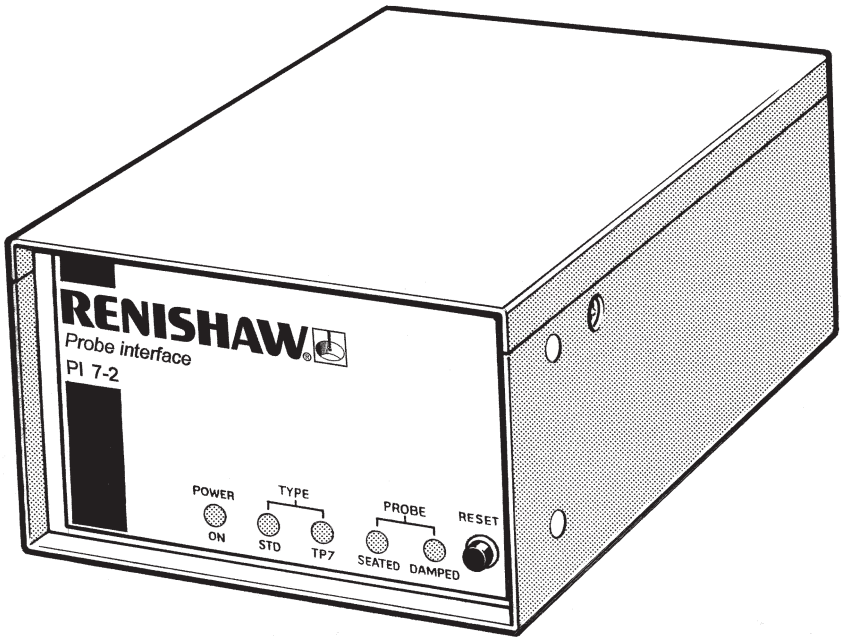


PI 7-2



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Renishaw part no: H-1000-5015-13-C

Issued: 01 2009

PI 7-2

interface for TP7M probe series

installation 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.

TÜV

This equipment has been independently certified by TÜV Product Services in accordance with OSHA (US) and SCC (Canada) requirements to the standards UL61010-1 Second Edition and CAN/CSA-C22-2 No. 61010-1 Second Edition.

Safety

If this product is not used in its intended manner, any protection provided may be impaired.

There are no user serviceable parts inside this equipment.

The PI 7-2 interface unit must be connected to a supply incorporating a protective earth conductor via a three-core mains cable (line cord).

Electrical ratings

Supply voltage range	100-240 V ac +10%, -15%
Power frequency range	47 Hz - 66 Hz
Power consumption	10 W
SSR contact ratings	±40 mA pk ±50 V pk

Operating conditions

The PI 7-2 interface unit is specified to operate under the following conditions as defined in BS EN 61010-1:2001.

Protection provided by enclosure	IP30
Altitude	Maximum 2000 m
Operating temperature	0 °C to +50 °C
Storage temperature	-10 °C to +70 °C
Relative humidity	Maximum 80 % RH up to +31 °C, decreasing linearly to a maximum 50% at +40 °C
Transient voltages	Installation category II
Pollution degree	2

The PI 7-2 is isolated from AC power by disconnection of the IEC mains connector on the rear panel. If any additional means of isolation is required, it must be specified and fitted by the machine manufacturer or the installer of the product. The isolator must be sited within easy reach of the CMM operator and comply with IEC61010 and any applicable national wiring regulations for the country of installation.

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 Renishaw products

Renishaw plc 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.

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

Claims under warranty must be made from authorised services centres only, which may be advised by the supplier or distributor.

