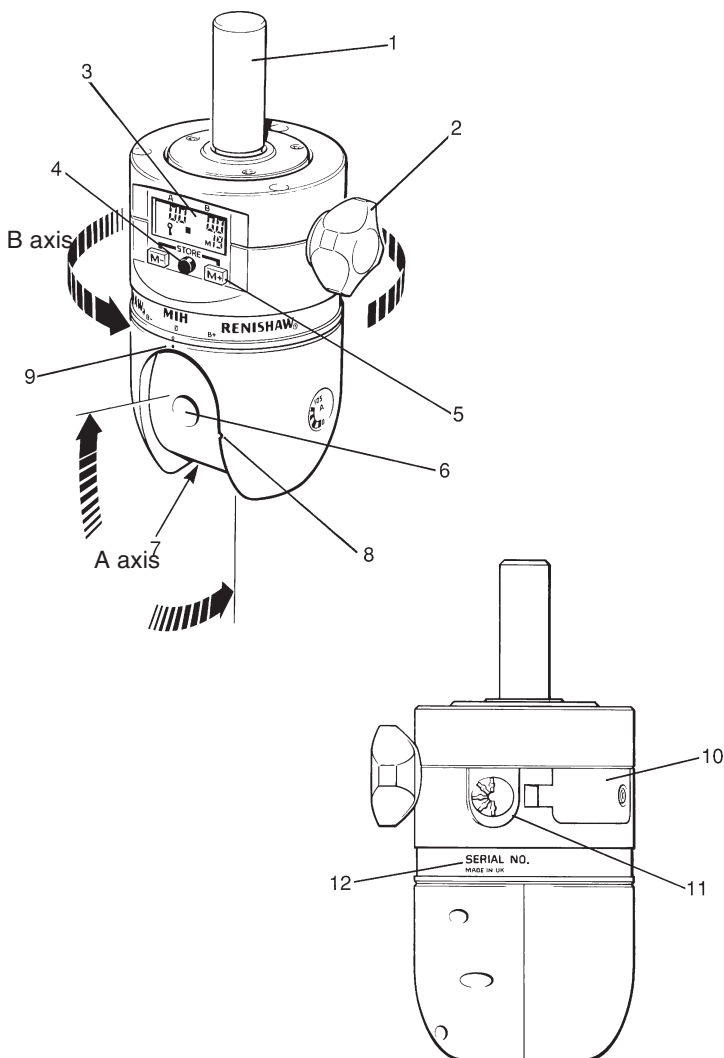
3.1  
MIH front  
Figure 1

- 1 Mounting shank
- 2 Lock/unlock thumbwheel
- 3 LCD display
- 4 Probe status LED
- 5 LCD memory programming buttons
- 6 Probe Autojoint lock/unlock access window
- 7 Renishaw Autojoint probe mounting (recessed into A axis swivel)
- 8 A axis zero position markers
- 9 B axis zero position markers

3.2  
MIH back  
Figure 1

- 10 Battery housing
- 11 5-pin DIN connector
- 12 Serial number

Figure 1



## LCD display

---

### 3.3

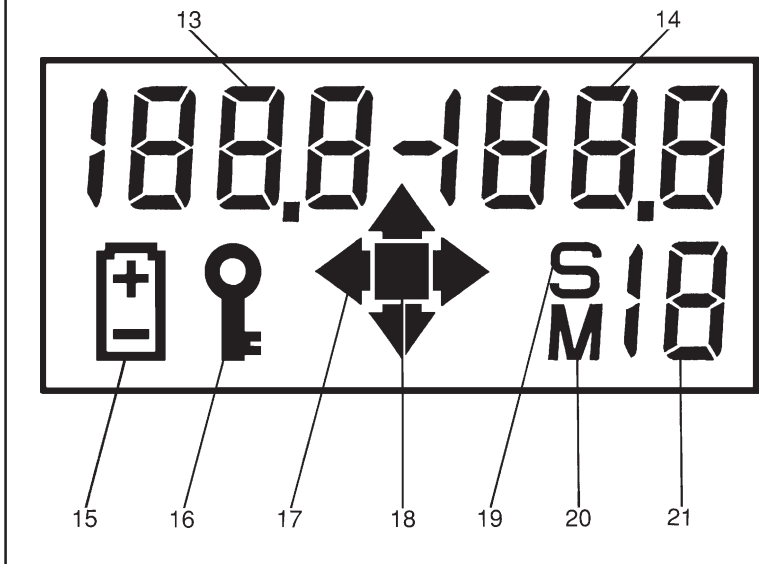
#### LCD display

Figure 2

- |    |                                         |
|----|-----------------------------------------|
| 13 | A axis positional data (0° to +105°)    |
| 14 | B axis positional data (-180° to +180°) |
| 15 | Low battery indicator                   |
| 16 | Head locked symbol                      |
| 17 | Rotation direction arrows               |
| 18 | Position confirmation symbol            |
| 19 | Sequence store indicator                |
| 20 | Memory mode indicator                   |
| 21 | Memory number                           |



Figure 2



### 4.0 INSTALLATION

---

#### 4.1 Fitting the battery

Figure 3

1. Move MIH to axis positions A0.0, B0.0 and lock up
2. Unscrew housing retaining screw
3. Open housing door
4. Insert battery as shown (negative end first)
5. Close door and secure retaining screw (do not overtighten)
6. Reset datum (See Datum mode, section 6.2)

**NOTE**

**Incorrect insertion of the battery will not cause  
damage to the MIH**

---

#### 4.2 Fitting the probe

Figure 4

1. Offer up the female Autojoint with key slot facing as shown
2. Using an S10 Autojoint key, insert into access hole and locate blade in key slot
3. Rotate clockwise to lock the Autojoint
4. Once qualified, probe/stylus combinations may be interchanged without the need to re-qualify
5. After changing a probe, unlock and re-lock the head to ensure repeatability

---

#### 4.3 Connection

Figure 5

Insert Renishaw 5-pin DIN plug into socket

- Pin connections:
- |   |                    |
|---|--------------------|
| 1 | - Head LED cathode |
| 2 | - Ground           |
| 3 | - Head LED anode   |
| 4 | - Probe circuit    |
| 5 | - Probe circuit    |

---

#### 4.4 Quill mounting



Ensure that the head is securely mounted onto the CMM quill. Any rotational movement occurring during use will result in a loss of repeatability of positional data.

