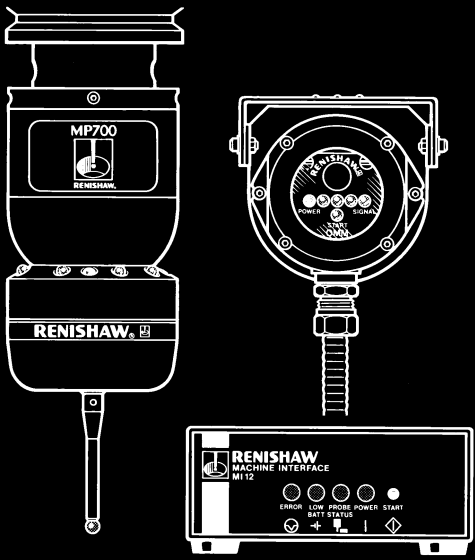
H-2000-5132-04-A



RENISHAW

MP700 PROBE SYSTEM OPERATOR'S GUIDE

CE RENISHAW CE

This product has been tested to the following European Standards:

BS EN 50081-2
BS EN 50082-2

It complies with the relevant essential health and safety protection requirements of the following EC Directives:

89/336/EEC, 91/263/EEC, 92/31/EEC (EMC), 93/68/EEC (CE Marking)

All relevant safety information, including that incorporated in the installation instructions, user instructions and maintenance instructions must be observed.

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 used in accordance with this Operator's Guide, 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 cautioned that any peripheral device installed with this equipment, such as a computer, must be connected with a high-quality shielded cable to ensure compliance with FCC limits.

H-2000-5132-04-A

Operator's Guide

MP700 PROBE SYSTEM

RENISHAW®

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PATENTS: Features of the Renishaw MP700 Probe System are subject to the following patents and patent applications:

EP 0068899	JP 1556462	US4813151
EP 0243766	JP 24104/88	US 4817362
EP 0388993	JP 24105/88	PCT/GB94/054
EP 242747B	US 4462162	

Note...

For in-depth information on the MP700 Probe System, refer to your MP700 Probe System Installation and User's Guide (H-2000-5142). Where necessary, this can be obtained by contacting your nearest Renishaw company.

RENISHAW®

Table of Contents

System Overview

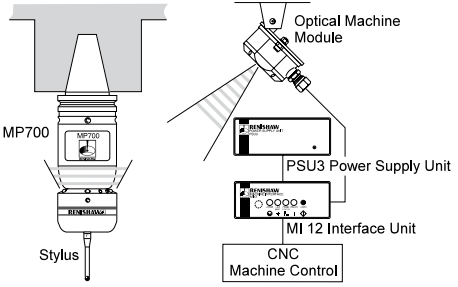
There are two types of MP700 Probe System:

- The Optical Machine Module/MI12 Machine Interface Unit variant.
- The Optical Machine Interface variant.

MP700 Probe System (Optical Machine Module/MI12 Machine Interface Unit Variant)

This system comprises:

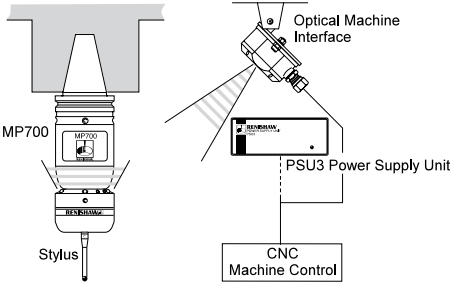
- A Renishaw® MP700 Spindle Probe.
- A Renishaw® Optical Machine Module.
- A Renishaw® MI12 Machine Interface Unit.
- A Renishaw® PSU3 Power Supply Unit (optional).



MP700 Probe System (Optical Machine Interface Variant)

This system comprises:

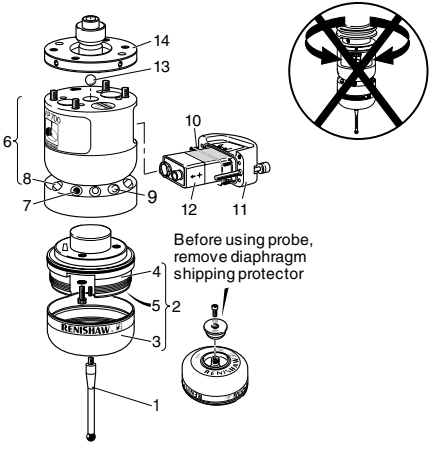
- A Renishaw® MP700 Spindle Probe.
- A Renishaw® Optical Machine Interface **(optional alternative to MI12 Machine Interface Unit and Optical Machine Module)**.
- A Renishaw® PSU3 Power Supply Unit (optional).



The Renishaw, MP700 Machine Spindle Probe

Note

The MP700 Machine Spindle Probe is 116.7mm (4.59 in.) in length (excluding stylus) and has a diameter of 62mm (2.24 in.).