Patents

Features of Renishaw's PI 7-2 and associated products are the subjects of the following patents and patent applications:

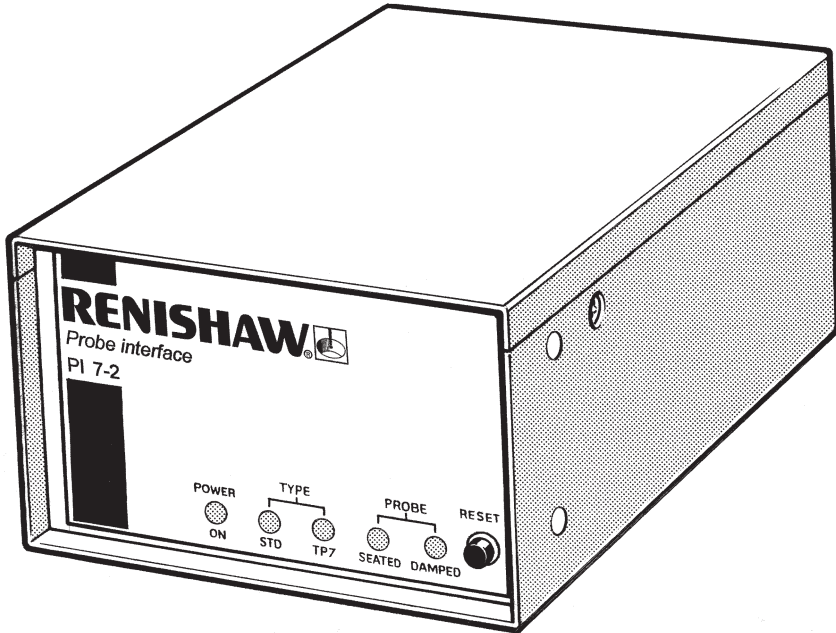
EP 0243766	JP 2,545,082	US 4813151
EP 0388993	JP 2,647,881	US 4916339
EP 279828 B	JP 3,346,593	US 5,228,352
EP 0521703		

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1 Introduction

The PI 7-2 is a dedicated signal conditioner for interfacing the TP7M series of probes or touch-trigger probe types such as TP2, TP20 or TP6/TP6A, to the CMM controller.



2 Product description

2.1 Technical description

The PI 7-2 automatically recognises the probe type, determines the probe status, which is either triggered or seated (armed), and transmits debounced signals to the CMM controller. Status and control signals are transferred between the PI 7-2 interface, other Renishaw equipment and the CMM controller via the product interconnection system (PICS) ports.

The TP7M probe series employ silicon strain sensors to detect the small gauging forces applied to the stylus tip. There is no electronic processing in the probe and the sensors are connected directly to the interface via the Renishaw autojoint connector, the probe head and associated wiring. The sensor signals are amplified and the resultant 'probe signals', proportional to changes of strain, are compared with reference voltages to determine the status of the probe.

The initial value of strain in the sensor structure will vary with the mass of the stylus and the orientation of the probe. At switch-on or following re-orientation of the probe on a movable head, a process known as 'autozero' is used to rapidly null the strain to a zero reference level.

When the stylus contacts the workpiece, a change of strain occurs in the probe structure causing the probe signal voltage to exceed the trigger reference level. A probe trigger signal condition occurs by asserting SYNC on the PICS port. As stylus deflection increases, the probe signal voltage will exceed the halt reference level and HALT will be asserted on the PICS port. When the stylus backs-off the workpiece, the probe signal falls below the reference levels; SYNC and HALT are cleared to the seated state and the sensor outputs are nulled to the zero reference level in preparation for the next trigger. Debounce timers allow the motion characteristics to stabilise after the initial trigger and reseat events, to prevent spurious switching.

A solid state relay (SSR) equivalent of the SYNC output is provided for controllers requiring a voltage free contact at their probe input.

There is a choice of 2 levels of trigger sensitivity to allow the TP7M series to be used on a wide range of CMM types or in situations where the ambient vibration levels are not ideal.