**WARNING**

**Always fit mounting shanks with the screws  
supplied (M3 x 5mm (0.20in) long). The use of  
incorrect screws may cause serious internal  
damage to the head.**

Figure 3

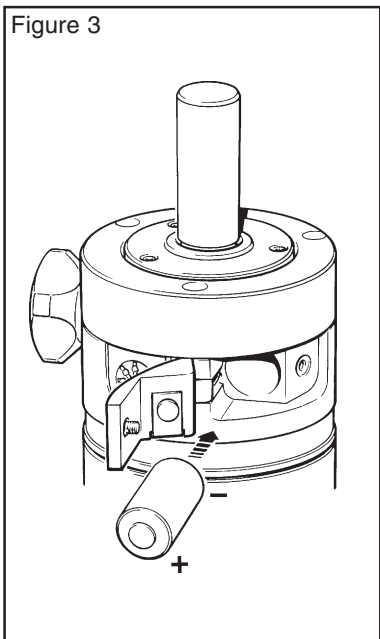


Figure 4

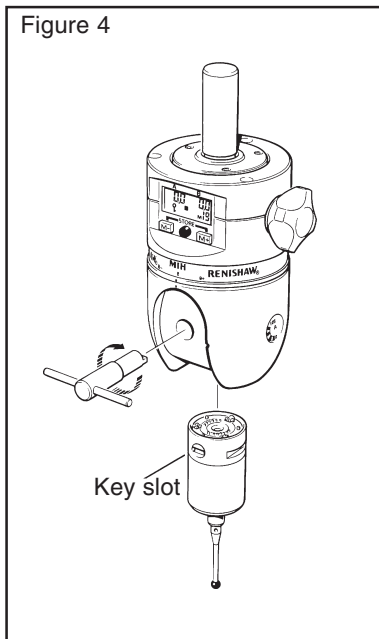
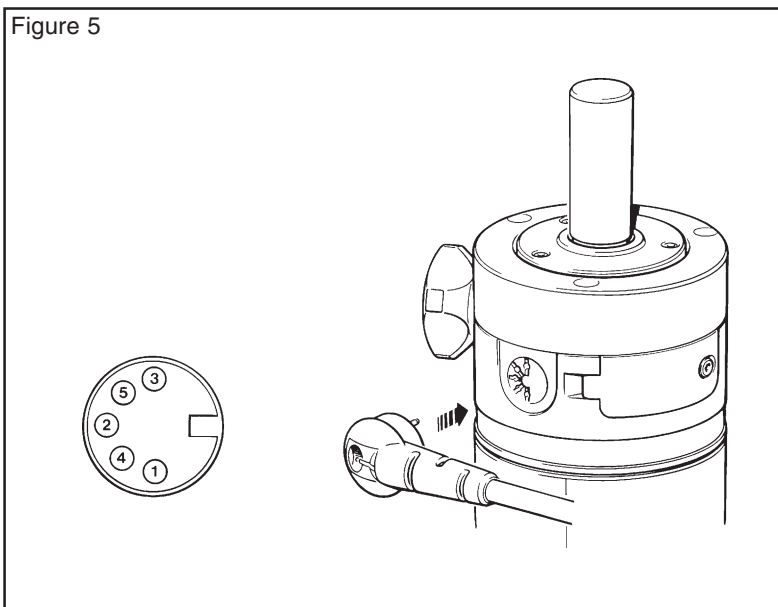


Figure 5



## 5.0 USING THE MIH

---

### 5.1 Unlocking the head

Figure 6

Both A and B axes are unlocked by a single turn of the thumbwheel in a counter-clockwise direction. The locked (key) symbol on the LCD will disappear. The head detent will not support extensions longer than 150mm (5.91in) and these must be supported by hand when unlocking.

---

### 5.2 Locking the head

To lock the head correctly after positioning, support the probe (and extension, if fitted) and turn the thumbwheel clockwise until a positive "click" is felt. A correct "lock-up" is confirmed by the appearance of the key symbol on the LCD. To ensure repeatability, it is important to simply support the probe/extension during lock-up and **NOT** to constrain it.

**NOTE**

**Do not leave the head unused in an unlocked position as this will shorten battery life.**

---

### 5.3 Positioning the head

Figure 7

Rotation of each axis is achieved against a built-in detent mechanism. This provides the user with discreet 7.5° incremental positions so that the head cannot be locked in a non-repeatable position.

The detent also provides limited support for probe/extension combinations when the head is unlocked.

The B axis is positioned by holding the lower housing and rotating until the required position is reached.

The A axis is positioned by holding the probe or extension body as close to the head as possible and rotating until the required position is reached.

To ensure maximum repeatability, each axis should be moved separately, and should not be moved beyond overtravel positions.



**CAUTION**

**Do not change axis positions by holding the stylus, as this will cause damage to the probe.**

Figure 6

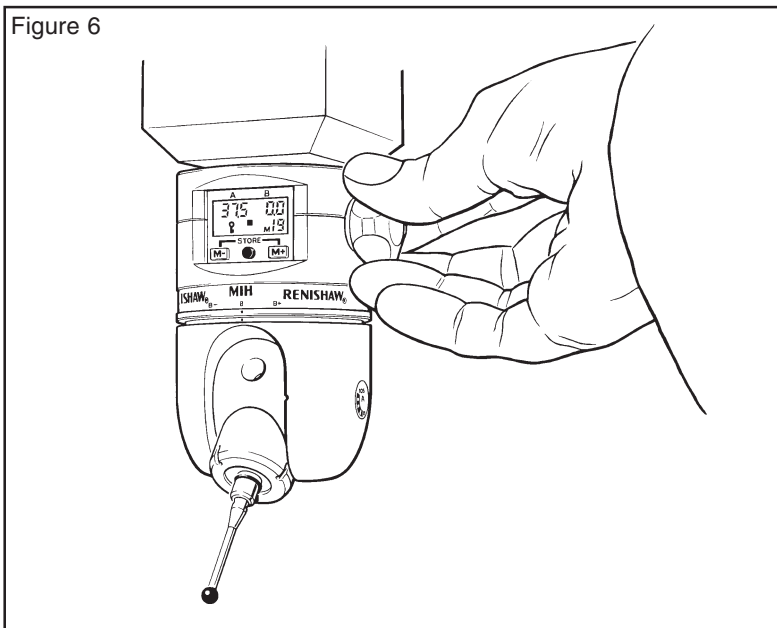
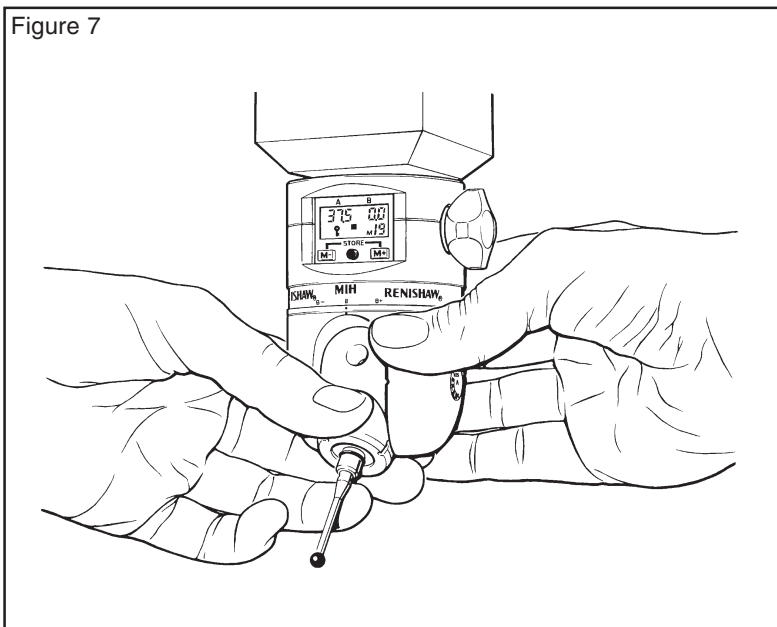


Figure 7



## 6.0 THE LCD/SOFTWARE FACILITY

---

### 6.1 Introduction

A and B axis positional data is shown on an integral liquid crystal display (LCD). When the head is unlocked and repositioned, position detectors fitted in each axis update the display which will show live position data. Power for the LCD/software is supplied by a battery fitted within the head which should be replaced when the low battery indicator is shown. Under normal use the head will still function for many days after the low battery indicator appears.