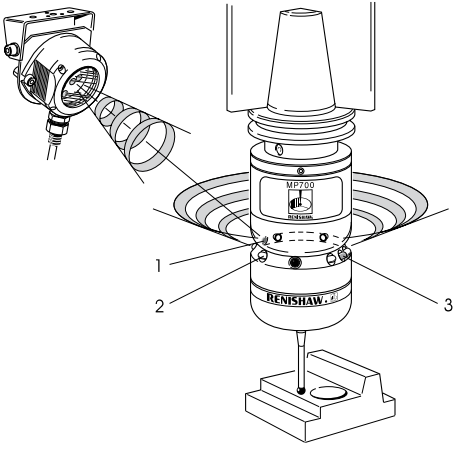


1. Stylus
2. Probe Head
3. Probe Head Cover
4. Probe Head Body
5. Jacking Grubscrews (2 off)
6. Optical Module
7. Receiving Diodes (3 x Rx)
8. Transmitting LED's (6 x Tx)
9. Probe Status LED (1 x Red/Green)
10. Battery Cover Seal
11. Battery Cover
12. Battery
13. Centre Ball (optional)
14. Stylus On-centre Adjustment Plate

The Probe Status LED

The probe status LED [3] will:

Flash green	When the stylus is seated.
Flash red	When the stylus is deflected.
Remain constantly red	When a battery change is required.



1. Receiving Diodes (3off)
2. Transmitting LED's (6off)
3. Probe Status LED

The Optical Machine Module (OMM)

The OMM is an optical transmitter/receiver which includes a receiver window [5] and a series of LEDs that allow you to monitor probe system status:

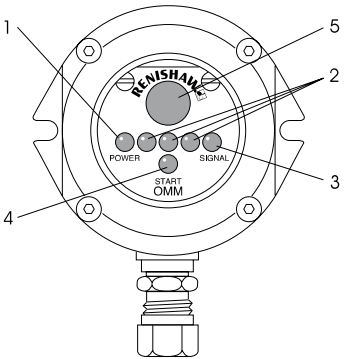


Fig. No	LED	Purpose
1	**'POWER'** (Red)	Lit when the power supply is active.
2	**Clear** (3off) (Transmitting)	Transmits infra-red control signals to the MP700 probe.
3	**'SIGNAL'** (Green)	Lit when a signal is received from the MP700 probe.
4	**'START'** (Yellow)	Lit when the MI12 Machine Interface Unit transmits a start signal.

The Machine Interface Unit (MI12)

The MI12 Machine Interface Unit sends probe signals to the CNC machine tool controller and includes a number of LEDs to allow you to monitor probe system status.

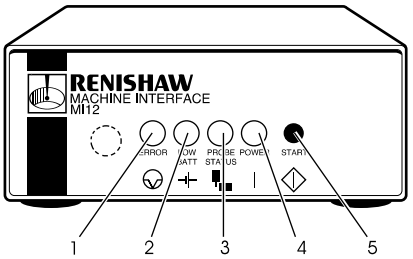


Fig. No	LED	Purpose
1	**'ERROR'** (Red)	Lit when the optical beam is obstructed or the probe is off.
2	**'LOW BATT'** (Red)	Lit when battery needs replacing.
3	**'PROBE STATUS'** (Red)	Lit when the probe is seated. Off when the stylus is deflected or when a probe error occurs.
4	**'POWER'** (Red)	Lit when the power supply is active.

The 'START' button [5] sends start signals to the probe.

Note...
An audible indicator sounds whenever the probe triggers.

The Optical Machine Interface (OMI)

The OMI is an alternative to the OMM and MI12 Machine Interface Unit and includes a receiver window [7] and a number of LEDs to allow you to monitor probe system status.

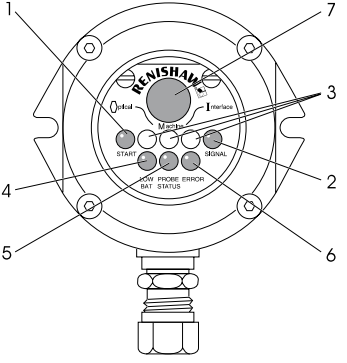
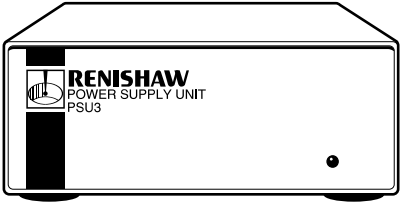


Fig. No	LED	Purpose
1	**'START'** (Yellow)	Lit when a start signal is transmitted to the probe. This LED will: ● Flash once when a machine controlled start signal is commanded. ● Flash continuously at one second intervals when the system is set to 'Auto-Start'.
2	**'SIGNAL'** (Tri-colour)	Lit when there is power to the system and indicates the infra-red signal strength received from the probe. This LED will: ● Turn red if the signal is too weak. ● Turn yellow if the signal is marginal. ● Turn green if the signal is O.K.
During a start transmission, this LED will indicate all three colours in sequence. If optical interference is received whilst the probe is not transmitting, the LED will flash yellow or green.		
3	**Clear** (Transmit)	Transmits infra-red control signals to the probe.
4	**'LOW BAT'** (Red)	Flashes when the battery needs replacing.
5	**'PROBE STATUS'** (Bi-colour)	Lit when the power to the system is on. This LED will: ● Turn green when the probe is seated. ● Turn red when the probe is triggered or when an error has occurred.
6	**'ERROR'**	Lit when an error exists.