2.2 Front panel indicators

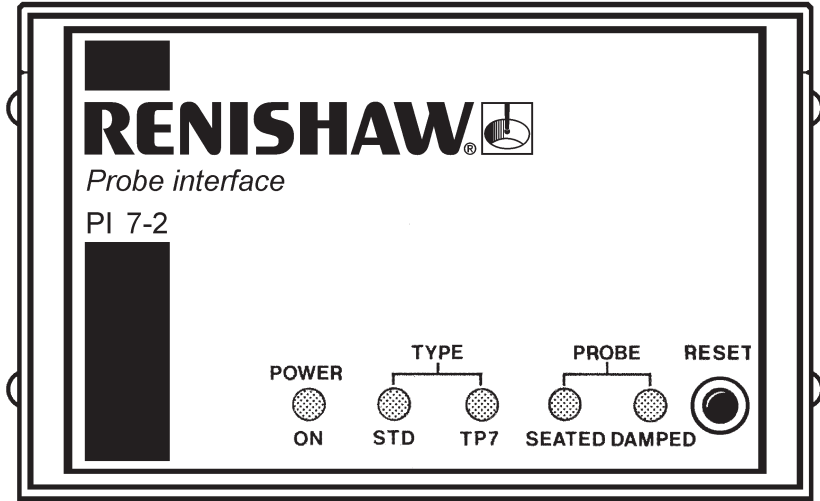


Figure 1 - PI 7-2 interface front panel

Front panel indicators

Indicator		Colour	Function
POWER	ON	Green	Mains power on
TYPE	STD	Green	Touch-trigger probe selected
	TP7	Green	TP7M series probe selected
PROBE	SEATED	Green	ON - probe (seated)
			OFF - probe triggered or no probe connected
	DAMPED	Yellow	PDAMP asserted

2.3 Reset switch

Automatically, the probe will reset to the armed state when the PI 7-2 is powered up. Occasionally, it may be necessary to perform a manual reset, for example after changing the probe stylus.

Press the RESET button on the front panel for 2 seconds to reset the probe to the armed (seated) state.



CAUTION: Pressing the RESET button inhibits probe triggers. Before pressing the button, the CMM must be stationary, in manual mode, with the stylus clear of the workpiece.

NOTE: The action of unlocking and locking the PH10 series motorised head will perform the same function as the RESET button.

2.4 Configuration switches

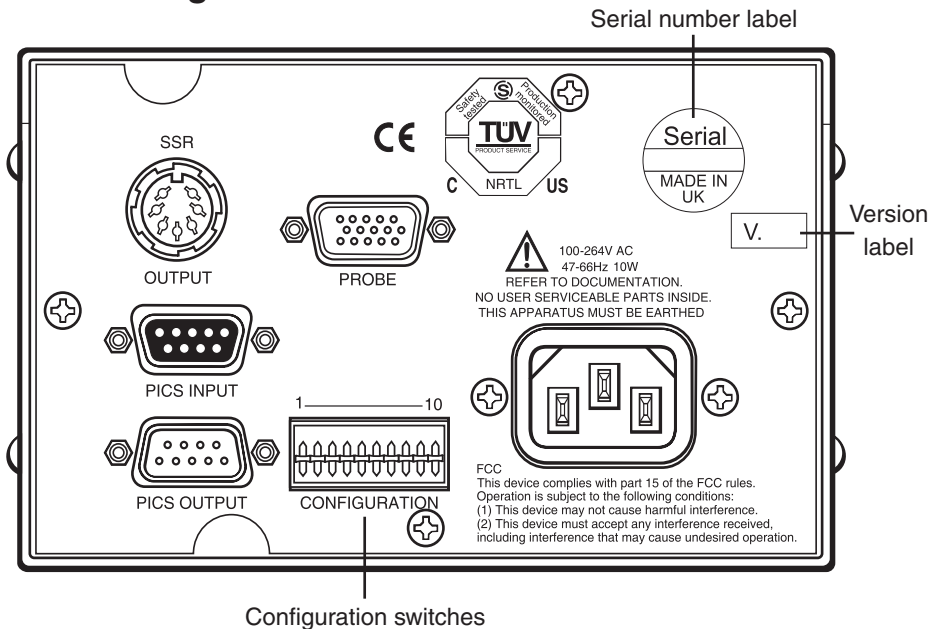


Figure 2 - PI 7-2 interface back panel

Configuration switches

Switch no.	Function	Position	Description
1	SSR invert	UP DOWN	SSR closed when probe seated SSR open when probe seated
2	Buzzer	UP DOWN	Audible indication of probe trigger - OFF Audible indication of probe trigger - ON
3	Kinematic probe input	UP DOWN	Autojoint input only PICS input enabled
4	Probe type	UP DOWN	Optimise for issue '01' (or later) probe All probe types
5	STOP disable	UP DOWN	No response to PICS - STOP Trigger outputs respond to PICS - STOP
6	HALT invert	UP DOWN	PICS - HALT output active HIGH PICS - HALT output active LOW
7	HALT mode	UP DOWN	HALT generated internally HALT asserted by PICS
8	Auto reset	DOWN UP	Automatic reset disabled Probe will reset after 2 seconds
9	Trigger sensitivity	DOWN UP	Level 1 (high sensitivity) Level 2 (mid sensitivity)
10	No function - unused		

Switch 1

The solid state relay (SSR) output contacts may be set to be open when the probe is seated and closed when the probe is triggered. The output may be inverted to mimic the action of a kinematic probe.