The MIH also has a user-friendly software facility which is operated by two buttons. The software facility operates in four modes which are entered and exited by button presses and/or time-out periods of non-use. The locked symbol and low battery indicator function in all modes.

---

### 6.1.1 Datum mode

This mode has automatic entry when the battery is first fitted or replaced. Datum mode requires the user to set the A and B axis position detectors to zero and must be completed successfully before the LCD can be used. Datum mode may also be automatically entered if an error occurs in the axis position detectors, caused by mis-use of the head. Again, correct datuming of the head must be completed before use can commence. See section 6.2 Datum mode in this manual for step-by-step instructions.

---

### 6.1.2 Simple mode

The software automatically enters Simple mode upon completion of the datuming routine. Following the time-out of other modes, the MIH software will always return the user to Simple mode. This is a use-only mode in which live A and B axis data will always be shown. In addition, if the head is locked in a position which corresponds to one which has been previously stored in memory, the memory number will be displayed on lock-up. See section 6.3 Simple mode in this manual for step-by-step instructions.

---

**6.1.3  
Memory  
mode**

The user can enter Memory mode from Simple mode by pressing either the M+ or M- button. In this mode the MIH memory can be programmed or used. In Memory mode, chosen head positions can be stored in up to 20 memory stores. Each position is allocated a memory number (0 to 19). In use, a chosen memory number is selected and direction arrows on the LCD lead the user to rotate the axis until the position stored in that memory is achieved. If the user fails to achieve the selected position, this condition is indicated by the flashing of the direction arrows on lock-up. Once the correct position is reached, the arrows disappear and the head position confirmation symbol is shown.

Exit from Memory mode will occur after a 10 second period of inactivity and the head will revert to Simple mode. A simple button press will return the user to Memory mode. See section 6.4 Memory mode in this manual for step-by-step instructions.

---

**6.1.4  
Sequence  
mode**

Sequence mode can be entered by a 5 second press of both M+ and M- buttons from Simple mode.

In Sequence mode, pre-memorised head positions can be arranged in any order to suit a particular sequence of inspection. Up to 20 sequence position numbers are available and the sequence can be re-edited as required. In use, the direction arrows lead the user through the pre-programmed sequence and will confirm that the head is locked in a correct position. The display automatically indicates the next position in the sequence when the head is next unlocked. See section 6.5 Sequence mode in this manual for step-by-step instructions.

## Battery life/Datum mode

---

---

### 6.1.5 Conserving battery life

Figure 8

To conserve battery life, the LCD will automatically power down if the head is left in an unlocked state and remains unused for more than 20 seconds.

The LCD will return to its exact display before the 20 second time-out upon lock-up.

Rotating either axis whilst the LCD is in this powered-down state will return the user to Datum mode upon lock-up (see Section 6.2 Datum mode).

This function will automatically operate if the head is left unlocked in any mode.

Stored memories and sequences remain unaffected by this function.

#### NOTE

**Do not leave the head unused in an unlocked position, as this will shorten battery life.**

---

### 6.2 Datum mode

When the battery is first inserted or replaced, the MIH enters a Datum mode routine which must be successfully completed prior to use. The A and B axis position detectors within the head require datuming to a zero position before the LCD will display the correct A and B axis positions. Datuming the head will also be required if a head datum error occurs during use.

---

#### 6.2.1 Step 1

Figure 9

On entry into Datum mode the LCD shows a datum error. Unlock the head to reset datum.

---

#### 6.2.2 Step 2

Figure 9

Rotate the A and B axes to their zero positions by aligning the zero position markers on both axes. (See Section 3, Major components, features 8 and 9.)



Figure 8

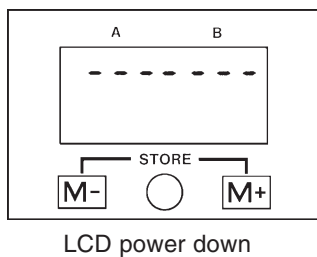
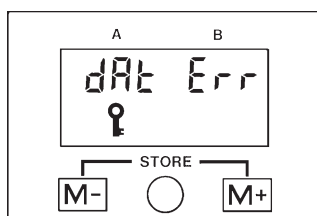
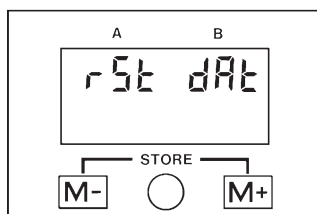


Figure 9

Step 1



Step 2



## Datum mode

---

### Datum mode

(continued)

---

#### 6.2.3 Step 3

Figure 10

Lock the head in this position and press the M+ and M- buttons simultaneously to reset datum.

---

#### 6.2.4 Step 4

Figure 10

The display will now change to show A and B axis data at A0.0, B0.0. Datum is now set and the A and B axis displays will show positional data when the head is locked and unlocked.

---

#### 6.2.5 Step 5

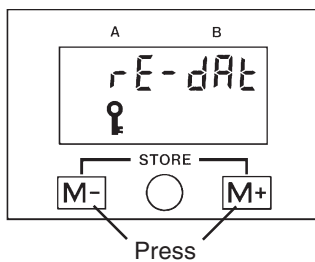
Confirm that datum is correctly set by rotating each axis to its extreme positions and check that the position data on the LCD is correct.

A axis      $0^{\circ}$  to  $+105^{\circ}$  plus overtravel

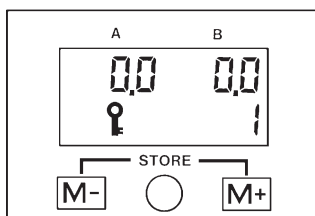
B axis      $\pm 180^{\circ}$  plus overtravel

Figure 10

Step 3



Step 4



## Simple mode

---

---

### 6.3 Simple mode

Following insertion of the battery and datuming of the head, the MIH is now ready to be used in Simple mode. All data shown in the A and B axis positions on the LCD will be "live".

**Example:** To use the MIH repeatably in positions A0.0, B0.0 and A105.0, B-180.0

---

#### 6.3.1 Step 1 Figure 11

Position the head to A0.0, B0.0 and lock in position. Qualify the probe tip on your CMM in the normal manner. The stored tip number should be noted, together with the corresponding A and B axis positions on the MIH.

---

#### 6.3.2 Step 2 Figure 11

Unlock the head and rotate the A and B axes until the required position is reached - in this example

A105.0, B -180.0

If overtravel in either axis occurs, the 'O-t' symbol will appear in the axis data on the LCD. Rotate the head to a valid position.