The PSU3 Power Supply Unit

The PSU3 Power Supply Unit, fitted in instances where a 24V power supply is not available from the CNC machine controller to power the MI12 Machine Interface Unit or the OMI, includes the following:

- An 'ON/OFF' switch (located within the rear panel).
- A 'POWER' LED, located within the front panel, which illuminates when the power supply is active.



System Operation

CAUTION

PRIOR TO PROBE SYSTEM OPERATION, IT IS VITALLY IMPORTANT THAT THE PROGRAM THAT WILL 'DRIVE' YOUR PROBE HAS BEEN VERIFIED. INCORRECT PROGRAMMING CAN RESULT IN DAMAGE TO BOTH YOUR MACHINE, WORKPIECE AND TO THE PROBE SYSTEM ITSELF.

The MP700 is battery powered and has two modes of operation:

- **Standby:** where the probe receiver is operational.
- **Operational:** where the probe is switched on and will transmit and receive signals.

Switching On the Probe

The MP700 Probe is 'switched on' by one of the following methods. It is important that the probe is stationary for a minimum of 1 second after initiating a start signal. Following the start signal, the probe status LED will flash green:

- **Manual Start:** By depressing the 'START' button located on the front panel of the MI12 Machine Interface Unit (where applicable).
- **Machine Start:** Where an M code is generated by the program.

Switching Off the Probe

The probe will 'switch off' using one of the following methods:

- **Optical On - Time Out:** Where a timer automatically returns the probe to standby mode if the probe is not used for 33 or 134 seconds.
- **Optical On - Optical Off:** Where a second start signal, generated by a software M code, switches the probe to standby after a period of 4.2 or 8.6 seconds.

Resetting the Probe

Changing the probe's orientation can cause the probe to remain triggered. Where this occurs, the probe must be reset.

The method you must use to reset your probe is dependent upon the probe's 'switch-off' setting. However, it is important to ensure that the probe is stationary and away from the part for 1 second following any probe reset.

Probe Set at Optical On - Time Out

Either:

- Initiate a single M code start signal or
- Press the 'START' button on the MI12 Machine Interface Unit .

Probe set at Optical On - Optical Off

Wait a minimum of 5 seconds from the time you sent the first start signal, then either:

- Initiate two M code start signals allowing 0.5 seconds between each one *or*
- Press the 'START' button on the MI12 Machine Interface Unit twice, allowing 0.5 seconds between each depression of the button.

Do's and Don'ts

Mounting the Probe

- Ensure that the probe is securely mounted to the shank.
- Ensure that the probe status LED is aligned such that it is visible to the Operator.
- Ensure that the diaphragm protection cover has been removed.
- Ensure that on-centre adjustment has been performed.

Switching On the Probe

- Make sure the probe is stationary for a period of one second after the M code start signal is sent.
- Never select the Auto Start setting of the MI12 Machine Interface Unit or Optical Interface Unit.

Switching the Probe Off

- Use of the Optical On/Optical Off mode will greatly extend the life of your probe battery.
- Use of the Optical On/Time Out option is recommended when you wish to regularly re-orientate the probe (ie. 5 axis) and subsequent resetting may be required.
- Ensure the probe does not remain active in the tool changer when the Optical On/Time Out option has been selected.

Use of Styli

- It is recommended that carbon fibre styli are used whenever you wish to use styli in excess of 100mm; this is particularly important on 5 axis machine tools.

5 Axis Machine Applications

- The probe will require resetting if rotational speeds in excess of 2000°/minute are used when the probe is mounted horizontally, or moved from a horizontal to a vertical position (or vice versa).
- The probe may be rotated when vertically mounted without the need for resetting.

The Battery

- Whenever the MP700 Probe System indicates that battery power is low, renew the battery as soon as possible.
- In instances where the probe has remained inactive for a long period of time, and the probe fails to switch on, renew the battery as a matter of course.
- Prior to renewing the battery, always ensure that all machining residue and coolant have been removed from the probe.

Probe Calibration

- It is recommended that calibration (datuming) of the MP700 Probe is performed using a calibration sphere.
- Dependent on the system accuracy you require, and the degree of tolerance to which you wish to machine, a single calibration radius may be used.

Programming Techniques

- Ensure that the probing speed is exactly the same as the speed used to calibrate the probe.
- Ensure a minimum speed of 15mm/min. is observed during all inspection cycles.
- Ensure that the probe remains on the component surface for no more than 30 seconds.
- Ensure that measurements are always taken moving towards the surface and not when moving away from it.
- Ensure that all inspection moves occur outside the machine tool's acceleration and deceleration zones.
- A maximum of three triggers per second can be achieved.
- When using existing measurement cycles, ensure that these are updated to account for any system time delays.
- Best accuracy will be achieved by minimising spindle on-centre errors.
- Ensure that the probe is not spun at or above 500 rpm.