Switch 2

The internal audible indicator normally gives a short tone burst when the SYNC output changes from the seated to the triggered state. The switch may be set to enable or disable the sound.

Switch 3

With switch 3 UP, the PI 7-2 will automatically change operating modes from TP7M to kinematic probe types (TP2, TP20 or TP6/TP6A) when a TP6A probe or PAA series adapter is attached to the Renishaw autojoint connector on the probe head. Switch 3 should be set to the DOWN position only when it is necessary to connect a kinematic probe or an electronic trigger, from an external source, to the PICS input connector. For example, this will be necessary if the TP7 is fully integrated with the TP200 probe on the same installation.

Switch 4

Early versions of the TP7M probe required faster resetting than the '01' (or later) issue (after January 1995). Where only the '01' or later versions are to be used, switch 4 should be set to the UP position to optimise the reset function. This will reduce the possibility of an incorrectly seated probe occurring in situations where the back-off from the gauge point is slow or where the stylus 'skates' on the surface. Switch 4 should be set to the DOWN position where the 'pre-01' probe or mixed types are used. The DOWN position provides equivalent function to previous versions of the PI 7.

The TP7M probe types may be recognised by the differences in appearance shown in figure 3.

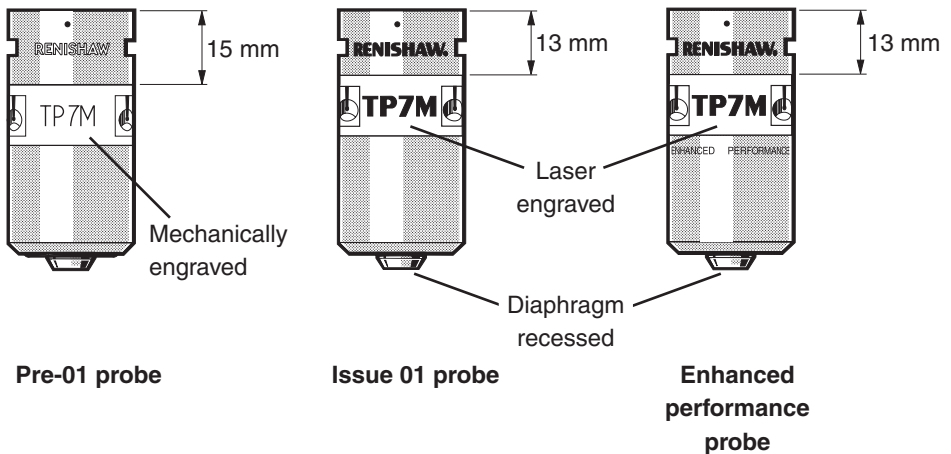


Figure 3

The TP7M probe indicating spacing of stainless steel sleeve and recessed diaphragm on '01' probe and the enhanced performance probe

Switch 5

With switch 5 DOWN, the SYNC, HALT and SSR outputs will go to the triggered state when the CMM controller or other Renishaw equipment asserts the PICS STOP line. Setting switch 5 UP disables the response.

Switch 6

The HALT output at the PICS connector is active low with switch 6 DOWN but may be inverted by selecting switch 6 UP.

Switch 7

Set switch 7 to the UP position for normal operation with the TP7M or kinematic probes (TP2, TP20 or TP6/TP6A). For fully integrated operation of the TP7M with the TP200 probe on the same installation, set switch 7 to the DOWN position to allow the HALT signals from the PI 200 interface to be automatically routed to the CMM controller when the probe is changed.

Switch 8

Set switch 8 DOWN for normal operation with the automatic reset disabled. Set switch 8 UP to select automatic reseal of the probe 2 seconds after triggering. This facility is included for compatibility with previous versions of the PI 7.