**WARNING**  
**Do not attempt to lock the head in an overtravel position**

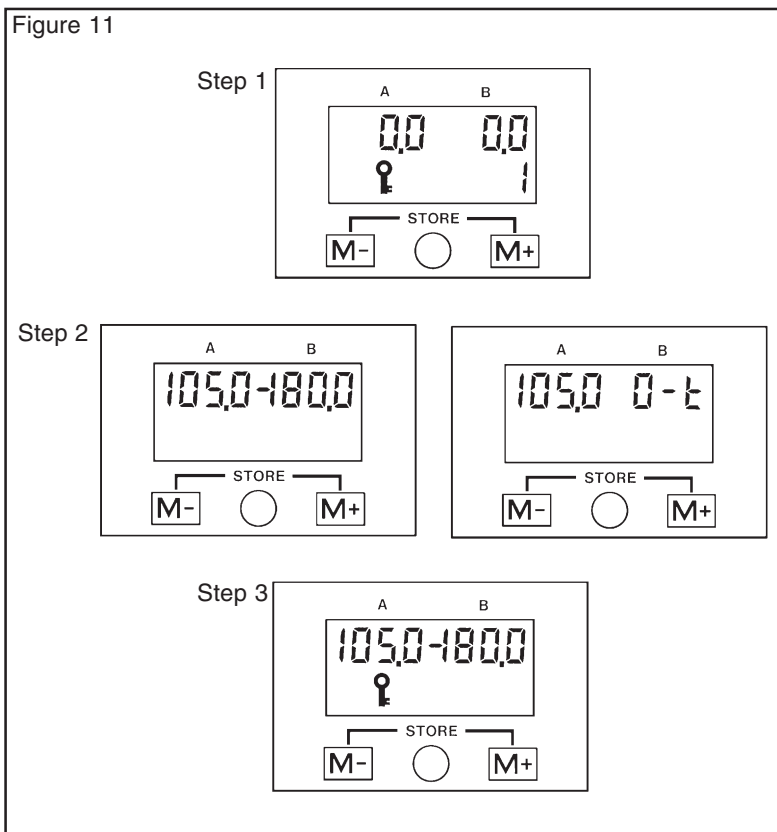
---

#### 6.3.3 Step 3 Figure 11

Lock the head in a valid position, A105.0, B-180.0. Qualify the probe tip on your CMM in the normal manner. The stored tip number should be noted, together with the corresponding A and B axis positions on the MIH.

The MIH can now be used in either of the two pre-qualified positions (A0.0, B0.0 or A105.0, B-180.0) without the need to re-qualify the probe tip after each move. Simply unlock the head, move to the required position and lock up. The previously stored tip data for that head position can be recalled from the CMM computer software ready to take points.

Figure 11



### Simple mode

(continued)

The head can be used in this way in up to 720 repeatable positions. The number of positions which are to be used will be dictated by the workpiece requiring inspection, but in some cases may be restricted by the number of storage positions for tip data available on your CMM software. Please consult your CMM supplier for further details.

Attempting to move the head axes whilst locked will cause damage and may result in movement of the axis position detectors in severe cases. Should this occur, the MIH software will signal an axis error message and will ask for a datum reset (Figure 12) when unlocked.

See Step 2 of the Datum mode section (6.2) for details of this routine.

If the head is in a locked position which has previously been stored within the head's programmable memory function, the memory number corresponding to that position will show on the LCD screen upon lock-up. For further details on the use of the memory function see Section 6.4.

---

### 6.4 Memory mode

When the battery is first fitted, all memory locations are pre-set to A0.0, B0.0.

Pressing either the M+ or M- button when in Simple mode activates Memory mode.

---

#### 6.4.1 Step 1

Figure 13

In this example the head is positioned and locked at A0.0, B0.0 in Simple mode.

---

#### 6.4.2 Step 2

Figure 13

The M+ or M- button is pressed to activate Memory mode. Memory location 1 is shown on the LCD and the axis data stored in that location shown in the A and B axis position displays. Because the head is at this position (A0.0, B0.0), the direction arrows do not show, only the position confirmation block shows. If no button presses or head lock/unlock occur within 10 seconds, the LCD reverts to Simple mode.

**M1 now = A0.0, B 0.0**

Figure 12

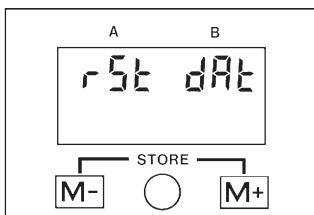
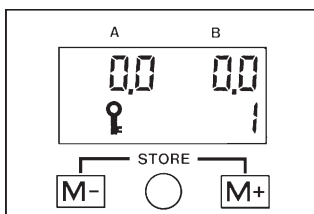
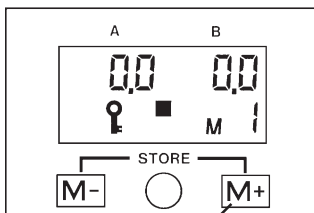


Figure 13

Step 1



Step 2



Press

## Memory mode

---

### Memory mode

(continued)

---

#### 6.4.3

##### Step 3

Figure 14

The head is unlocked, repositioned and locked at A30.0, B30.0 in Simple mode.

Press M+ to activate Memory mode.

---

#### 6.4.4

##### Step 4

Figure 14

Memory location M1 is displayed (A0.0, B0.0) since this was the last memory number used.

As the head is not in this position, the direction arrows appear showing the direction in which each axis must be rotated to achieve the position stored in M1 (A0.0, B0.0).

---

#### 6.4.5

##### Step 5

Figure 14

To store A30.0, B30.0 in memory location M2, press M+ and the memory number will increment until M2 is reached.

Currently A0.0, B0.0 is stored in M2 and this is displayed together with the flashing direction arrows showing how this position can be reached.

---

#### 6.4.6

##### Step 6

Figure 14

Pressing the M+ and M- buttons simultaneously for longer than half a second will store A30.0, B30.0 in memory location 2.

The display will then "blink" to show that the position data is stored in the memory.

This is confirmed by A30.0, B30.0 appearing in the A and B axis displays and the direction arrows disappearing, leaving only the confirmation block.

**M2 now = A30.0, B30.0**

---

#### 6.4.7

##### Step 7

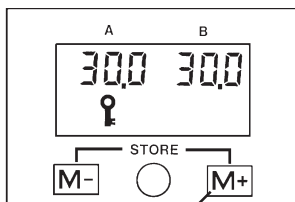
Figure 14

To return the head to a previously memorised position M1 (A0.0, B0.0) press M- to decrement the memory number to M1. The direction arrows flash to show the direction moves required to reach that position and the axis data stored in M1 (A0.0, B0.0) is displayed.



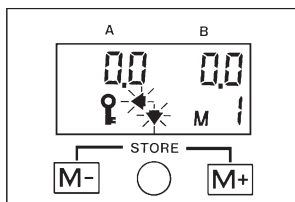
Figure 14

Step 3

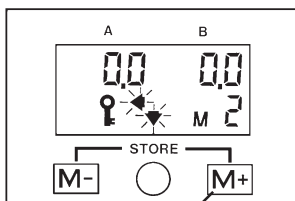


Press

Step 4

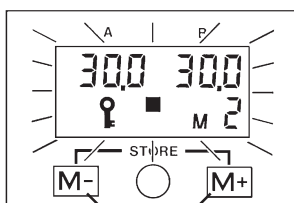


Step 5



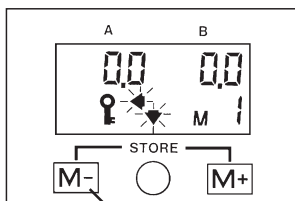
Press

Step 6



Press

Step 7



Press

### Memory mode

(continued)

---

#### 6.4.8

#### Step 8

Figure 15

Unlock the head to display live positional data. The direction arrows remain but stop flashing.