Installation and Maintenance of the MP700 Machine Spindle Probe

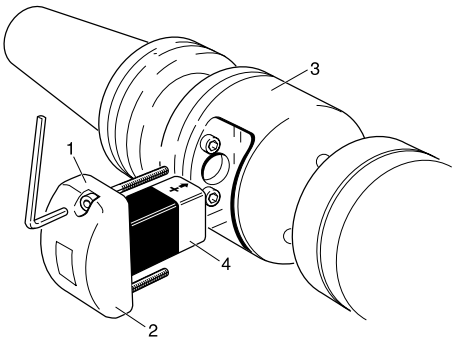
Battery Installation/Renewal

1. Release the two capscrews [1]
2. Remove the battery cover [2].
3. Disconnect and remove the battery [4].
4. Obtain new battery. The following battery types may be used:

Manufacturer	Model Number
EverReady	PP3-P I.E.C. 6F22
Duracell (Alkaline)	MN16046LR61
Varta	4022

5. Install the new battery into the probe ensuring correct polarity.
6. Ensure battery cover seal is correctly seated and lightly lubricate with mineral oil or grease.
7. Assemble battery cover and secure with the two capscrews [1]; tighten the capscrews to 1,1Nm (0.8 lbf.ft).

TYPICAL BATTERY LIFE EXPECTANCY			
Alkaline	**Continuous**	**Standby**	**5% Usage 72 min/day**
	43 Hours	**380 Days**	**35 Days**



1. Capscrew (2 off)
2. Battery Cover
3. OMP
4. Battery

Mounting the MP700 Probe to a Shank

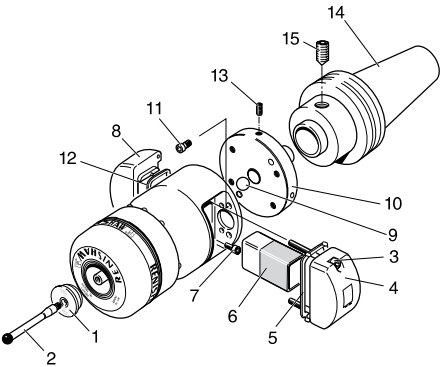
There are two methods of mounting the probe to a shank:

- **By using the adjustment plate:** which allows the probe to slide across the shank end face.
- **By using the adjustment plate and optional centre ball:** which allows the probe to pivot on the shank and slide across the shank end face.

To mount the probe:

1. Remove the diaphragm protection cover [1].
2. Assemble the stylus [2]. Tighten the stylus to 2Nm (1.7 lbf.ft).
3. Release the two capscrews [3].
4. Remove the battery cover [4].
5. Disconnect and remove the battery [6].
6. Release and remove retaining screw [7] securing cover [8]; remove cover.
7. Where applicable, position centre ball [9] within location point provided at top of probe.
8. Assemble adjustment plate [10] to probe and secure with four capscrews [11]. Tighten capscrews to 5.1Nm (3.76 lbf.ft).
9. Fully release four flat point grubscrews [13], then grease the two cone point grubscrews [15] and fit to shank [14].

Continued on page 24



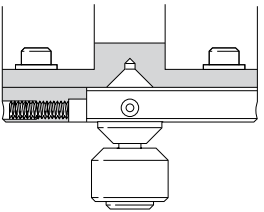
1. Diaphragm Protection Cover
2. Stylus
3. Capscrew (2off)
4. Battery Cover
5. Battery Cover Seal
6. Battery
7. Retaining Screw
8. Cover
9. Centre Ball
10. Adjustment Plate
11. Capscrew (4off)
12. Cover Seal
13. Flat Point Grubscrew (4 off)
14. Shank
15. Cone Point Grubscrew (2off)

10. Mount adjustment plate [10] to shank [14] and secure in position by lightly tightening cone point grubscrews [15].
11. **If stylus on-centre adjustment is to be carried out using the adjustment plate without the ball, carry out steps 12 thru 16 and then continue to page 25. If the ball and adjustment plate method is to be used, go straight to page 25 without completing steps 12 thru 16.**
12. Ensure cover seal [12] is correctly seated and lightly lubricated with mineral oil or grease.
13. Reassemble cover [8] and secure with retaining screw [7]. Tighten the retaining screw to 1.1Nm (0.8 lbf.ft.).
14. Reinstall battery [6] ensuring correct polarity.
15. Ensure battery cover seal [5] is correctly seated and lightly lubricate with mineral oil or grease.
16. Assemble battery cover [4] and secure with the two capscrews [3]. Tighten the capscrews to 1.1Nm (0.8 lbf.ft).

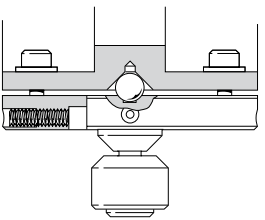
Stylus On-centre Adjustment

There are two methods of stylus on-centre adjustment:

- **By using the adjustment plate:** which allows the probe to slide across the shank end face.
- **By using the adjustment plate and optional centre ball:** which allows the probe to pivot on the shank and slide across the shank end face.