Switch 9

Set switch 9 DOWN for normal operation with the TP7M at its highest sensitivity (level 1) and lowest error.

Under certain conditions, vibration may cause false 'air' triggers during gauging and it may be necessary to reduce the probe's sensitivity. False triggers may occur when large or heavy stylus arrangements are used, or where there is floor transmission from nearby machinery or vehicles. Set switch 9 UP to select level 2. This will reduce sensitivity to vibration but with a small loss of measuring accuracy.

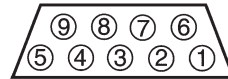
NOTE: All configuration switches are hardware controlled and do not require the PI 7-2 to be switched off and on again to make the selection active.

2.5 Connector pins

Refer to the Renishaw installation guide 'Product interconnection system – PICS' (part number H-1000-5000) for the electrical specification of the PICS signals.

PICS output connector

The PICS output connector is a 9 pin 'D' type plug. The pin numbers (viewed on the rear panel) are shown in the table below.



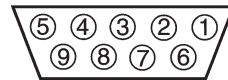
PICS output connector pin numbers

Pin no.	Function
1	STOP
2	PPOFF
3	0 V
4	Reserved for Renishaw use
5	SYNC (probe trigger)

Pin no.	Function
6	HALT
7	PDAMP
8	LEDOFF
9	Not used
Shell	Screen

PICS input connector

The PICS input connector is a 9 pin 'D' type socket. The pin numbers (viewed on the rear panel) are shown in the table below.



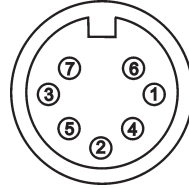
PICS input connector pin numbers

Pin no.	Function
1	STOP
2	PPOFF
3	0 V
4	Reserved for Renishaw use
5	Probe input

Pin no.	Function
6	HALT IN
7	PDAMP
8	LEDOFF
9	Probe return (0 V)
Shell	Screen

Solid state relay (SSR) connector

The SSR output connector is a 7 pin DIN socket. The pin numbers (viewed on the rear panel) are shown in the table below.



SSR connector

Pin no.	Function
1	0 V
2	Not used
3	Not used
4	Probe status 1

Pin no.	Function
5	Probe status 2
6	Not used
7	Not used
Shell	Screen

2.6 Summary of changes from earlier versions of PI 7

- New enclosure
- Universal mains voltages
- Broken gauge detection added
- Auto reset selections reduced to either 2 s or OFF
- Audible warning (buzzer) volume control removed
- Audible warning (buzzer) OFF switch added
- RESET button on front panel added
- PICS HALT o/p invert switch added
- PICS SSR o/p invert switch added
- Optimisation available for '01' type probes

2.7 Dimensions

Enclosure style 1/3 rack (19 ") x 2U

Overall dimensions 140 mm x 88 mm x 183 deep

Mounting method Rack mounting or free standing

Weight 1.6 kg

3 Replacement of PI 7, PI 7c and PI 7H

The following table relates the PI 7-2 configuration switches to the previous standard and custom versions of the PI 7.

Function	PI 7-2 *	PI 7-2 #	PI 7	PI 7c	PI 7H
SSR invert	Sw1 UP DOWN	Sw1 UP DOWN	Sw2 UP DOWN	Sw2 UP DOWN	Sw2 UP DOWN
Buzzer off	Sw2	Sw2	'VOL' on rear panel	'VOL' on rear panel	'VOL' on rear panel
Kinematic probe input	Sw3 UP DOWN	Sw3 UP DOWN	Sw6 DOWN UP	Sw6 DOWN UP	Sw6 DOWN UP
Probe type	Sw4	Sw4	No function	No function	No function
STOP disable	Sw5 UP DOWN	Sw5 UP DOWN	Internal Sw3 on motherboard UP DOWN	Internal Sw3 on motherboard UP DOWN	Internal Sw3 on motherboard UP DOWN
HALT invert	Sw6 UP DOWN	Sw6 UP DOWN	No function	Internal Sw1 on LED board RIGHT LEFT	Internal Sw1 on LED board RIGHT LEFT
HALT mode	Sw7 UP DOWN	Sw7 UP DOWN	No function	No function	Internal Sw2 on LED board LEFT RIGHT
Auto reset	Sw8 DOWN	Sw8 RIGHT	Sw4/5 Sw4 DOWN Sw5 DOWN	Sw4/5 Sw4 DOWN Sw5 DOWN	Sw4/5 Sw4 DOWN Sw5 DOWN
	Sw8 UP	Sw8 LEFT	Sw4 UP Sw5 DOWN	Sw4 UP Sw5 DOWN	Sw4 UP Sw5 DOWN
Trigger sensitivity Level 1 Level 2	Sw9 DOWN UP	Sw9 RIGHT LEFT	Sw3 DOWN UP	Sw3 DOWN UP	Sw3 DOWN UP
Grounding	Function deleted	Function deleted	Sw1	Sw1	Sw1