---

#### 6.4.9

#### Step 9

Figure 15

Rotate the A and B axes in the directions indicated by the arrows until both arrows disappear and the position confirmation block comes on. This confirms that the head is now in the position stored in the memory location indicated.

#### NOTES

**If you overshoot the target position chosen in either axis, the direction arrows will lead you back to the required position.**

**If the head is locked in an incorrect position, the direction arrows will flash. The arrows will stop flashing after 10 seconds and the display will return to Simple mode showing "live" position data. If either button is pressed, the screen will return to the last used memory display.**

**The memory numbers are incremented or decremented by pressing either the M+ or M- buttons respectively. Pressing either button and keeping it pressed will cause the memory numbers to scroll up or down at the rate of two per second.**

---

#### 6.5

#### Sequence mode

Figure 16

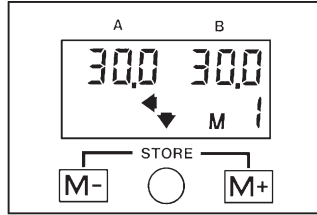
When the battery is first inserted, sequence step 1 contains the contents of memory 1, sequence step 2 contains the contents of memory 2 and so on up to sequence step 19. Step 20 contains an end of sequence marker (E).

By pressing the M+ and M- buttons simultaneously (for 5 seconds) when the head is locked in simple mode, sequence mode is entered.

The display gives the choice to either use the existing sequence (press M- button) or edit the sequence to create a new one (press M+). If no choice is made within 5 seconds, the display will return to Simple mode.

Figure 15

Step 8



Step 9

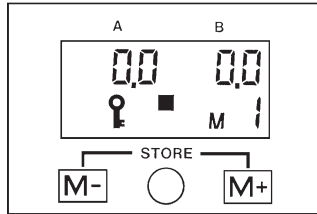
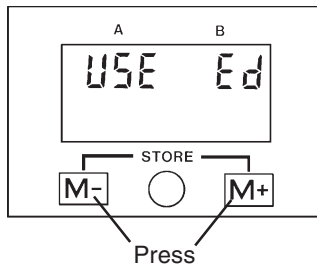


Figure 16



### Creating a new sequence (editing)

---

#### 6.5.1 Step 1

Figure 17

Pressing the M+ button to edit, the sequence is entered at step 1. The existing contents of this step (in this case memory 1) are also displayed.

---

#### 6.5.2 Step 2

Figure 17

Pressing M+ or M- will increment or decrement the sequence step numbers and the display will show the memory number stored in each sequence step. Keeping the M+ or M- buttons pressed will scroll through the sequence steps at the rate of two per second.

---

#### 6.5.3 Step 3

Figure 17

Once the sequence step to be changed is chosen (in this example step 3 currently containing memory number 3), pressing the M+ and M- buttons simultaneously for between half a second and 3 seconds\* changes the display. The S character disappears and the M character will be shown. This confirms that the sequence step chosen (step 3) is now frozen, and that the new contents can be chosen by pressing either the M+ or M- button to scroll up or down through the memory numbers.

---

#### 6.5.4 Step 4

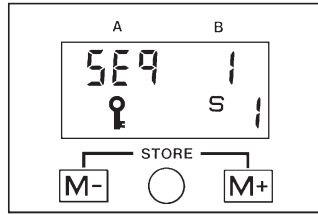
Figure 18

Once the memory number to be stored in sequence step 3 has been chosen (in this example memory 5), pressing the M+ and M- buttons simultaneously for between half a second and 3 seconds\* will store memory 5 in sequence step 3. This is confirmed by a store (Sto) message appearing on the display. The M character disappears and the S character reappears, confirming that the function of the M+ and M- buttons has been transferred back to selecting sequence steps.

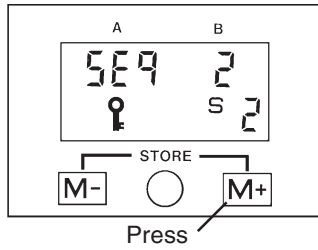
\* If the buttons are held for longer than 3 seconds, the display will revert to the 'End USE' screen (see step 7).

Figure 17

Step 1



Step 2



Step 3

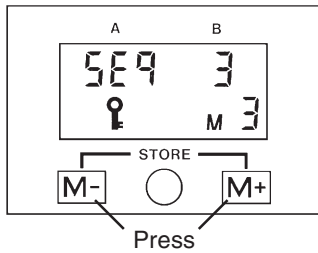
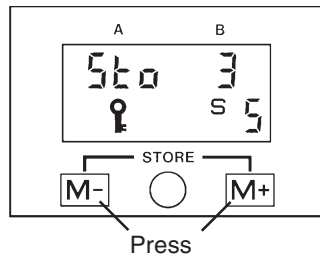
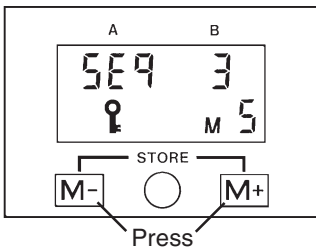


Figure 18

Step 4



### Creating a new sequence (editing)

(continued)

---

#### 6.5.5

#### Step 5

Figure 19

The sequence now has three steps - step 1 containing memory 1, step 2 containing memory 2 and step 3 containing memory 5. To end the sequence, the end of sequence marker (E) must be placed in sequence step 4. Pressing the M+ button will increment the sequence to step 4 and the display will show the current contents as memory 4.

---

#### 6.5.6

#### Step 6

Figure 20

Press M+ and M- simultaneously for between half a second and 3 seconds. This changes the display. The S character is replaced by the M character as before.

Press and hold either the M+ or M- button until the end of sequence marker (E) is displayed. This is positioned between M19 and M1.

Store E in sequence step 4 by pressing the M+ and M- buttons simultaneously for between half a second and 3 seconds.

The sequence is now complete and is as follows -

Step 1 (M1), Step 2 (M2), Step 3 (M5), Step 4 (E).