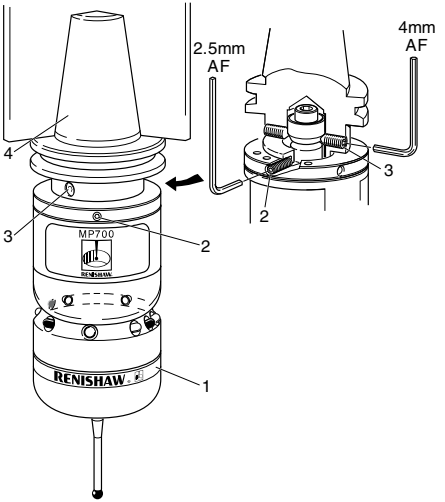
Adjustment Plate



Adjustment Plate with Centre Ball

Stylus On-centre Adjustment Using Adjusting Plate

1. Where necessary, install the probe [1] into the machine tool spindle.
2. Visually centralize the probe [1] relative to the shank [4]; and partially tighten cone point grubscrews [3] to 2-3 Nm (1.47 - 2.2 lbf. ft.).
3. Gradually and systematically tighten the four flat point grubscrews [2], backing off after each movement, until the stylus run out is less than 20µm.
4. Fully tighten cone point grubscrews [3] to 6 - 8Nm (4.4 - 5.9lbf. ft).
5. Continue adjustment using the four flat point grubscrews [2]. This is achieved by using each in opposition to the other in order to move the probe (first slackening one then tightening the other). Using two 2.5mm Allen keys (if required), progressively tighten the four grubscrews as the final setting is approached.
6. When the final setting is achieved (5µm (0.0002 in.) total stylus run out or better), ensure that the four flat point grubscrews [2] are fully tightened to 1.5 - 3.5Nm (1.1 - 2.6 lbf. ft).

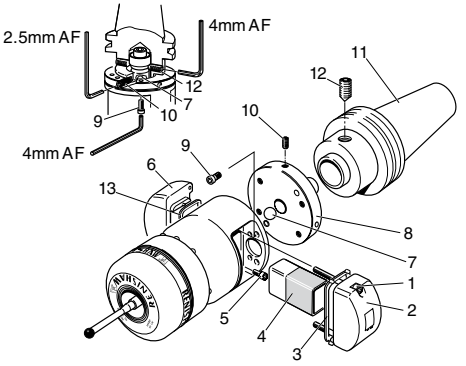


1. MP700 Probe
2. Allen Screw (4 off)
3. Allen Screw (2 off)
4. Shank

Stylus On-centre Adjustment Using The Centre Ball

1. Where necessary, release the two capscrews [1]. Remove the battery cover [2]. Disconnect and remove the battery [4]. Release and remove retaining screw [5]. Remove cover [6].
2. Visually centralize the probe relative to the shank [11]; partially tighten cone point grubscrews [12] to 2 - 3Nm (1.47 - 2.2 lbf. ft.).
3. Where necessary, install the probe into the machine tool spindle.
4. Visually check the alignment of the stylus, if adjustment is required, realign stylus by adjusting capscrews [9].
5. Tighten capscrews [9] to as near 5.1Nm (3.76 lbf. ft) as possible without loosing the alignment.
6. Gradually and systematically tighten the four flat point grubscrews [10], backing off after each movement, until the stylus run out is less than 20µm.
7. Fully tighten cone point grubscrews [12] to 6 - 8Nm (4.4 - 5.9 lbf. ft).
8. Continue adjustment using the four flat point grubscrews [12]. This is achieved by using each in opposition to the other in order to move the probe (first slackening one then tightening the other). Using two 2.5mm Allen keys (if required), progressively tighten the four grubscrews as the final setting is approached.
9. When the final setting is achieved (5µm (0.0002 in.) total stylus run out or better), ensure that the four flat point grubscrews [10] are fully tightened to 1.5 - 3.5Nm (1.1 - 2.6 lbf. ft).

10. Ensure cover seal [13] is correctly seated and lightly lubricate with mineral oil or grease.
11. Reassemble cover [6] and secure with retaining screw [5]. Torque-tighten the retaining screw to 1.1Nm (0.8 lbf.ft).
12. Reinstall battery [4] ensuring correct polarity.
13. Ensure battery cover seal [3] is correctly seated and lightly lubricate with mineral oil or grease.
14. Assemble battery cover [2] and secure with the two capscrews [1]; torque tighten the capscrews to 1.1Nm (0.8 lbf.ft).



1. Capscrew (2off)
2. Battery Cover
3. Battery Cover Seal
4. Battery
5. Retaining Screw
6. Cover
7. Centre Ball
8. Adjustment Plate
9. Capscrew (4off)
10. Flat Point Grubscrew (4off)
11. Shank
12. Cone Point Grubscrew (2off)
13. Cover Seal

Probe Head Removal and Switch Settings

CAUTIONS...

ONLY FULLY QUALIFIED TECHNICIANS SHOULD RESET THE PROBE HEAD AND OPTICAL MODULE PROBE SWITCH SETTINGS.