* Version 13 and above. # Version 12 and below.

4 Installation procedure



WARNING: Ensure the PI 7-2 is disconnected from the mains supply during installation.



WARNING: Do not exceed the operation ambient of 50 °C around the unit. Do not install near sources of heat. Forced cooling may be required in final installation.

4.1 Rack mounting

The PI 7-2 may be mounted in a 19 " equipment rack or may be free standing.

To mount the PI 7-2 alone requires 2 x 1/3 blanking panel kits (part number A-1018-0123). Refer to figure 4 below.

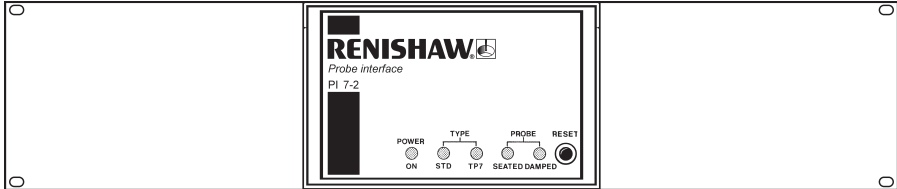


Figure 4 - Mounting the PI 7-2

To mount the PI 7-2 adjacent to a Renishaw PHC10-2 head controller or ACC2-2 autochange controller requires a rack mounting bracket (part number A-1018-0124) and an enclosure link bracket kit (part number A-1018-0126).

Remove the blanking plugs from the side of each unit and fit the halves of the link bracket before screwing them together, as shown in figure 5, with the screws provided.