Figure 19

Step 5

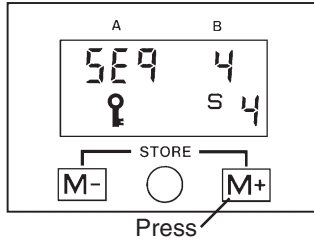
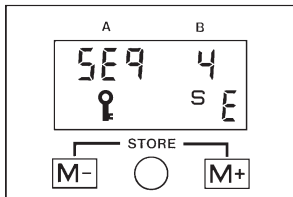
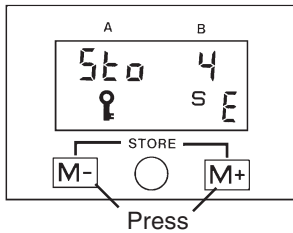
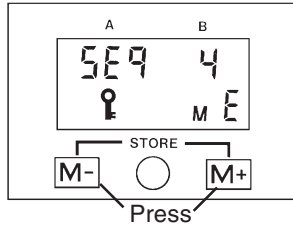
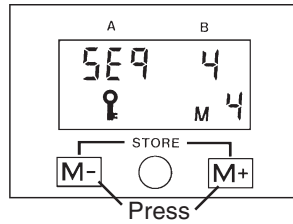


Figure 20

Step 6



### Creating a new sequence (editing)

(continued)

---

#### 6.5.7

#### Step 7

Figure 21

To exit from editing a sequence, press the M+ and M- buttons simultaneously for longer than 3 seconds. The display will give a choice of either ending sequence mode or using the sequence.

Pressing the M- button or taking no action for 5 seconds will return the display to Simple mode. Pressing the M+ button enables use of the stored sequence.

#### NOTE

**To reset the sequence back to its original form (step 1 containing memory 1, step 2 containing memory 2, etc), simply place the end of sequence marker (E) in sequence step 1 during sequence editing.**

---

#### 6.6

#### Using a sequence

When using a sequence, the only requirement is to position the MIH following the axis direction arrows and lock up once the correct position is reached. On unlock, the sequence will automatically increment to the next step and the direction arrows will indicate the direction each axis must be rotated to achieve the position stored in that step.

---

#### 6.6.1

#### Step 1

Figure 22

To use a sequence, either press the M- button from the 'USE Ed' display or the M+ button from the 'End USE' display. Either of these actions will automatically start the sequence at step 1. The memory contents of sequence step 1 are displayed and the flashing direction arrows indicate the direction in which each axis must be rotated to achieve the position stored in sequence step 1. If the head is already in this position, the position confirmation block will be displayed.

If the head is not in this position, unlock the head and follow the direction arrows. The display will show live positional data and the position confirmation block will confirm when the correct position has been reached.



Figure 21

Step 7

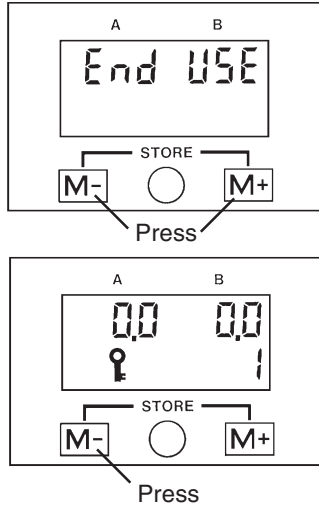
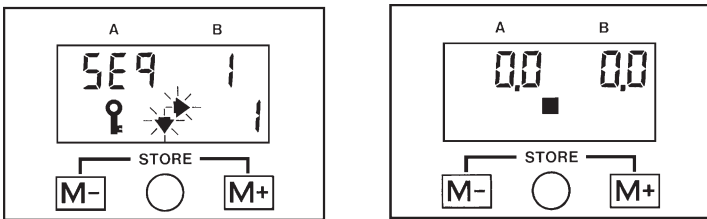


Figure 22

Step 1



## Sequence mode

---

### Using a sequence

(continued)

---

#### 6.6.2

#### Step 2

Figure 23

Locking the head in this position returns the display to show the sequence step number and its contents. The corresponding probe tip number can now be selected and points taken.

---

#### 6.6.3

#### Step 3

Figure 24

When the head is next unlocked, the direction arrows will show the way to achieve the position stored in sequence step 3. On locking up in the correct position, the display will show sequence step 3 and its memory contents, along with the position confirmation block.

If the head is locked in an incorrect position, flashing direction arrows will instruct the user to unlock and try again.

---

#### 6.6.4

#### Step 4

Figure 25

If the head is accidentally unlocked in a sequence step position before points can be taken, simply re-lock the head and press the M+ or M- buttons to step through the sequence until the correct step is reached.

When the last step in the programmed sequence is reached, the sequence will automatically loop back to the first step. This will only occur if the end of sequence marker (E) has been correctly placed during sequence editing.

---

#### 6.6.5

#### Step 5

Figure 25

Pressing the M+ and M- buttons simultaneously for longer than 3 seconds will give the choice to either re-use the sequence (press M+) or end using Sequence mode (press M-).

Pressing M+ will take the user back to step 1 in the sequence. Pressing M- or taking no action for 5 seconds will transfer the display back to Simple mode.

Figure 23

Step 2

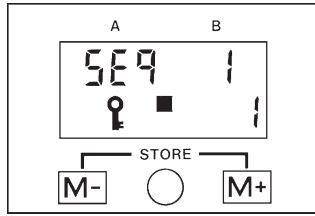


Figure 24

Step 3

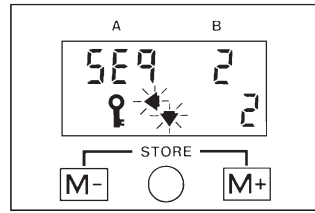
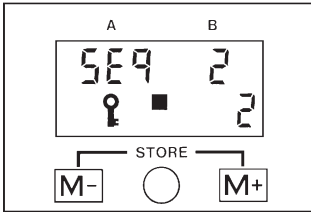
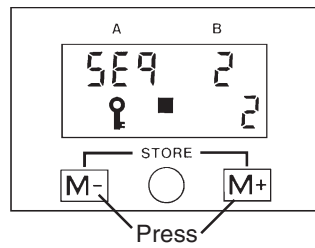
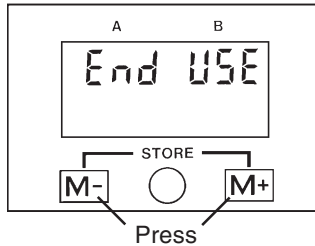


Figure 25

Step 4



Step 5



## 7.0 SUMMARY OF BUTTON OPERATION

Mode	Button operation	Effect
Datum mode	[M+] or [M-]	[No change]
	[M+] and [M-]	Simple mode entered

Simple mode	[M+] or [M-]	Memory mode entered
	[M+] and [M-] for longer than 5 seconds	Sequence mode entered

Memory mode	[M+]	Increments memory number
	[M-]	Decrements memory number
	[M+] held for longer than ½ second	Scrolls up memory numbers
	[M-] held for longer than ½ second	Scrolls down memory numbers
	[M+] and [M-] held for longer than ½ second	Stores current position
	[No action] for longer than 10 seconds	Simple mode entered

**Summary of button operation**

(continued)

Mode	Button operation	Effect
Sequence mode Select sequence mode function	[M+]	Edit sequence mode entered
	[M-]	Use sequence mode entered
	[No action] for longer than 5 seconds	Simple mode entered
Select sequence step in sequence edit	[M+]	Increments step number
	[M-]	Decrements step number
	[M+] held for longer than ½ second	Scrolls up step numbers
	[M-] held for longer than ½ second	Scrolls down step numbers
	[M+] and [M-] held for longer than ½ second	Selects memory number routine
	[M+] and [M-] held for longer than 3 seconds	Exits edit sequence mode
Select memory number in sequence edit	[M+]	Increments memory number
	[M-]	Decrements memory number
	[M+] held for longer than ½ second	Scrolls up memory numbers
	[M-] held for longer than ½ second	Scrolls down memory numbers
	[M+] and [M-] held for longer than ½ second	Stores memory number in current sequence step and returns to select sequence step
	[M+] and [M+] held for longer than 3 seconds	Exits edit sequence mode