DO NOT TWIST THE PROBE HEAD FROM THE OPTICAL MODULE PROBE OTHERWISE DAMAGE CAN RESULT.

Note...

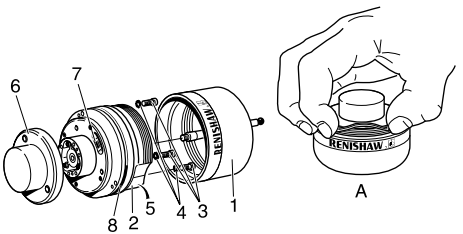
The probe head must only be removed to gain access to the probe head and optical module probe switches.

Removing the Probe Head

1. Unscrew probe head cover [1] counterclockwise and remove from probe head [2].
2. Release and remove the three retaining capscrews [3], together with the three star washers [4].
3. Gradually tighten the two grubscrews [5] to jack the probe head from the optical module probe.

Accessing the Probe Head Switch

To gain access to the probe head switch [7], peel back the probe rear seal [6] by squeezing it as shown in **View A**.



1. Probe Head Cover
2. Probe Head
3. Retaining Screw (3 Off)
4. Star Washer (3 Off)
5. Grubscrew (2 Off)
6. Probe Rear Seal
7. Probe Head Switch
8. 'O' Ring

Adjusting the Probe Head Switch

CAUTIONS...

DO NOT TOUCH ELECTRICAL COMPONENTS WHEN ADJUSTING SWITCH SETTINGS.

KEEP ALL COMPONENTS CLEAN. DO NOT ALLOW THEM TO BECOME CONTAMINATED WITH MACHINING RESIDUE OR COOLANT.

NEVER USE THE TIP OF A PENCIL TO ADJUST THE SWITCH.

UNDER NO CIRCUMSTANCES MUST THE PROBE REAR SEAL BE REMOVED.

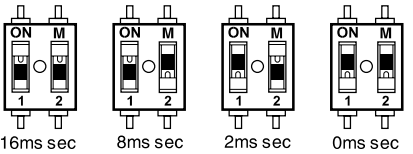
Note...

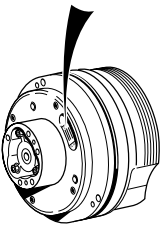
The probe head switch controls the time delay required by the probe to provide immunity against the effects of vibration and shock and is normally set at 8 milliseconds. Reducing the time delay below 8 milliseconds will make the probe far more susceptible to unexpected triggers caused by rapid traversing or orientation.

The probe head switch can be adjusted to set the time delay to:

- 0 milliseconds.
- 2 milliseconds.
- 8 milliseconds (factory setting).
- 16 milliseconds.

To select the time delay setting you require, move the switch to the positions shown below.





Probe Rear Seal removed for clarity

Adjusting the Optical Module Probe Switch

CAUTIONS...

DO NOT TOUCH ELECTRICAL COMPONENTS WHEN ADJUSTING SWITCH SETTINGS.

KEEP ALL COMPONENTS CLEAN. DO NOT ALLOW THEM TO BECOME CONTAMINATED WITH MACHINING RESIDUE OR COOLANT.

NEVER USE THE TIP OF A PENCIL TO ADJUST THE SWITCH.

The switch can be used to adjust the following settings:

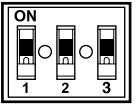
- The '**DEBOUNCE**' time: which controls the minimum time that must elapse after sending a start signal, before the optical module probe is ready to act upon another start signal. This can be set to 4.2 or 8.6 seconds.

- The '**TIME OUT**' period: which controls the period of time that the optical module probe will remain operational before switching to the standby mode when in the Optical on - Time out mode. This can be set to 33 ± 2 seconds or 134 ± 2 seconds.

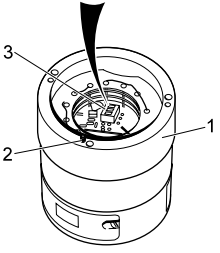
- The **'MODE'**: in which the probe operates. This can either be Optical On - Optical Off or Optical On - Time Out.

To select the 'DEBOUNCE', 'TIME OUT' and/or 'MODE' setting(s) you require, move switches 1,2 and/or 3 to the position(s) shown below.

1 DEBOUNCE	2 TIME-OUT	3 MODE
4.2 secs	33 secs	Optical On Optical Off



1 DEBOUNCE	2 TIME-OUT	3 MODE
8.6 secs	134 secs	Optical On Auto Time Off



1. Optical Module Probe
2. Dowel
3. Optical Module Probe Switch

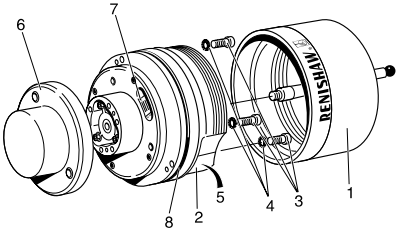
Replacing the Probe Head

1. Fully release the two grubscrews [5] to facilitate assembly of the optical module probe to the probe head [2].
2. Visually inspect the probe rear seal [6] and 'O' ring [8] for damage and deformation. If damage is found, return the probe to your supplier for repair.