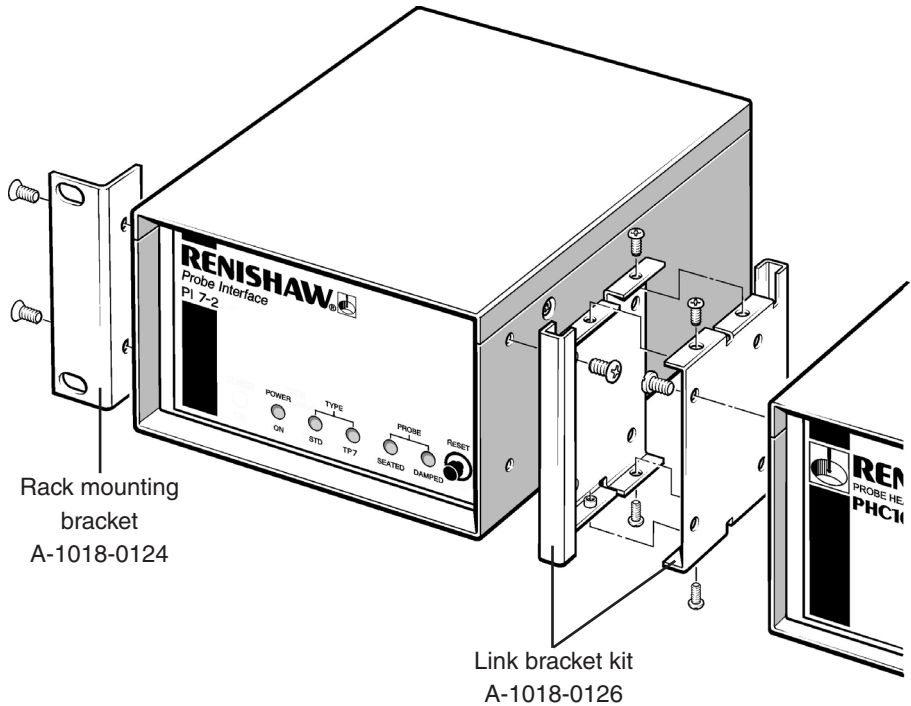


Figure 5 - Mounting the PI 7-2 adjacent to a Renishaw PHC10-2

To mount the PI 7-2 into an existing installation adjacent to a PHC10 or ACC2 (previous style of enclosure with extruded side pieces), a link bracket (part number M-1018-0097) and 2 x M5 screws x 6 mm long (part number P-SC29-0506) are required.

Remove the blanking plugs from the side of the PI 7-2 and screw the bracket in place. On the extruded style enclosure, prise out the rubber cover from the corner moulding and loosen the 2 screws. Locate the bracket between the corner moulding and the front panel, tighten the screws and replace the cover.

4.2 System interconnection

The interconnections for the TP7 system on a PH10M motorised probe head are shown in figure 9. The table opposite gives a list of alternative standard Renishaw cable lengths and part numbers.

Refer to the Renishaw 'PH10M system' installation guide (part number H-1000-5071), for further information

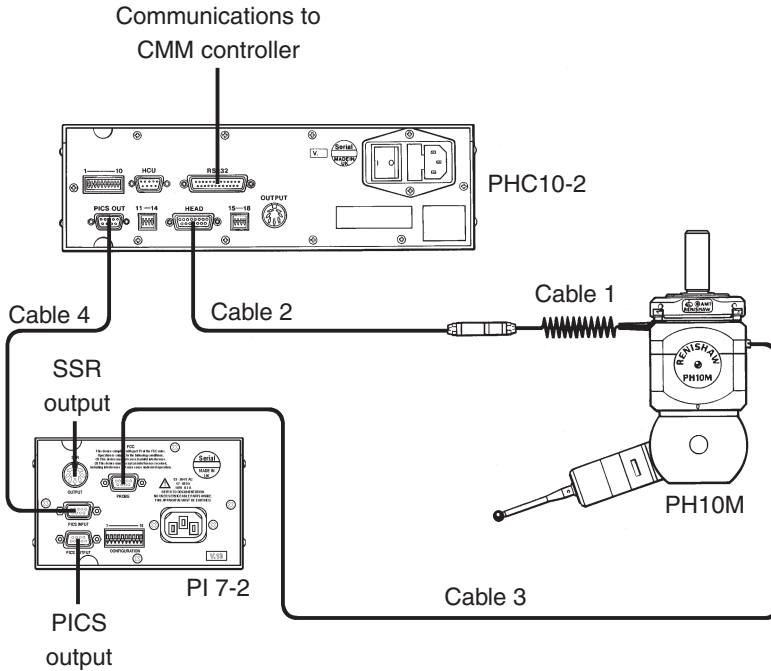


Figure 6 - System interconnection

Cable no.	PL no.	Length (m)	Part number	Notes
1	PL5	0.4 - 0.8	A-1016-7672	Coiled
	PL6	0.8 - 1.6	A-1016-7673	Coiled
	PL12	0.1	A-1016-7674	Plain
	PL13	0.1 - 0.2	A-1016-7675	Coiled
2	PLM6	6	A-1016-7564	Unterminated
	PLM7	4	A-1016-7563	Unterminated
	PLM8	6	A-1016-7677	
	PLM9	4	A-1016-7678	
3	PL38	25	A-1016-7625	Unterminated
	PL42	15	A-1016-7624	Unterminated
	PL56	12	A-1016-7626	Unterminated
	PL44	8	A-1016-7627	Unterminated
	PL46	3.7	A-1016-7678	Unterminated
	PL45	1.8	A-1016-7629	Unterminated
4	PL25	0.3	A-1016-0120	

NOTE: Cables marked 'unterminated' are supplied with one end prepared but unterminated. The connector parts are supplied for fitting after routing of the cable in the installation.

5 Maintenance

Check the security of mounting screws and electrical connectors.

Remove dust from the external surfaces with a proprietary cleaning cloth.

There are no user serviceable parts within the PI 7-2.

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