## Button operation

---

### Summary of button operation

(continued)

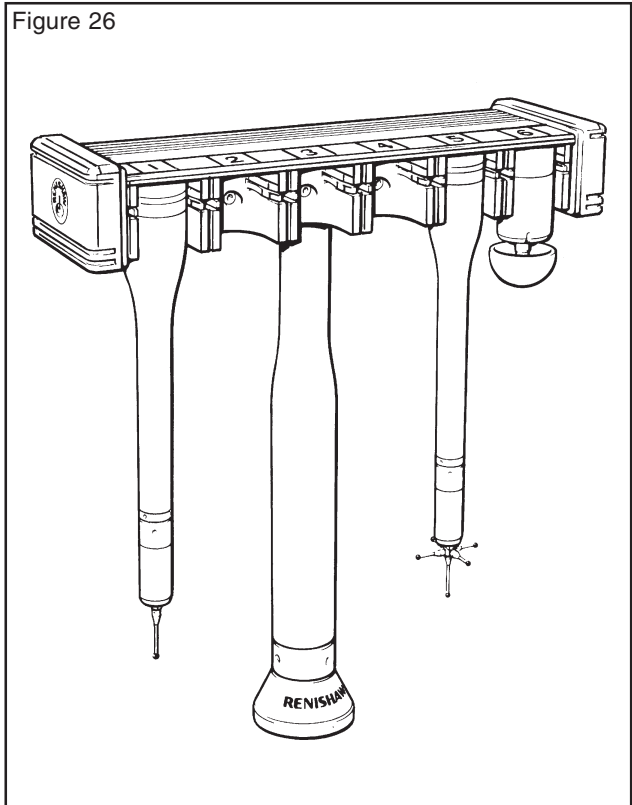
Mode	Button operation	Effect
<b>Sequence mode</b>  Use sequence mode	[M+]	Increments step number
	[M-]	Decrements step number
	[M+] held for longer than ½ second	Scrolls up step numbers
	[M-] held for longer than ½ second	Scrolls down step numbers
	[M+] and [M-] held for less than 3 seconds	[No change]
	[M+] and [M-] held for longer than 3 seconds	Exits use sequence mode
Exit sequence mode function	[M+]	Use sequence mode entered
	[M-] or [No action] for longer than 5 seconds	Simple mode entered

## 8.0 ACCESSORIES

### 8.1 MAPS Figure 26

The Renishaw Manual Autojoint Probe Stand (MAPS) is a low-cost storage rack for up to six autojointed probe/extension combinations. A complementary product to the MIH, MAPS allows the user to manually insert or remove pre-datumed probe/extension set-ups for protective storage or use with the MIH. MAPS can be either wall-mounted or bolted directly to the CMM table for easy access. For further information on MAPS, see the MAPS User Guide (Part No. H-1000-5300).

Figure 26

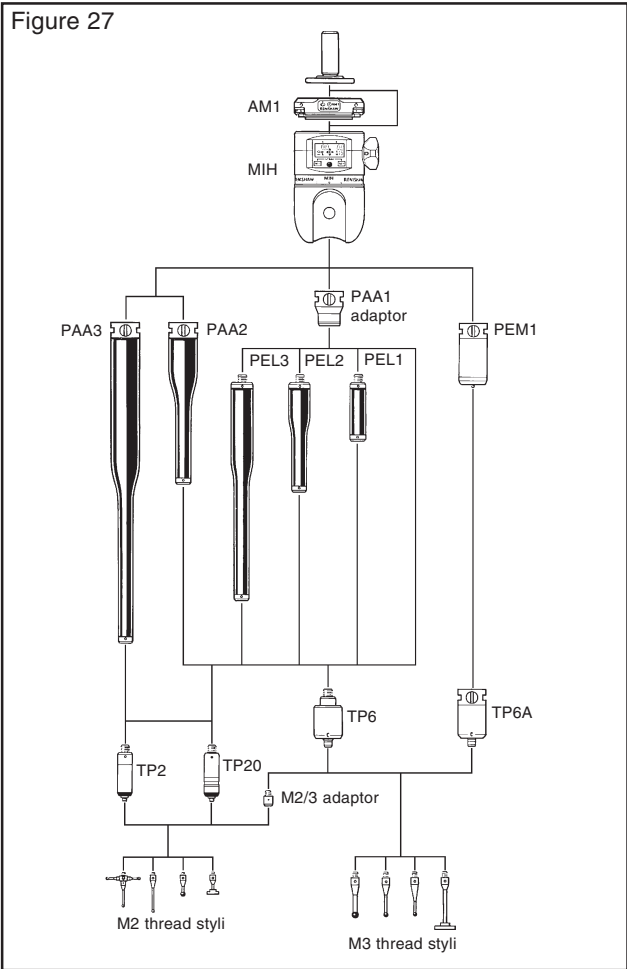


Accessories  
(continued)

8.2  
Autojoint  
extensions/  
adaptors  
Figure 27

A large range of Autojoint probe extensions/adaptors are available from Renishaw providing easy access to the deepest of features.

Utilising the patented Renishaw Autojoint, probing set-ups can be simply locked onto the MIH without the need to re-qualify each time, yielding maximum flexibility and valuable time saving.





**Accessories**

(continued)

**8.3  
Shanks**

Figure 28

Renishaw provide an extensive range of machine mounting shanks to fit most makes of CMM. Please take care when mounting the MIH with a parallel shank, as any rotational movements will invalidate any stored data.

**WARNING**

**Always fit mounting shanks to the MIH by using the screws supplied (M3 x 5mm (0.20in) long).  
The use of longer screws will cause serious internal damage to the head.**

Figure 28

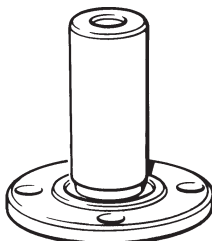
**8.4  
AM1  
adjustment  
module**

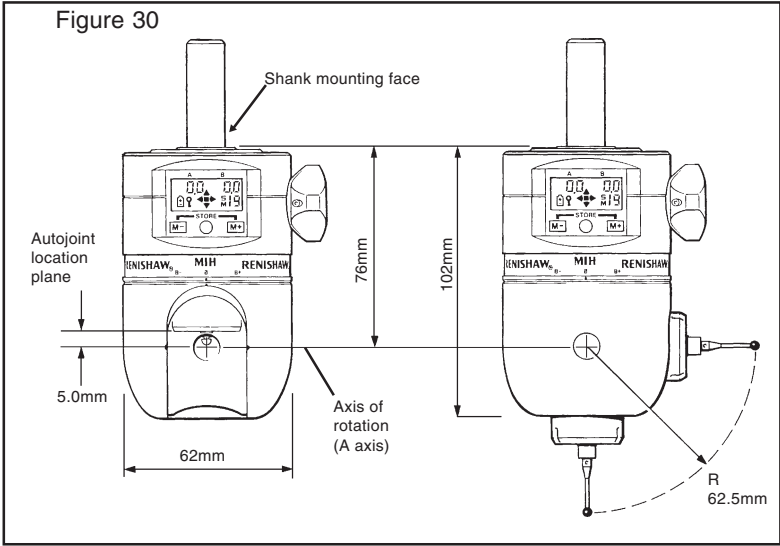
Figure 29

The AM1 is a compact adjustment module for accurately aligning probe heads with the CMM axes and/or the Renishaw Autochange rack. In addition, an in-built quick release bayonet mechanism allows the head to be removed for storage and replaced without the need to re-align. Limited overtravel protection is also provided by the AM1.