CAUTION

DO NOT TWIST THE PROBE HEAD OTHERWISE DAMAGE CAN RESULT.

3. Align dowel, located within the face of the optical module probe, with the clearance hole within the probe head. Gently push the optical module probe and probe head together.
4. Secure the probe head to the optical module probe with the three retaining screws [3] and three star washers [4]. Tighten the three retaining screws to 1.1Nm (0.8 lbf. ft).
5. Hand tighten the two grubscrews [5]; sufficient force should be applied to ensure that they will not 'back off' when subjected to machine vibration.
6. Where necessary, replace the 'O' ring [8] and lightly lubricate with mineral oil or grease.
7. Reassemble the probe head cover [1] (the cover is fully home when it abuts the stop).

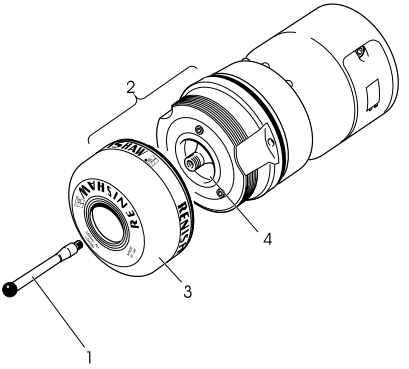


1. Probe Head Cover
2. Probe Head
3. Retaining Screw (3 Off)
4. Star Washer (3 Off)
5. Grubscrew (2 Off)
6. Probe Rear Seal
7. Probe Head Switch
8. 'O' Ring

Diaphragm Inspection

The probe mechanism is protected by two Viton diaphragms. It is important that the outer of these is periodically inspected in the following manner:

1. Unscrew the probe stylus [1] from the probe head [2].
2. Unscrew the probe head cover [3] from the probe head [2].
3. Visually inspect outer diaphragm [4] for damage. If damage is found, refer to your MP700 Probe System Installation and User's Guide (Publication Number H-2000-5142).



1. Stylus
2. Probe Head
3. Probe Head Cover
4. Outer Diaphragm

Troubleshooting

PROBE SYSTEM FAILS TO SWITCH ON	
Possible Cause	**Rectification Action**
Probe is already switched on. (Optical On/Optical Off)	Check that probe is off. Where necessary, switch off the probe.
Dead Battery.	Change battery.
Battery has been incorrectly fitted.	Check battery for correct installation.
Probe is not aligned with optical receiver of OMM/OMI.	Verify alignment. Ensure OMM/OMI fixtures are secure.
Swarf build up on optical receiver of OMM/OMI.	Remove swarf.
Beam between optical receiver of OMM/OMI and the probe is obstructed.	Clear obstruction.
Signal strength of OMI is too weak.	Ensure 'SIGNAL' LED is green. If LED is red or yellow, adjust the signal strength of the OMI in accordance with the MP700 Probe System Installation and User's Guide.
OMM is not transmitting the start signal.	Verify that 'START' LED illuminates when a start signal is sent.
MI12 Machine Interface Unit is not receiving the machine M code.	Check the power supply to the MI12. Check condition of all connections and outputs.
No power supply to OMI.	Verify that OMI has a power supply.

PROBE SYSTEM FAILS TO SWITCH ON (Continued)

Possible Cause	Rectification Action
No power supply to MI12 Machine Interface Unit.	Verify that MI12 has a power supply. Check all connections and fuses. Verify power supply is a stable 24V.

PROBE STOPS IN MID-CYCLE (PROBE OPEN/FAIL)

Possible Cause	Rectification Action
Beam obstructed.	Check for LED error. Remove obstruction.
Probe has been orientated too quickly.	Ensure axial movement of probe is maintained within the recommended rate.
Probe has false-triggered due to shock and vibration during an axial move.	Check probe settings in accordance with the MP700 Probe System Installation and User's Guide. Reduce axial speed of probe. Reduce styli mass.
Probe remained on workpiece surface too long.	Review software.
Probe remaining on workpiece and not backing off.	Increase distance settings. Review software.
Probe failing to trigger on contact with workpiece.	Increase probing speed to a minimum of 15mm per minute.
Probe has collided with foreign object.	Remove obstruction.
Damaged cables.	Check all cables.

PROBE STOPS IN MID-CYCLE (PROBE OPEN/FAIL) (Continued)

Possible Cause	Rectification Action
Power supply de-activated.	Check power supply.
Loose probe assembly.	Check tightness of probe styli and probe shank.
Probe unable to find part within programme window.	Part out of position or missing.

PROBE CRASHES

Possible Cause	Rectification Action
Probe signals are being taken from a tool setting probe.	Verify system functionality.
Workpiece is obstructing the path of the probe.	Review software.
Probe length offsets have been removed.	Review software.

POOR REPEATABILITY AND ACCURACY

Possible Cause	**Rectification Action**
Swarf on part.	Remove swarf.
Tool change repeatability is poor.	Verify probe repeatability using a single point move.
Probe position has changed due to loosening of probe assembly.	Verify tightness of probe styli, on-centre adjustment mechanism and shank mounting.
Probe position has changed from its calibrated position by 180° or due to M19 orientation.	Verify probe position. Check on-centre setting and, if necessary, adjust to within 20% of part tolerance.
Calibration and updating of offsets is not occuring.	Review software.
Calibration and probing speeds are not the same.	Review software.
Calibrated feature has moved.	Verify position of calibrated feature.
Measurement is occuring as the stylus leaves a surface.	Review software.
Probing is being performed within the machine's acceleration and deceleration zones.	Review software.
Probe feedrate is too high for machine/controller.	Perform simple repeatability trials at various speeds.

POOR REPEATABILITY AND ACCURACY (Continued)

Possible Cause	Rectification Action
Temperature variation is causing excessive movement in the machine and the workpiece.	Minimize machine and workpiece temperature changes. Increase the frequency of calibration.
Machine has poor repeatability due to loose encoders, backlash, tight slideways and/or accident damage.	Perform a health check on your machine tool.

PROBE FAILS TO SWITCH OFF

Possible Cause	Rectification Action
Probe set in 'Time Out' mode.	Wait for a minimum of 2 minutes and 20 seconds for the probe to switch off.
Probe set in 'Time Out' mode causing timer to reset in the tool carousel.	Use a lighter styli. Review use of 'Optical On-Time Out' mode.
Probe is being switched on by the OMM/OMI.	Reduce proximity and/or the signal strength of the OMM/OMI.
Probe being continuously switched on by an adjacent probe within the tool carousel.	Ensure the a distance of 600mm is maintained between each probe.
No line of sight between probe and OMM/OMI when switch off signal is sent.	Ensure line of sight is maintained.

PROBE STATUS LED FAILS TO ILLUMINATE

Possible Cause	Rectification Action
Battery installed incorrectly.	Check battery for correct installation.

MI12 'POWER' LED FAILS TO ILLUMINATE WITH POWER SWITCHED ON

Possible Cause	Rectification Action
Faulty electrical contact.	Check all connections.
Blown fuse.	Check all fuses. Replace blown fuse.
Incorrect power supply.	Ensure power supply is 24V dc.

MI12 'LOW BATT' LED REMAINS ILLUMINATED

Possible Cause	Rectification Action
Incorrectly installed battery.	Check battery for correct installation.
Fully discharged battery.	Renew battery.

PROBE STATUS LED REMAINS ILLUMINATED

Possible Cause	Rectification Action
Battery voltage below useable level.	Renew battery.

PROBE IS TRANSMITTING SPURIOUS READINGS

Possible Cause	Rectification Action
Damaged cables.	Check all cables for damage. Renew cables if damage is found.
Electrical or optical interference.	Move transmission cables clear of any cables carrying high currents.
System malfunctioning or inducing intermittent errors.	Shield from intense light sources, e.g. Xenon beacons. Electrically isolate OMM from the machine to prevent any possibility of an earth loop. Ensure there are no arc welders, stroboscopes or other high intensity light sources in close proximity to the probe system.
Poorly regulated power supply.	Ensure that the power supply is correctly regulated.
Excessive machine vibration.	Eliminate machine vibration
Loose mountings or stylus.	Check and tighten mountings. Tighten stylus.

PROBE FAILS TO RESEAT CORRECTLY

Possible Cause	Rectification Action
Probe trigger occurred on reseat.	Move stylus clear of workpiece.
Inner and/or outer diaphragm is damaged.	Inspect/renew diaphragms.

MP700 Calibration Requirements (applies to non-Renishaw software users only)

CAUTION

IF THIS PROCEDURE IS NOT FOLLOWED, THEN MEASUREMENT ERRORS MAY BE EXPERIENCED.

If vector measurement is undertaken, involving any motion in the Z axis, the following procedure is recommended for probe calibration and measurement (Renishaw software includes these features as standard):

1. Calibrate the probe using standard calibration methods to establish the probe length, stylus ball radius and spindle to stylus ball X, Y offsets.

Note...
The following explanation assumes that the probe length offset is applied to the end of the stylus ball.

2. When measurement is required, using three axis motion, position the stylus ball centre on a measuring path normal to the surface, allowing for the stylus X, Y offsets and adjusting the Z position by the calibrated ball radius.

3. Make the measurement move and capture the X, Y, Z position.

4. To determine the measured position, re-apply the X, Y stylus offsets to the captured position.

5. To determine the surface contact position, re-apply the X, Y stylus offsets and the calibrated ball radius in Z (this gives the stylus ball centre position), then compensate by the calibrated ball radius along the vector path to adjust the captured position.

HOW TO OBTAIN YOUR COPY OF THE MP700 PROBE SYSTEM INSTALLATION AND USER'S GUIDE

A copy of the MP700 Probe System Installation and User's Guide can be obtained from your nearest Renishaw company (see back cover for company names, addresses and telephone numbers) and may be ordered in any one of the following languages:

Language	Part Number
English	(H-2000-5142)
French	(H-2000-5143)
German	(H-2000-5144)
Italian	(H-2000-5145)

If no Renishaw company exists in your country, please contact:

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