Figure 29



## 9.0 DIMENSIONS



## 10.0 MECHANICAL SPECIFICATION

Probe mounting Renishaw Autojoint

Autojoint repeatability (at the stylus tip) ( $2\sigma$ ) 0.5 $\mu$ m (0.00002in) \*

Probe status indicator LED

Swept radius 62mm (2.44in) \*

MIH positional repeatability (at the stylus tip) ( $2\sigma$ ) 1.0 $\mu$ m (0.00004in) \*

Accuracy of step spacing from theoretical position in each axis (at the stylus tip)  $\pm$ 0.3mm ( $\pm$ 0.012in) \*

Total angular movement    A axis 0° - 105° in 7.5° steps = 15 positions  
                                          B axis  $\pm$ 180° in 7.5° steps = 48 positions

Total number of positions 720

Support limit of head (unlocked) 150mm (5.91in) using PAA2 and TP6

Maximum extension length 300mm (11.81in) using PAA3 and TP6

Lock/unlock mechanism Single thumbwheel rotation

Weight 580g (1.3lb)

Working temperature range 10°C - 40°C (50°F - 105°F)

\* Using a TP6A fitted with a 21mm (0.83in) stylus

## 11.0 ELECTRICAL SPECIFICATION

Probe connector      Renishaw 5-pin DIN connector

Battery type to      6 volt lithium manganese cell  
power LCD            (Ø12mm [0.48in] x 25mm [0.98in])

Battery type	Part number
PX28L	P-BT03-0004
Alternatives:	
L544BP	
K28L	
V28PXL	

### NOTE

**Whilst other battery types (i.e. silver oxide) will correctly power the LCD, overall battery life will be reduced, and battery life beyond the low battery warning indicator will be significantly reduced.**



### WARNING

**Care must be taken when disposing of lithium manganese batteries**

**DO NOT INCINERATE**

### 11.1 Battery life

#### TYPICAL BATTERY LIFE

(10 minutes/day unlock time):

Before low battery warning	40 weeks
After low battery warning	11 days

#### BATTERY LIFE WITH HEAVY USAGE

(20 minutes/day unlock time):

Before low battery warning	26 weeks
After low battery warning	8 days

## 12.0 TROUBLESHOOTING GUIDE

Observation	Possible causes
Poor repeatability (probe changing)	Loose mounting
	Dirty or damaged Autojoint
	Autojoint lock-up procedure incorrect
	Probe extension too long
Poor repeatability (head positioning)	Loose mounting
	Head lock-up procedure incorrect with long extensions
Incorrect LCD function	Battery power low
No LCD function	No battery present or battery inserted incorrectly
Unexpected software modes entered	Buttons not pressed simultaneously
	Time-out exceeded
No probe signal and/or no probe status LED	Cabling faulty/not connected
	Probe/extension bars faulty
	Probe interface faulty/not connected
When inserting battery, self test mode is entered	Button pressed during battery insertion

**The MIH contains no user serviceable parts and should be returned to Renishaw if suspected faulty**

Checks/Remedial action
Ensure shank mounting screws are tight and shank is securely mounted in machine quill
Inspect Autojoint probe connection contacts for damage and contamination. Clean with a stiff brush if necessary
Ensure probe set-up is locked onto the head correctly using the Autojoint key
Ensure maximum extension bar length of 300mm (11.81in) is not exceeded
Ensure shank mounting screws are tight and shank is securely mounted in machine quill
Ensure maximum extension bar of 300mm (11.81in) is not exceeded and that extensions longer than 150mm (5.91in) are supported on lock-up
If low battery indicator is shown, replace battery. If not, head may be faulty (see NOTE above)
Ensure battery is present and is inserted correctly (refer to installation section for correct procedure)
Ensure simultaneous operation when appropriate (eg to enter Sequence mode, if buttons are not pressed simultaneously, Memory mode is entered)
On time-out (no button presses or head movement for a period of time) the LCD will revert to Simple mode if locked, or power down if unlocked
Check continuity of cabling from head to interface/machine control (refer to installation section for pin connections)
Check probe/extensions are working correctly by exchange/elimination/continuity check - if faulty, return to Renishaw Service Centre for repair
Ensure correct connection of interface/machine control
Re-insert battery ensuring buttons are not pressed or press both buttons simultaneously three times to enter Datum mode

## 13.0 MIH SELF TEST

**NOTE**

**These tests are for diagnostic purposes only**

The self test function can only be entered by pressing the M+ or M- button whilst the battery is being inserted. If this should happen accidentally, either refit the battery or step through the function by pressing both M+ and M- buttons three times to enter Datum mode.

---

### 13.1 LCD test

Figure 31

This test cycles round the LCD displaying each segment in turn.

Pressing the M+ button will display all LCD segments simultaneously. Pressing the M- button will display the MIH software version number.

Press the M+ and M- buttons simultaneously to transfer to the encoder test.

---

### 13.2 Encoder test

Figure 32

The head should be locked during this test.

Any positional error within the A or B axis encoders will be detected and displayed in this self test.

Press M+ and M- simultaneously to transfer to battery test.

---

### 13.3 Battery test

Figure 33

This function is used by Renishaw when setting the low battery indicator threshold.

To step through this function, press the M+ and M- buttons simultaneously to transfer to Datum mode.

Figure 31

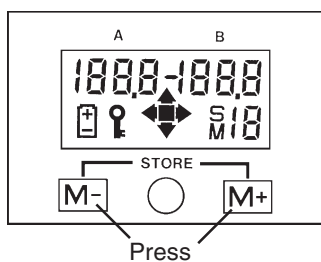


Figure 32

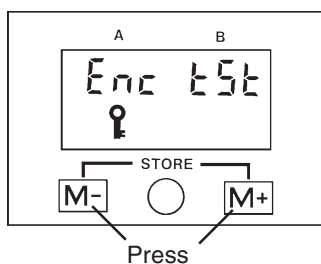
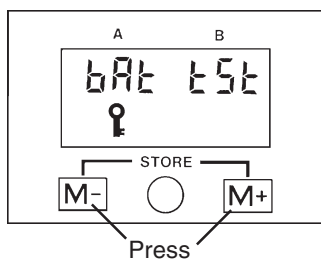


Figure 33



## **14.0 MAINTENANCE**

The MIH contains no user serviceable parts.

The MIH may be cleaned by wiping with a dry, lint-free cloth.



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